Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

The Business Value of Superior Energy Performance®

Certifying Increased Energy Productivity under ISO 50001

Better Buildings Summit

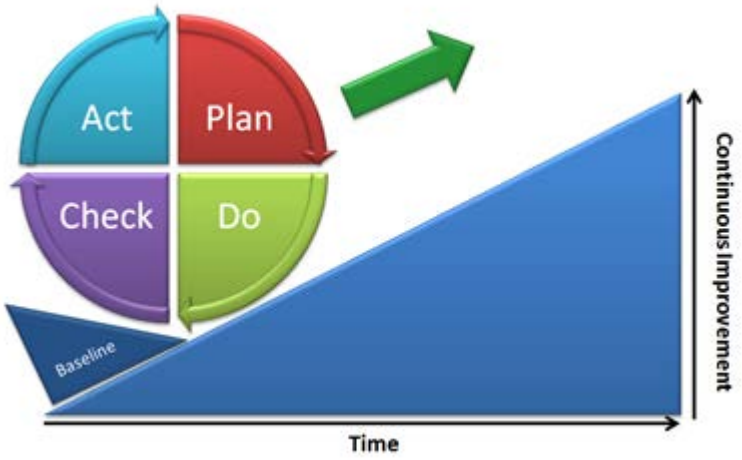
Paul Scheihing, Advanced Manufacturing Office

May 10, 2016

U.S. DEPARTMENT OF ENERGY

Energy Management System (EnMS)

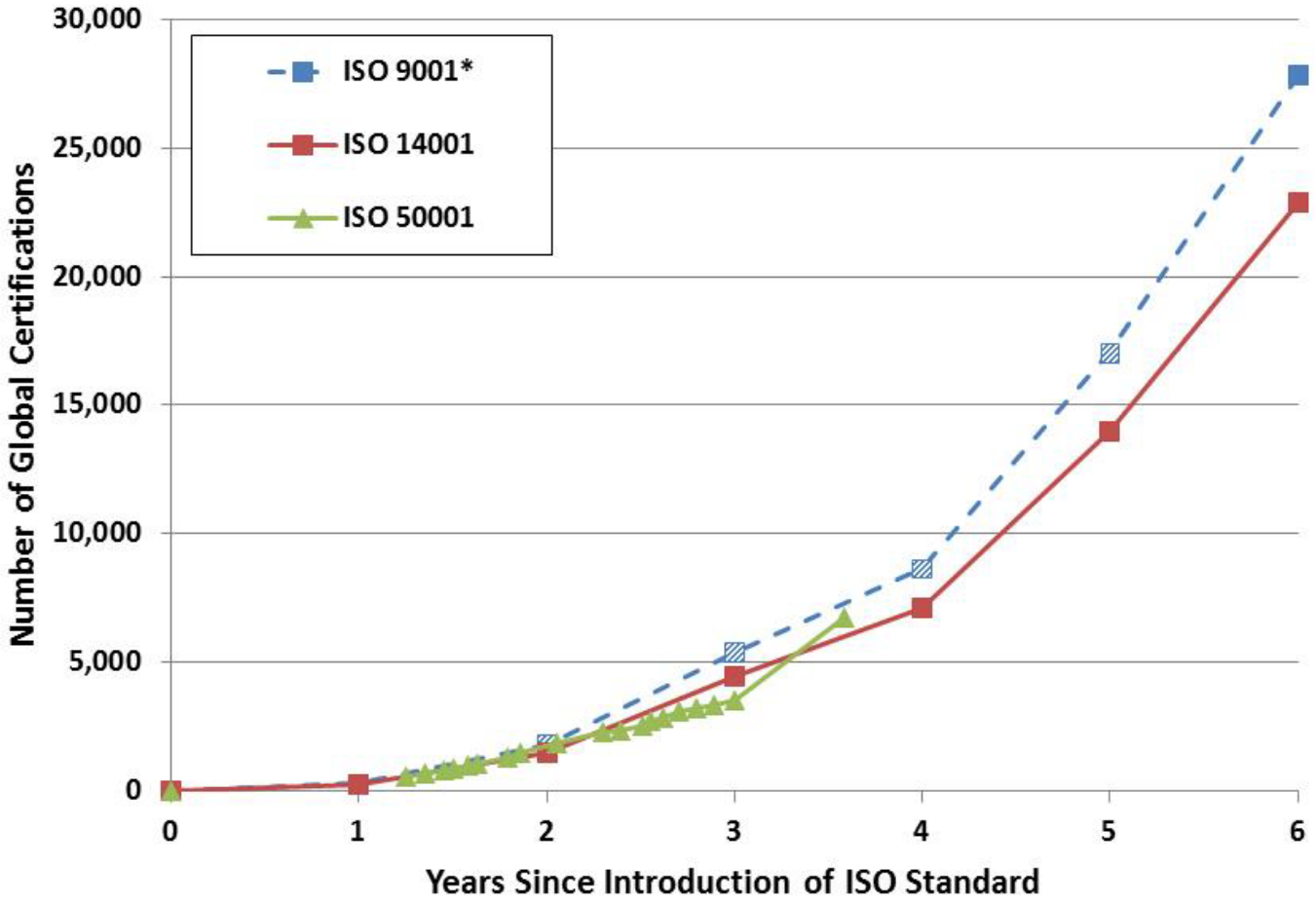
- **Elevates and integrates energy into normal business systems**, as has happened for safety & quality
- **Involves staff from the board room to the shop floor**: Organizational change in culture
- Systematic energy management leads to **continual improvements** in energy and cost performance



Energy & cost savings over time

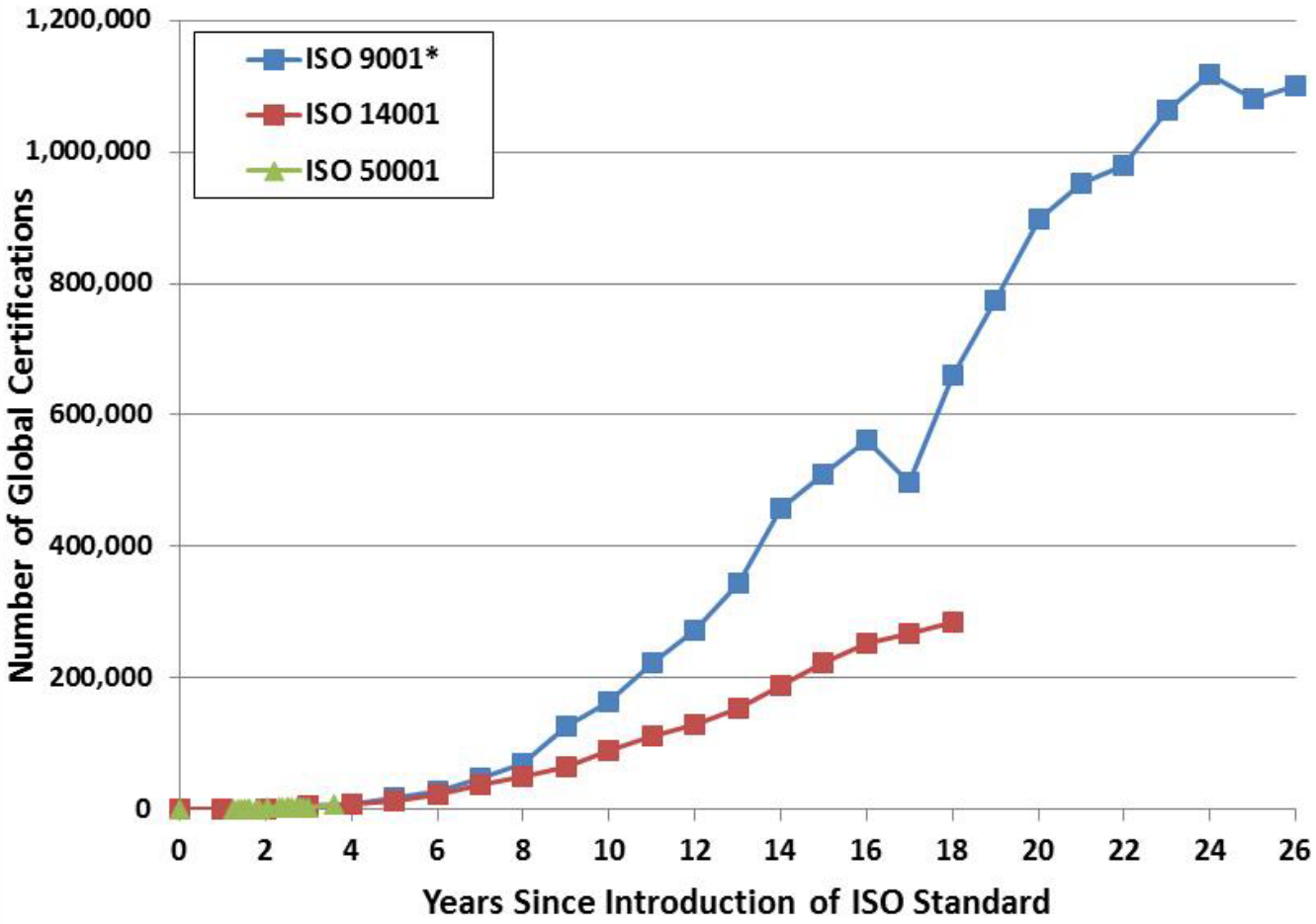
Initial Growth of ISO 9001, 14001, & 50001

Global - Initial 6 Years



Initial Growth of ISO 9001, 14001, & 50001

Global - Initial 26 Years



Superior Energy Performance U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY

Superior Energy Performance® (SEP™)

SEP is a DOE certification program that verifies energy management excellence and sustained energy savings.

SEP is ISO 50001 plus:

- **Deeper, sustained savings at less cost** through robust tracking and measurement with advanced tools
- **Credible, third-party verification** by ANSI-ANAB accredited entity that market can reward supply chains, utilities, and carbon trading
- **National recognition** by U.S. DOE identifying sustainability leaders

iStock photo: 16418416

Superior Energy Performance® (SEP™)

Leaders in energy management and performance

- Achieving up to $1 million in annual savings
- Significant savings from operational improvements with no capital investment
- Reducing carbon emissions, with third-party verified energy performance improvement

Through certification to Superior Energy Performance…

HILTON WORLDWIDE
LAND O'LAKES
3M
VOLVO
Coca-Cola
Schneider Electric
NISSAN
DETROIT DEMAND PERFORMANCE
MedImmune A member of the AstraZeneca Group
BRIDGESTONE Your Journey, Our Passion
OLAM
HARBEC Technical Innovation with Environmental Responsibility
CURTISS WRIGHT
GENERAL DYNAMICS
Cummins

SEP Certified Facilities
and Verified Energy Performance Improvement

Improvement over 3 years unless stated otherwise

Schneider Electric	Saanichton, BC Canada	30.6%
	Smyrna, TN	23.1%
	Clovis, CA	16.7%
	Seneca, SC	15.6%
	Peru, IN	24.9% / 10 yrs
	Costa Mesa, CA	23.4%
	West Kingston, RI	20.0%
	Columbia, MO	13.3% / 1 yr
	Apodaca, Mexico (Monterrey 2)	11.3%
	Hopkins, SC	10.2%
	Tijuana, Mexico	10.2%
	Cedar Rapids, IA	8.8%
	Apodaca, Mexico (Monterrey 3)	7.8%
	Lexington, KY	6.9%
	Lincoln, NE	6.5%
	Rojo Gomez, Mexico	5.9%
HILTON WORLDWIDE	Washington, DC	15.9%
	Honolulu, HI	8.4%
	San Francisco, CA	6.3%
3M	Brockville, Ontario Canada	21.4% / 7 yrs
	Cordova, IL	5.7%
VOLVO	Mack Trucks, Macungie, PA	41.9% / 10 yrs
	Dublin, VA	28.4% / 10 yrs
	Hagerstown, MD	20.9%
Cummins	Columbus, IN	16.8%
	Whitakers, NC	12.6%
DETROIT	Detroit, MI	32.5% / 10 yrs
NISSAN	Smyrna, TN	17.7%
HARBEC	Ontario, NY	16.5%
Coca-Cola	Dunedin, FL	12.2%
GENERAL DYNAMICS	Scranton, PA	11.9%
BRIDGESTONE Your Journey, Our Passion	Wilson, NC	15.1% / 10 yrs
OLAM	Gilroy, CA	9.8%
MedImmune A member of the AstraZeneca Group	Gaithersburg, MD	8.5%
CURTISS WRIGHT	Cheswick, PA	7.6%
LAND O'LAKES	Carlisle, PA	5.7%

Last updated: March 1, 2016

SEP Measurement & Verification Protocol provides robust methodology to track and verify energy performance improvement.

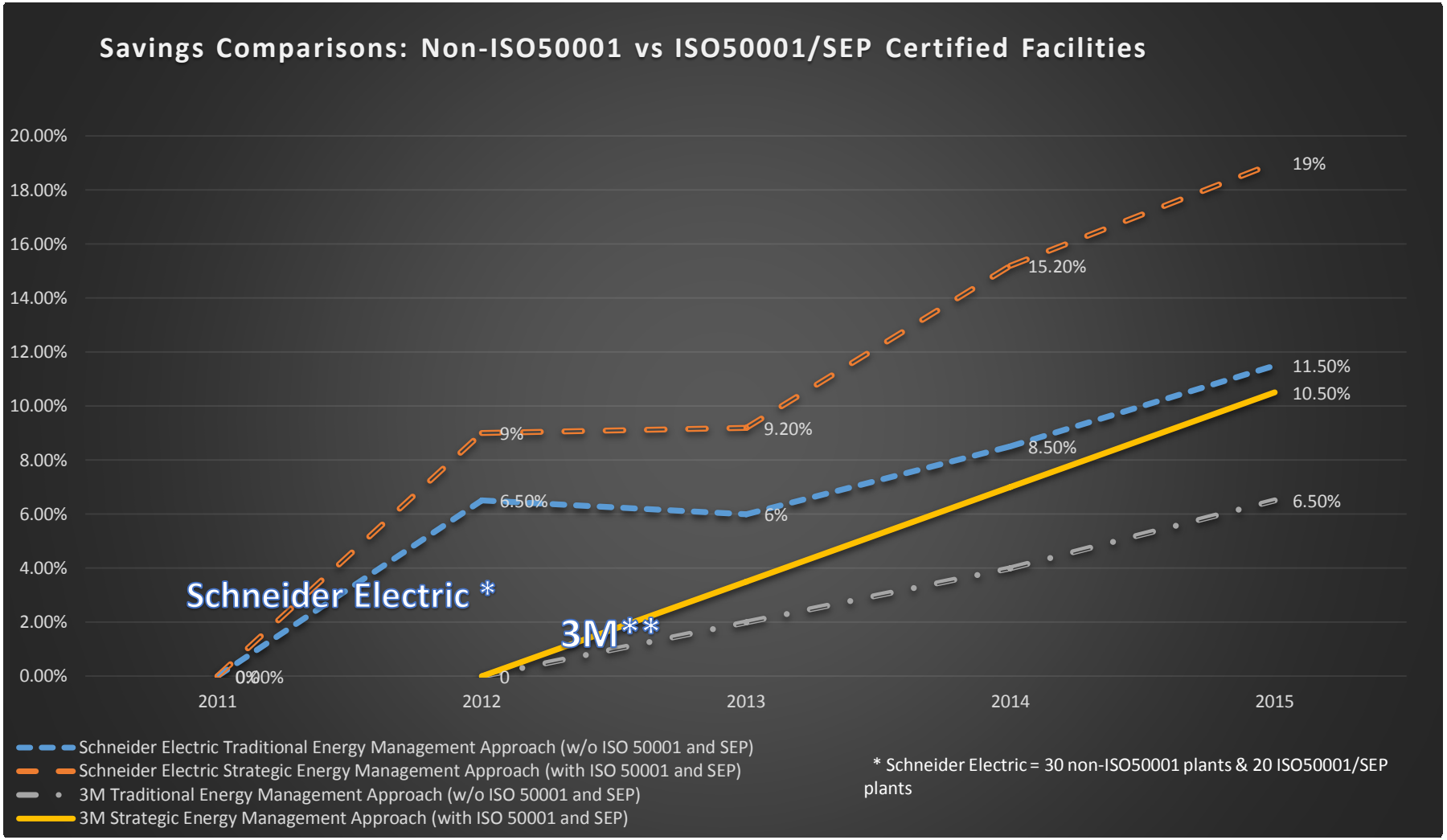
Annual Cost Savings

Company	Facility	Annual Savings	Payback
Cummins	Rocky Mount Engine Plant, Whitakers, NC facility	**$716,000**	11 months
General Dynamics	Scranton, PA facility	**$956,000**	6 months
Nissan	Smyrna, TN facility	**$938,000**	4 months
Volvo Trucks	New River Valley, VA facility	**$866,000**	5 months

"SEP verification provides the ability to have **proven performance metrics to quantify actual savings**, giving both **internal and external credibility** to savings claims."

Volvo Trucks
Dublin, VA

ISO 50001 and SEP makes a difference!



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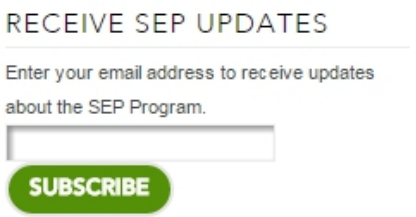
U.S. DEPARTMENT OF ENERGY

Learn more:

energy.gov/isosep

Subscribe on the SEP website to receive the latest SEP news & program updates:



Better Plants complements SEP

DOE's Better Plants

Corporate-wide Recognition
Aspirational Focus:
Pledge to improve energy performance by
25% in the next 10 years

Superior Energy Performance

Facility-level Certification
Achievement Focus:
Energy performance improved
5% or more over past 3 years or 15% or more over past 10 years

Better Plants Helps SEP Participants

- Provides structure for corporate-wide energy efficiency goals
- Fosters replication of SEP at other facilities

SEP Helps Better Plants Partners

- Helps individual plants to accelerate energy savings that contribute toward corporate goal
- Provides rigor of energy performance measurement at the facility level

HILTON WORLDWIDE

Better Buildings Summit

Strategic Energy Management

WALDORF ASTORIA HOTELS & RESORTS

CONRAD HOTELS & RESORTS

EMBASSY SUITES

HOMEWOOD SUITES BY HILTON

HOME2 SUITES BY HILTON

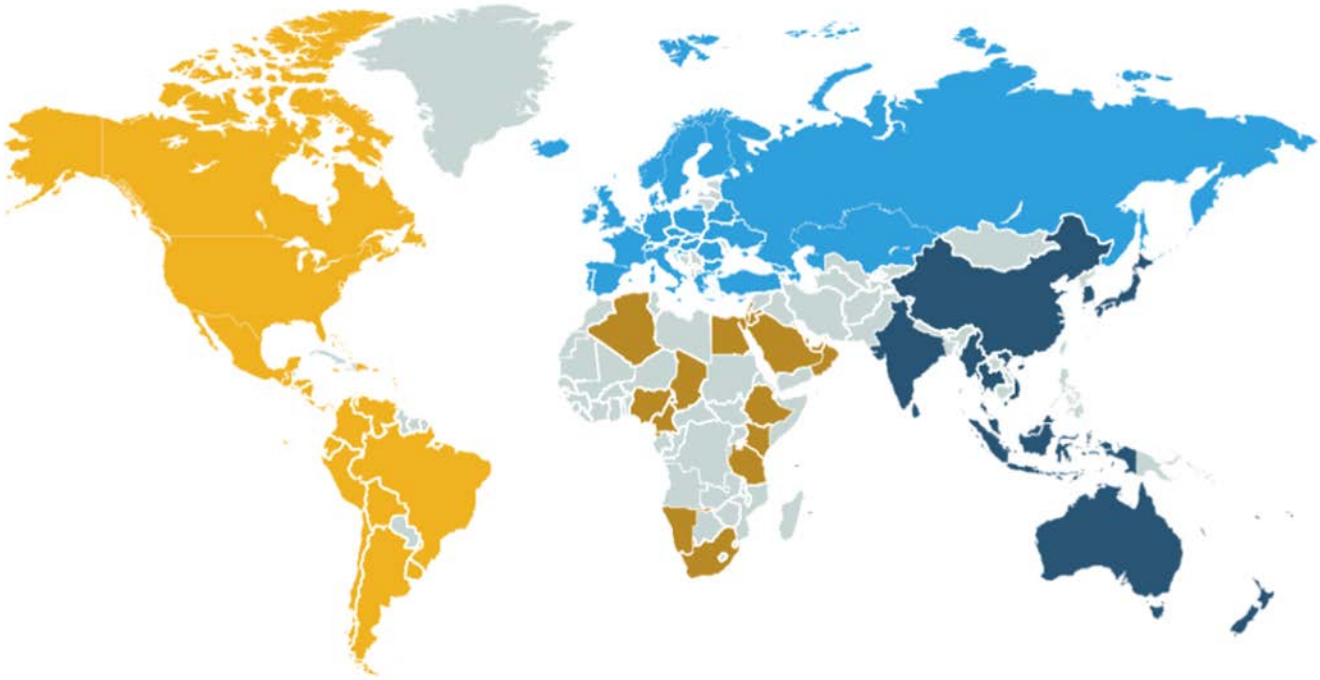
Company Overview

HILTON WORLDWIDE

Hilton Worldwide is the largest hotel company in the world with 4,650 hotels and 1,000,000+ rooms open or under development in 100+ countries and territories

Hilton HOTELS & RESORTS
WALDORF ASTORIA HOTELS & RESORTS
CONRAD HOTELS & RESORTS
canopy BY HILTON
CURIO A COLLECTION BY HILTON
DOUBLETREE BY HILTON
EMBASSY SUITES
Hilton Garden Inn
Hampton
HOMEWOOD SUITES BY HILTON
HOME2 SUITES BY HILTON
Hilton Grand Vacations
HILTON HHONORS

- **Founded in 1919**
- **$11.2 billion in revenue (2015)**
- **164,000 employees**
- **140 million guests served in 2015**
- **50+ million HHonors members**
- **266,000 rooms in the pipeline – over half under construction**



AMERICAS	EUROPE	MIDDLE EAST & AFRICA	ASIA PACIFIC
Rooms: **611,000**	Rooms: **74,000**	Rooms: **22,000**	Rooms: **51,000**
Pipeline: **137,000**	Pipeline: **27,000**	Pipeline: **29,000**	Pipeline: **73,000**
Under Construction: **51,000**	Under Construction: **13,000**	Under Construction: **21,000**	Under Construction: **49,000**

Corporate Responsibility - Issue Alignment

HILTON WORLDWIDE

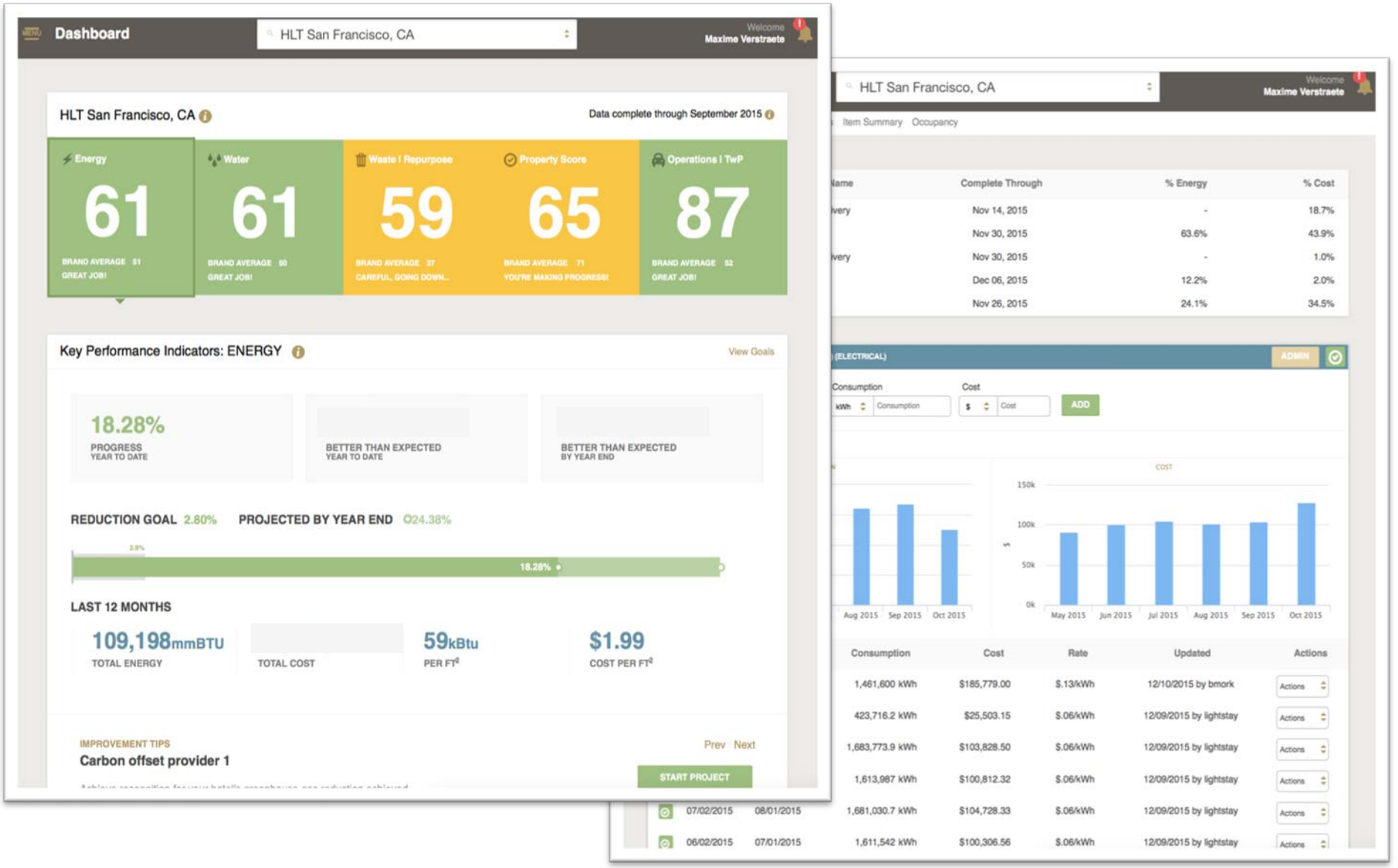
TRAVEL WITH PURPOSE®

- Youth Opportunity
- Team Members
- Inclusion

- Smart Volunteering
- Human Rights
- Disaster Support

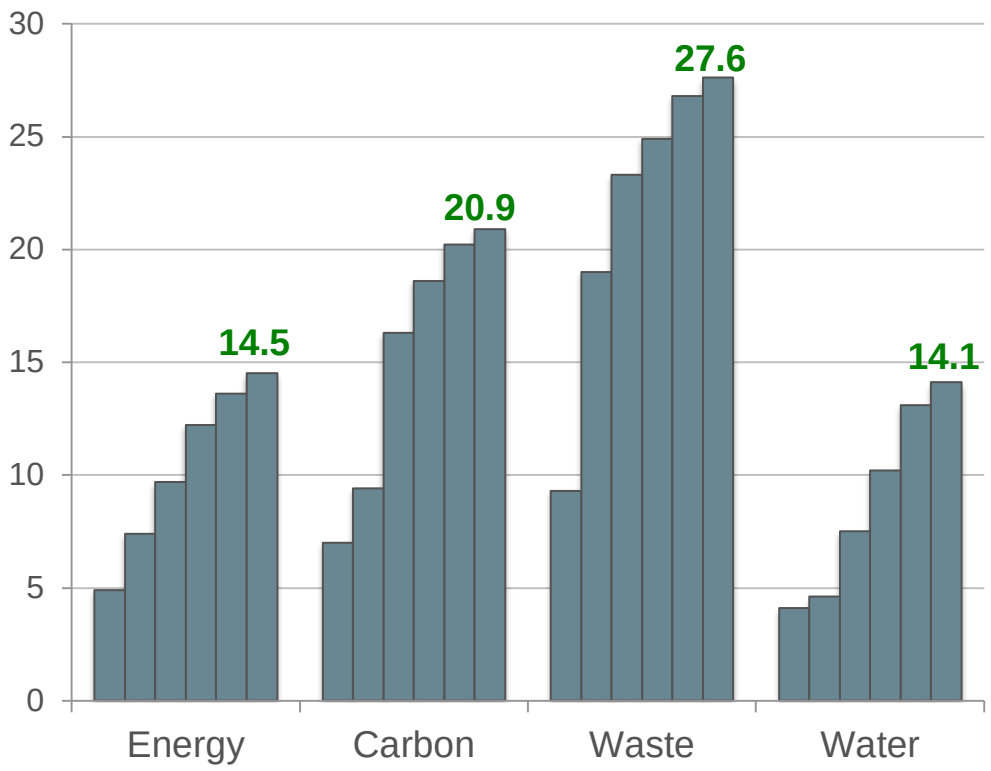
- Energy
- Water, Waste, Carbon
- Responsible Sourcing

Measurement, targets, continuous improvement and validation



Reducing our environmental footprint

6-Year progress



- We achieved our 20% carbon goal on the last year from a combination of energy efficiencies (15.2%) and the purchase of 417 million kWh renewable energy (2012 EPA Green Power Partner of the Year)
- The multi-year financial crisis had a strong impact on energy efficiency which requires more capital for improvements. No cost/low cost projects could only take us so far
- Energy and carbon were aggressive goals, based on a bold vision for Hilton Worldwide in a time when the economy was strong

$550 Million in estimated cumulative cost savings

ISO & Hilton Worldwide: Increased Focus on Energy

In September 2014, Hilton achieved ISO 50001 certification for Energy Management and ISO 9001 and 14001 re-certifications for quality and environmental management

ISO 9001 - Quality management

This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement. ISO 9001 helps ensure that customers get consistent, good quality products and services, which in turn brings many business benefits.

ISO 14001 - Environmental management

This standard ensures environmental impact is being measured and improved. The benefits can include reduced cost of waste management, savings in consumption of energy and materials, lower operating costs, and improved corporate image among regulators, customers and the public.

ISO 50001 – Energy management

ISO 50001 helps organizations save money as well as helping to conserve resources and tackle climate change. ISO 50001 supports organizations in all sectors to use energy more efficiently, through the development of an energy management system (EnMS).

Benefits of adding ISO 50001

Leverage our 9001 and 14001 certifications, and add ISO 50001 to our 2014 recertification and benefit from time, effort and cost efficiencies.

Benefits:

- **Industry leadership**: After being one of the first in industry to achieve ISO 9001 and 14001 certifications at a global scale for all our hotels and offices, achieving ISO 50001 solidifies our leadership position
- **Increase LightStay value proposition**: ISO 50001 further expands LightStay as a continuous improvement system for energy management.
- **Performance**: Results from ISO 50001 organizations show incremental performance improvement beyond even mature energy programs (deeper energy cost reduction)
- **Risk management**: These standards also act as an enhancement to risk management and due diligence programs in Energy area
- **Staying ahead of legislation**: Growing interest by utility companies in ISO 50001 as a way to sustain energy performance improvements which could eventually result in incentives and rebates. Energy was at the forefront of Obama's Climate Action Plan.

Benefits of “Going Through the Process”

Benefits:

- Having a documented Energy Management System is key to sustained improvement
  - Management system structure ensures sustainability of improvements
  - Effective management oversight is ensured
- Having third party oversight assures sustainability
  - Verification by a recognized protocol
  - Independent assurance statement (DEKRA)
- Looking at energy from a system perspective versus project level brings a different eye/approach
- Shifting from budget line item to a deeper analysis of energy use
- Integrating energy management into the management processes as required by ISO standards
  - Management review
  - Performance measurement
  - Individual performance metrics

Energy Review

Significant Energy Users And Relevant Variables

The significant energy users at hotels:

- HVAC system
- Lighting
- Water heating

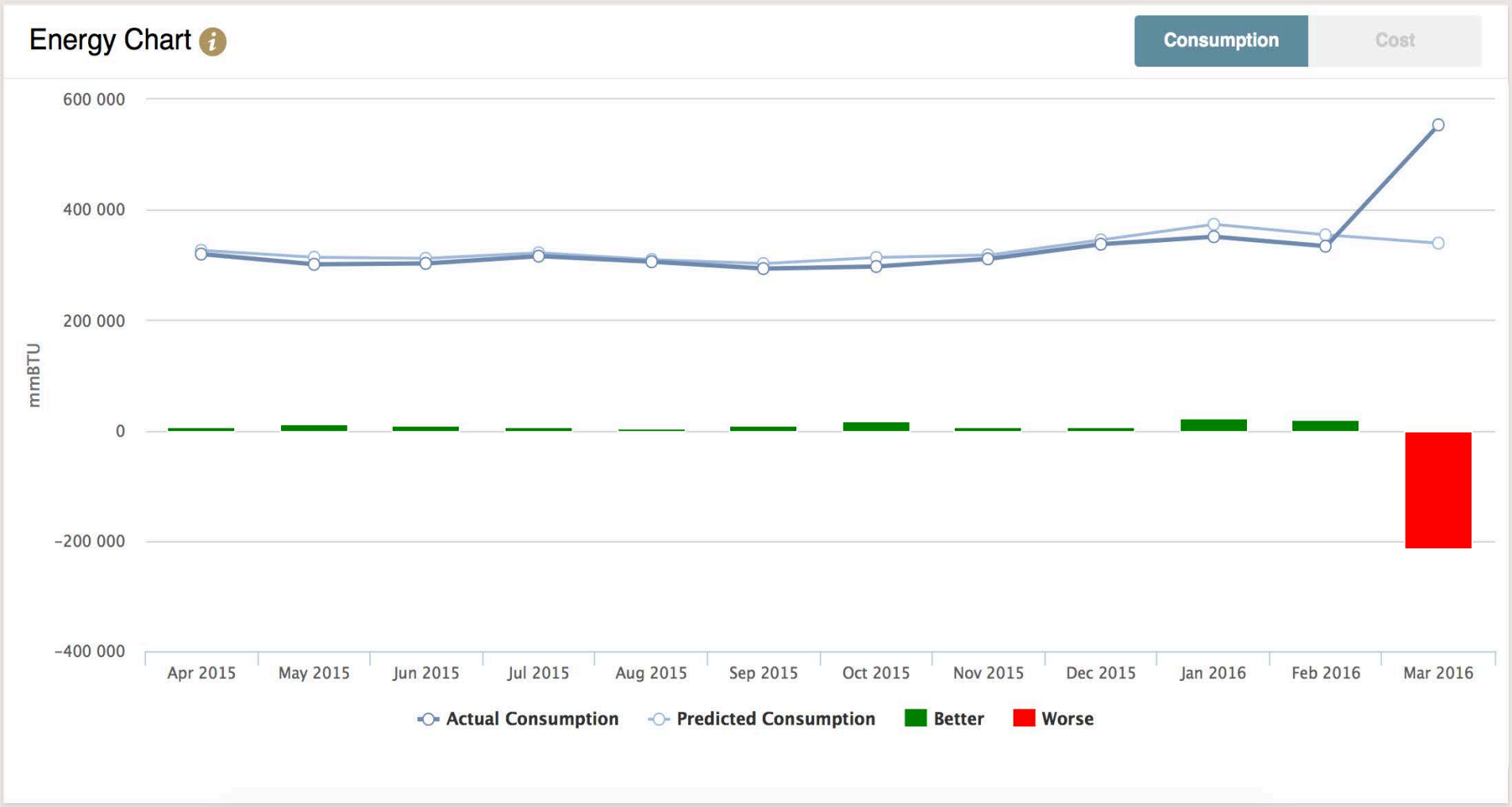
The main variables affecting these significant energy users are:

- Weather
- Occupancy
- Meeting room occupancy and food covers in some cases are also variables affecting the significant energy users

Determine Energy Performance And Future Use

Energy performance and future energy are estimated on a monthly basis through a linear regression model as defined by Superior Energy Performance's measurement and verification protocols for industry

Energy Modeling



Going a step further: SEP certification

HILTON WORLDWIDE

Bottom-Up Sanity Check = Identified projects that "explain" the measured top down improvement of the SEnPI.

Property	SEP Achievement	Certified Improvement (over 3 years)	SEnPI Measured Performance (over 3 years)	Bottom-Up Estimated Improvement	No. of Projects
Hilton San Francisco	Silver	>5%	6.3%	9.2%	4
Hilton Hawaiian Village	Silver	>5%	8.4%	6.7%	3
Hilton Washington, DC	Platinum	>15%	15.9%	15.1%	13

Washington Hilton Energy Projects

Washington, DC Projects	Savings
Chiller 1, 2, and 3 Flow	0.37%
Boiler #1 Control Upgrade	1.08%
VFD Install - Condenser Pump #2 & #1	0.88%
Chilled Water Pump Upgrade	3.00%
LED Lighting Upgrade	3.72%
2013 Energy Efficiency Upgrades	1.35%
Service Hot water upgrade	1.76%
Chiller overhaul (2013)	0.72%
Condenser Water Pump Replacement (30 hp)	0.33%
Boiler pressure reduction	0.87%
ECM Motor	0.77%
Remove old DX split systems	0.11%
Replace AHU 7 & 10 (10 hp)	0.11%
Washington Total	**15.07%**

Great learnings

HILTON WORLDWIDE

SUPERIOR ENERGY PERFORMANCE

Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

SEP ENTERPRISE-WIDE ACCELERATOR

Hilton: Three hotels SEP certified.

Hilton Worldwide has become the first hospitality company to have hotels certified to the U.S. Department of Energy's (DOE's) Superior Energy Performance® (SEP™) program. The SEP certification for three hotels in Washington, DC, Honolulu, HI, and San Francisco, CA recognizes Hilton's leadership in energy management and verified energy performance improvement.

Better Buildings CHALLENGE U.S. DEPARTMENT OF ENERGY | SWAP

PARTNERSHIPS

SWAP Home | Meet the Teams | Episodes | SWAP in the News | FAQs | Recommendations | Beat Blog

Watch the Better Buildings Challenge SWAP and see how the Whole Foods Market and Hilton Worldwide energy teams work together to unveil energy savings opportunities in each other's buildings in San Francisco, California. Season 1 is now available.

Episodes

WATCH: Episode 1 | Grocery Store Energy Management | Hilton visits Whole Foods

Twitter News

Tweets by @BetterBldgsDOE

Better Buildings
@BetterBldgsDOE

#BBSummit2016 is just a few days away. Stay tuned for live tweeting from summit sessions and energy experts 1.usa.gov/1lfA6qk

4h

Better Buildings
@BetterBldgsDOE

Join #BBResNet members @Elevate_Energy. Learn how to make home energy data accessible to consumers at #BBSummit2016! bit.ly/1p5Hrvn

Photo Gallery

Better Buildings® CHALLENGE
U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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HILTON WORLDWIDE

Energy Performance

Goal

5-8% **Reduction in Energy Intensity by 2016**

Commitment

91 **Million Square Feet**

Showcase Project

Hilton Columbus Downtown
Columbus, OH

BACKGROUND

Nissan - Superior Energy Performance

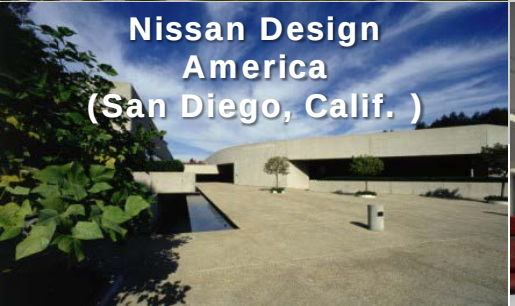
Chris Goddard

Better Buildings Summit
May 2016

NISSAN GROUP
OF NORTH AMERICA

U.S. FOOTPRINT

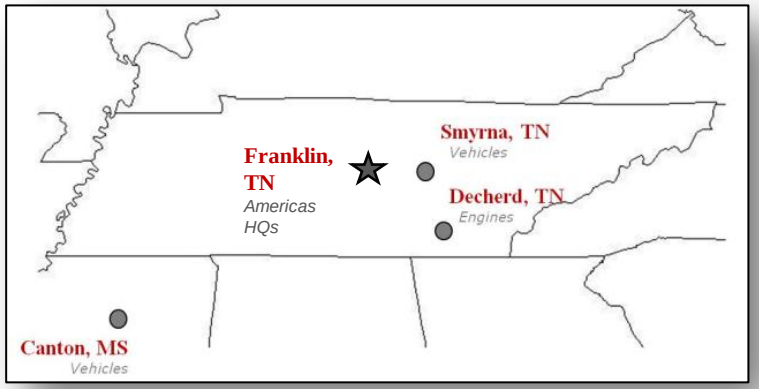
More than **22,000** employees in the U.S.



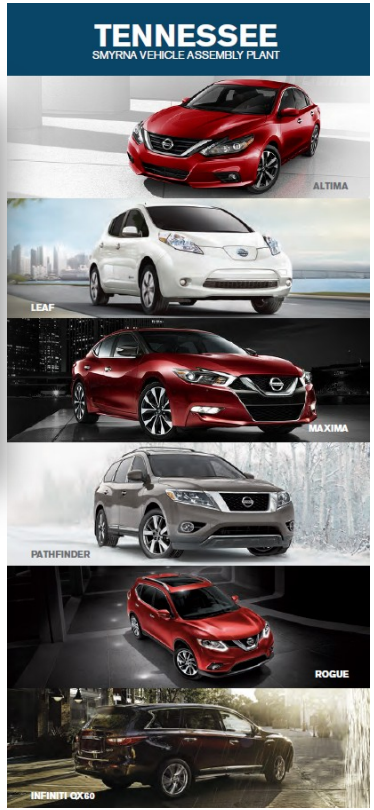
U.S. MANUFACTURING & INVESTMENT

- Celebrated more than 30 years of U.S. Automotive Manufacturing since 1983
- $10.8 billion manufacturing investment since 1981
- U.S. production has increased by more than 88% since 2010
- More than 400 suppliers in 40 states provide parts and materials to Nissan
- $13.6 billion in U.S. parts and materials purchases in 2015
- 14.7 million vehicles, 9.8 million engines and 80,000 lithium ion battery packs proudly manufactured in the U.S.

U.S. MANUFACTURING



NISSAN GROUP OF NORTH AMERICA



SMYRNA VEHICLE PLANT

Opened:	June 1983
Facility:	More than 6 million square feet
Property:	884 acres
Workforce:	More than 8,000 employees
Vehicles:	Nissan: Altima, Maxima, Rogue, Pathfinder, LEAF
	Infiniti: QX60
Capacity:	More than 640,000 vehicles annually
	Highest volume auto manufacturing plant in North America
Investment:	$6 billion
History:	Built more than 11 million vehicles since Job 1

ENERGY COMMITMENTS

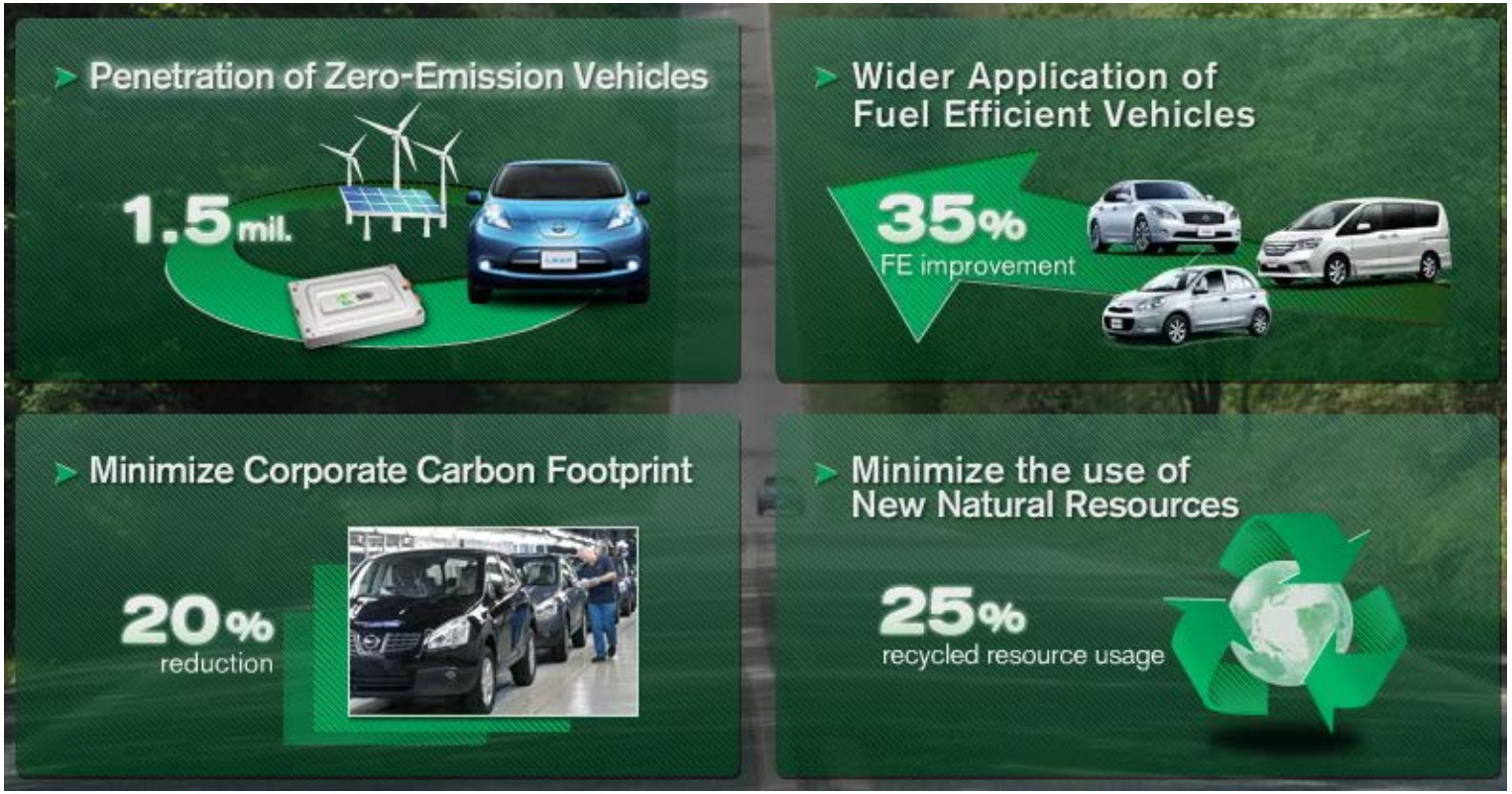
Cost Reduction On Energy Spend

Nissan Green Program

ENERGY STAR® Certification

DOE Better Plants / Superior Energy Performance ®

NISSAN GREEN PROGRAM



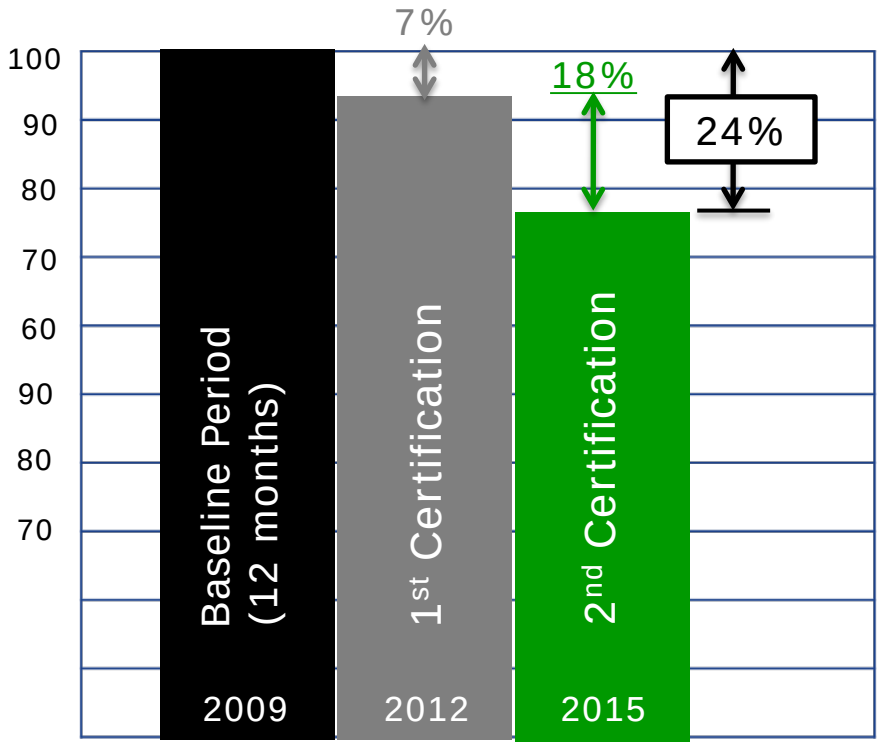
SEP CERTIFICATION

NNA-Smyrna received ISO 50001 and Superior Energy Performance (SEP) Certifications in 2012.

- Became the first passenger-vehicle manufacturing facility to attain ISO 50001 and SEP certifications.
- Within 3 years of establishing baseline, the Smyrna plant improved energy performance by 7%.

CONTINUOUS IMPROVEMENT

Normalized Facility Energy Consumption (source energy)



Nissan – Smyrna, TN facility

2015–18 | PLATINUM
Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

SEP ENTERPRISE BUSINESS CASE

- **Corporate Goals** and Customer Expectations
  - SEP Supports global CO_2 reduction targets
  - TdC reduction and supply chain cost savings.
- **Structure** ISO 50001 & SEP Harmonize EnMS across U.S. Sites
  - Smyrna plant serves as “Central Office”
  - Standardization (audits, project tracking, EnPIs)
- **Overall Opinion** (OaO) & Brand Strengthening
  - OaO is a key performance indicator
  - External recognition improves perception of environmental performance

SEP IMPLEMENTATION

- SEP adds rigor, analysis, and disciplined structure
- EnMS prompts NNA to consider energy impacts of new design projects and facility/equipment modifications

Technical Improvements:

New Body Paint Line 1 Plant
- Application of “3-Wet” Process
- Recycle 75% of booth air
- 40% Energy Savings
- 70% VOC emissions reduction

Installation of New Gas-Fired Boilers
- Eliminated use of Coal and related material handling equipment
- $2.6M investment
- 14,400 Mt/yr CO_2 reduction

Operational Improvements:

Global Energy Team Audit Activities
- FY16 focus on compressed air & chilled water systems optimization and Paint process improvements

Shop Floor Management
- Air leak repairs, equipment switch off, process optimization
- Treasure Hunts and Energy Savings Assessments (ESA’s)

BENEFITS & LESSONS LEARNED

- Increased payback requirement for energy CAPEX (1 yr to 3 yr)
- SEP Best Practice/Scorecard points are value-add and worth doing
- Corporate Sustainability Report – 3rd Party Audit of CO_2/GHG reporting
- Mature ISO 14001 program has helped ISO 50001 adaptation
- Simplification – Merged Energy & Environmental Policies
- EnPI Tool – Japanese energy managers like the DOE EnPI tool

"ISO 50001 and SEP are worth the effort as it brings structure and discipline to the program. Nissan values third-party validation and the external recognition for being an environmentally friendly manufacturer."

—Mike Clemmer, Director /Plant Mgr. Paint

THANK YOU!

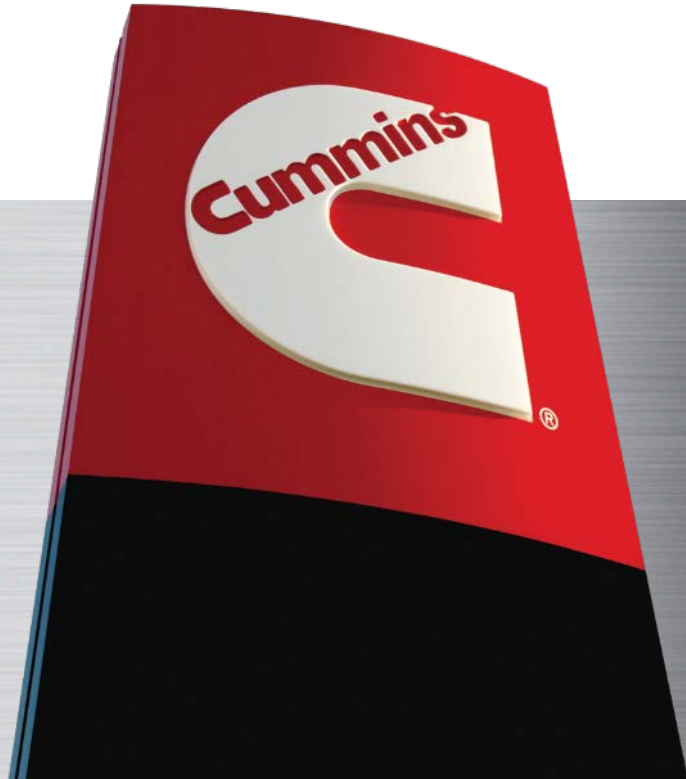

NISSAN

Cummins Energy Management: ISO 50001 & SEP

Mark Dhennin

Better Buildings Summit

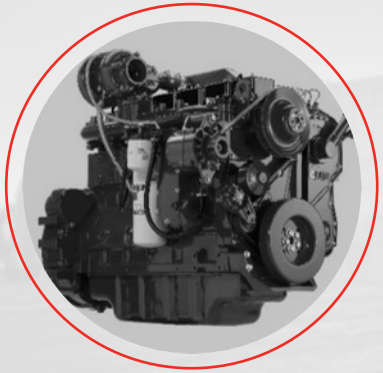
May 2016



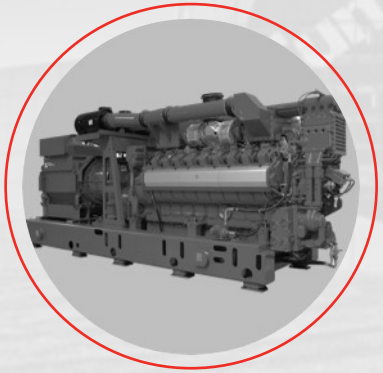
Cummins, Inc.

2015 Revenue: $19.1 billion

55,000 employees, 190+ countries & territories



Engines



Power Generation

Components

Distribution

Envolve Cummins Priorities

FOCUS	ACTION AREAS
Reducing our carbon footprint.	New product fuel efficiency • facility GHG reduction • renewable energy • products-in-use fuel efficiency • logistics • remanufacturing
Using fewer natural resources.	Water reduction and neutrality • increased recycling • zero disposal • materials efficiency • packaging • advanced manufacturing
Partnering to solve complex problems.	Supplier and community collaboration • new technologies • metals and water availability • NGOs • governments

Drivers for Energy Efficiency

Compliance

EED, ESOS

Local constraints

Energy & Water shortages

Cost Reduction

$150 million total energy spend in 2014

Corporate Goals

Sustainability Plan

Drivers for Energy Efficiency

Cummins Mission:

Demanding that everything we do leads to a cleaner, healthier, safer environment

Benefits of the Cummins EnMS

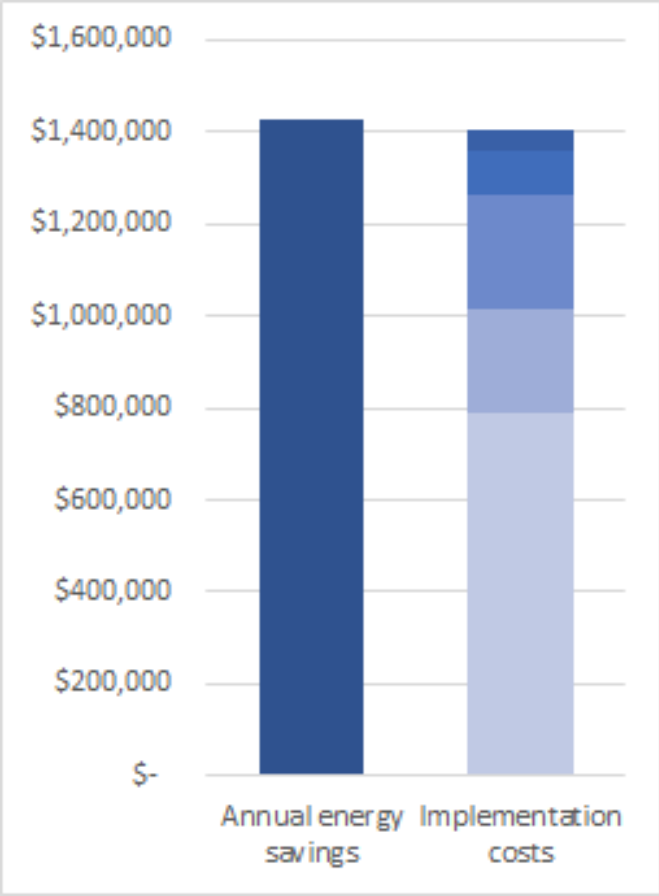
- Systemic approach driving continuous improvement
- Enterprise vs. individual site certification
- Integrated into existing Cummins HSEMS* Enterprise
- Corporate Policies & Procedures, Toolkit
- Best Practice Sharing
- Audit Costs Savings

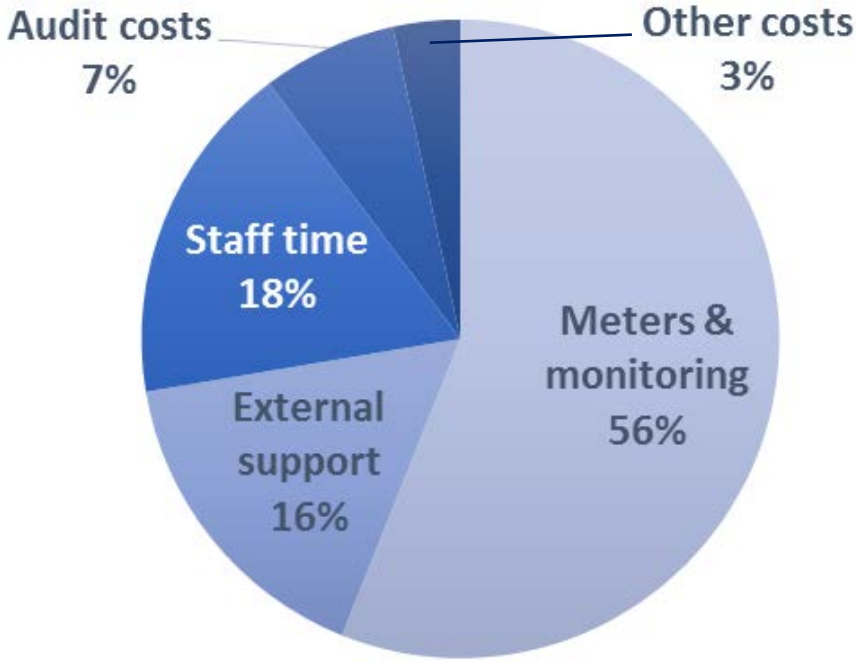
*HSEMS = Health, Safety & Environmental Management System (14001 & 18001)

EnMS Implementation Approach

2013	2015	2016	2017	2020
• 3 Pilots incl. 1 SEP site • **18% of footprint**	• 9 ISO 50001 incl. 2 SEP sites • **37% of footprint**	• 21 ISO 50001 incl. 3 SEP sites • **58% of footprint**	• 28 ISO 50001 incl. 11 SEP sites • **78% of footprint**	• 40 ISO 50001 sites, SEP based on local programs • **90% of footprint**

Cummins Enterprise EnMS: Return on Investment





Focus: Cummins Technical Center

- Opened in 1967
- 88 test cells and labs
- 1,100 employees
- 500,000 sq. ft.
- ISO 14001, ISO 50001, Superior Energy Performance – Platinum
- 722,000 MMBtu energy consumption, 2015
  - 42% Electricity, 37% Diesel, 20% Natural Gas, 1% Other
- 68.8 million gallons of water consumed, 2015

Cummins Technical Center, Columbus, IN

ISO 50001 & SEP at CTC

- Significant energy uses determined using the Cummins Energy Review Tool
  - energy, cost, GHGs, ability to influence & measure, regulatory requirements
- Involvement from multiple groups at CTC
  - Top management, operations, Energy Champions, Energy Deputies & Leaders

Testing Fuel

- 41% of total energy
- Testing drives almost all site activities

Ventilation

- Critical for maintaining test conditions
- Fans, pumps, motors

Chilled Water

- Critical for test cooling
- High demand during warm ambient conditions

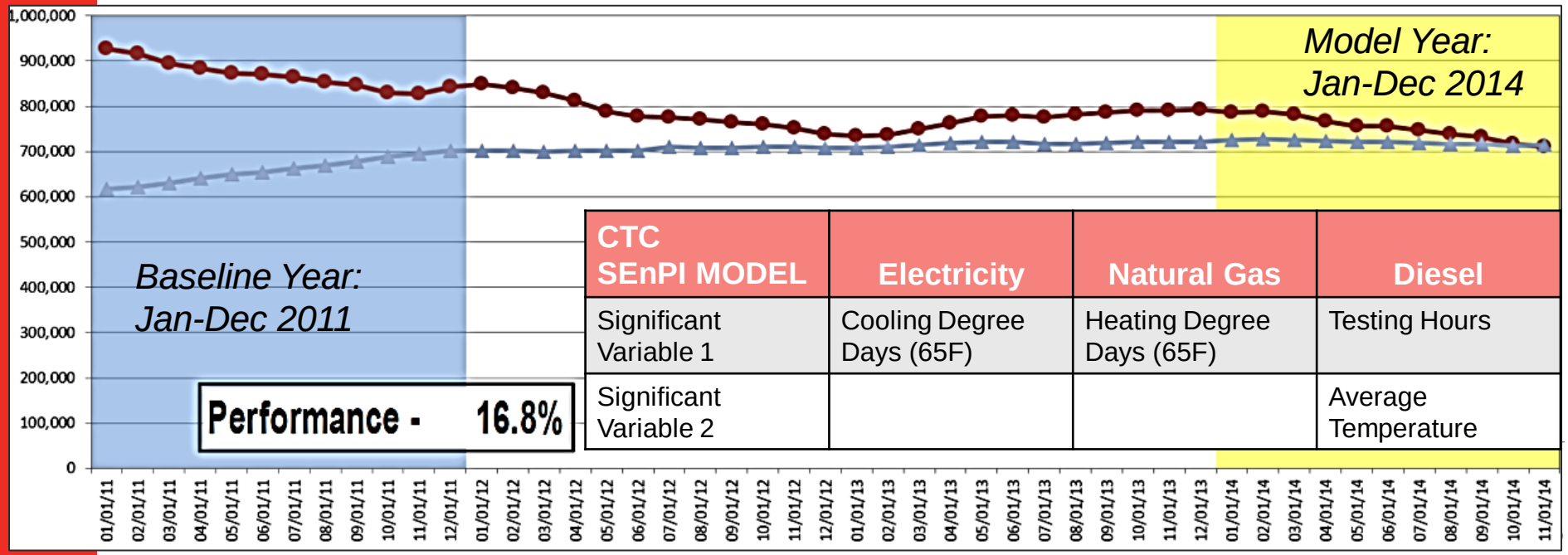
CTC's SIGNIFICANT ENERGY USES

SEP Implementation at CTC – Modeling

Challenges in a research environment

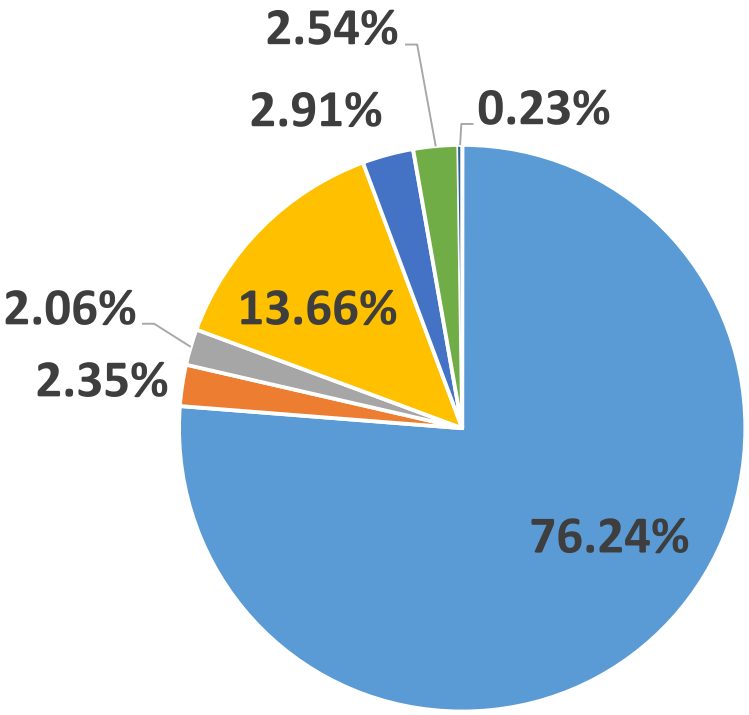
- Data normalization, characterization, availability

From EnPI Tool, developed by Georgia Tech for U.S. DOE



CTC SEnPI MODEL	Electricity	Natural Gas	Diesel
Significant Variable 1	Cooling Degree Days (65F)	Heating Degree Days (65F)	Testing Hours
Significant Variable 2			Average Temperature

CTC Energy Projects 2012 – 2014

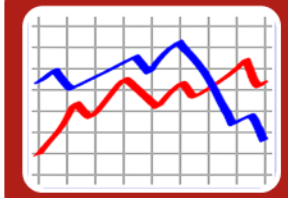


Performance - 16.8%

- **Regen Dynos**
  11,300,000 kwh $1,124,300
- **Hot water bedplate washdown**
  35,470 ccf $177,350
- **Parking Lot Lighting Upgrades**
  304,000 kwh $30,400
- **Facility Lighting Upgrades**
  2,000,000 kwh $201,400
- **Free Cooling Project**
  430,000 kwh $43,000
- **Test Cell Compressed Air Leaks**
  400,000 kwh $37,500
- **Compressed Air Leaks (non-test cell)**
  34,000 kwh $3,400

High level engineering

Operational level



Test Design

- Virtual analysis / computer simulation
- Bench-scale testing

Regenerative Dynamometers

- Recover test engine energy
- Increased technical performance capabilities

Test Control

- Test planning, coordination & control
- Reduces unproductive testing and re-running

Energy Deputies

- Ground-level improvement focus
- Harness team's technical expertise
- Just-Do-It mentality

Keys to Success

- Get senior management buy-in up front
- Set external goals and report transparently
- Understand where, when and how energy is used
- Use common tools and procedures
- Engage employees at all levels: individually and in teams, from top managers to the shop floor
- Harness on-site technical expertise
- Partner with others outside the organization
- Make energy efficiency a routine part of all employee work
- Acknowledge and reward accomplishments