TAPPING INTO DOE’S PORTFOLIO OF MANUFACTURING ENERGY EFFICIENCY RESOURCES

Jay Wrobel – Manager, Technical Assistance
Advanced Manufacturing Office

Better Buildings Summit
May 27, 2015
Better Plants Program Overview

Better Plants consists of close to **160 partners**, more than **2,300 facilities**

Average energy intensity improvement is about **2.4% per year**

Cumulative savings roughly **320 Tbtus and $1.7 billion** as of 2014
Better Plants Continues to Grow

• 13 new Program Partners so far this year

• 9 new Challenge Partners

• >11% of the US industrial energy footprint (a doubling since 2010)!
New Better Plants Initiatives

Water Pilot  Water/Wastewater Expansion  Supply Chain Pilot
New Better Plants Program Partners

**Industrial**
- abbvie
- BD
- Lineage
- O‘FALLON CASTING
  - Nonferrous Investment Castings
- OREGON FREEZE DRY
- OSHKOSH
- RICHMOND INDUSTRIES INC

**Water/Wastewater**
- ENCINA WASTEWATER AUTHORITY
- CITY OF ITHACA INCORPORATED 1868
- The Narragansett Bay Commission
- environment
  - LASANITATION
  - City of Los Angeles
- PIMA COUNTY
  - WASTEWATER RECLAMATION
- st.petersburg
New Better Plants Challenge Partners

**Industrial**
- BENTLEY
- Celanese
- Holcim
- LENNOX INTERNATIONAL
- TOYOTA

**Water/Wastewater**
- BCW&SA
- Los Angeles Department of Water & Power
- TE Connectivity
- VVWRA
Superior Energy Performance™

- SEP is a certification program that requires plants to meet the ISO 50001 energy management standard and verify the savings they achieve.
- 28 plants have been certified so far. Nine improved energy performance an average of 10% and saved over $500,000 per year.

ISO 50001 is a foundational tool that any organization can use to manage energy.

ISO 50001 Components in place:
- Top Management
- Energy Team
- Policy
- Planning
- Baseline
- Performance Metrics
Industrial Assessment Centers (IACs)

- Free assessments for small/medium sized manufacturers.
- IACs are university-based centers, led by professors and staffed by engineering students.
- Typical audit uncovers savings equal to about 8% of plant-wide energy consumption

Better Plants Partners receive priority access to IACs
Combined Heat and Power (CHP) Deployment

CHP Technical Assistance Partnerships provide

• Market Opportunity Analysis
• Education and Outreach
• Technical Assistance

Better Plants Partners receive free CHP screenings
Come to the Better Plants Recognition Event!

**Where:** Main ballroom (Salons 1 and 2)
**When:** 5:15-6:00 PM, Thursday evening

- Light snacks and cash bar
- Network with industry peers and Advanced Manufacturing Office (AMO) technology experts
- View posters of ongoing AMO projects
Why are we Here?
Knowledge is not Power.

Applying what you’ve learned is.
Speakers

- Steve Schultz, Corporate Energy Manager, 3M
- Bert Hill, Health, Safety & Environmental Manager, Volvo Group North America
- Muneer Chowdhury, Energy and Environmental Efficiency Manager, Bridgestone Americas
Superior Energy Performance – Proven Pathway to Accelerate Improvement

United States Department of Energy Better Buildings Summit
May 27, 2014
Our Vision

3M Technology Advancing Every Company
3M Products Enhancing Every Home
3M Innovation Improving Every Life
Our fundamental strengths are the foundation of 3M’s performance
Leveraging these assets creates value; strengthening them ensures our future

**Technology**
Ability to share and combine elements of 3M’s broad technology portfolio to produce unique, differentiated products, translating to premium margins.

**Manufacturing**
Utilization of 3M manufacturing footprint and technology, including process trade secrets, leading to higher-performing products and lower unit cost.

**Global capabilities**
Subsidiary front- and back-office footprint that allows for effective development, adaptation and commercialization of products.

**Brand**
Brand equity in the 3M brand and in authority brands that are shared across business groups.
3M Has Aggressive Energy-Efficiency Goals

- Challenge ‘95
- Year 2000 Environmental Targets
- Environmental Targets 2005
- Environmental Targets 2010
- 2015 Sustainability Goals
- 2025 Sustainability Goals
  - 30% improvement in energy efficiency
  - 25% more of 3M electricity from renewable sources
3M Partnership with US Department of Energy

- The partnership between 3M Energy Management and the U.S. Department of Energy goes back to the early 1990’s
- The partnership has provided 3M numerous opportunities to be on the cutting edge of programs and resources designed to help industry
- Member of U.S. Council for Energy-Efficient Manufacturing (U.S. CEEM), which collaborated with the U.S. Department of Energy on the development of ISO 50001 and Superior Energy Performance
Strategic Energy Management Continuum

**Project Focus**
- A loosely organized project-by-project approach.
- Supports facilities of any size that are beginning to manage their energy.

**ENERGY STAR Energy Management Guidelines**
- A systematic approach in preparation for ISO 50001 implementation.
- Supports medium and large companies with prior energy management activities.
- No ISO management system experience is necessary.

**ISO 50001**
- A structured EnMS following ISO plan-do-check-act framework.
- Supports industries with prior ISO system or energy management experience.
- Allows for third-party certification of conformance to the standard.

**Superior Energy Performance**
- Implement ISO 50001 EnMS
- Establish additional robust energy data tracking and measurement system.
- Obtain ANSI-ANAB accredited third-party energy performance verification.
EnMS resides at the corporate, business unit or enterprise level

Third-party validation of enterprise level EnMS Processes

- Level 1: Third-party verification of energy performance at each facility
- Level 2: Third-party verification of energy performance with sampling onsite of similar facilities
- Level 3: Third-party validation of enterprise energy performance verification methodology with some sampling onsite

Facility owns:
- Data
- Objectives, targets and action plans
- Monitoring and measurement

Reported energy performance
3M Locations Certified or Pursuing Certification

<table>
<thead>
<tr>
<th>Country</th>
<th>Site</th>
<th>Latest Action</th>
<th>SEP Certified</th>
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<tbody>
<tr>
<td>Canada</td>
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<td>London</td>
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<tr>
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<td>Perth 301</td>
<td>Waiting Stage 1 Audit</td>
<td>No</td>
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<tr>
<td>Canada</td>
<td>Perth 302</td>
<td>Waiting Stage 1 Audit</td>
<td>No</td>
</tr>
<tr>
<td>France</td>
<td>Tilloty</td>
<td>ISO 50001 Certified</td>
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</tr>
<tr>
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<td>Kamen</td>
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</tr>
<tr>
<td>Germany</td>
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<tr>
<td>Germany</td>
<td>Jachen</td>
<td>ISO 50001 Certified</td>
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<tr>
<td>Korea</td>
<td>Novy</td>
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<td>No</td>
</tr>
<tr>
<td>Poland</td>
<td>Wroclaw PSD</td>
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<tr>
<td>Poland</td>
<td>Wroclaw Automotive</td>
<td>December 2014</td>
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<tr>
<td>U.K.</td>
<td>Hove Island</td>
<td>Certification On-hold</td>
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<tr>
<td>U.S.</td>
<td>Cordova</td>
<td>ISO 50001 Certified</td>
<td>Silver</td>
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<tr>
<td>U.S.</td>
<td>Aberdeen</td>
<td>Working as a group of</td>
<td>Co-horts</td>
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<tr>
<td>U.S.</td>
<td>Cynthiana</td>
<td>Enterprise-wide ISO</td>
<td>Certification</td>
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<tr>
<td>U.S.</td>
<td>Decatur</td>
<td>50001 and individual</td>
<td>Superior</td>
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<td>Hutchinson</td>
<td>Energy Performance</td>
<td>certificates</td>
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<td>U.S.</td>
<td>Prairie du Chien</td>
<td></td>
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</tr>
<tr>
<td>U.S.</td>
<td>3M Center</td>
<td></td>
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</tr>
</tbody>
</table>

Energy Intensity

- All 3M
- All ISO and SEP Plants
- All SEP Plants
- Five SEP Cohorts

2014

Q1

Q2

Q3

Q4

Q1

Q2

Q3

Q4

Q1
Results

- **1Q 2015 vs 1Q 2014**
  - 3M global improvement of 1.7%
  - 3M ISO 50001 facilities improved 5.3%
  - 3M Superior Energy Performance facilities improved 7.8%
  - Five SEP cohort plants in Enterprise-wide certification improved 8.1%

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All data based on BTU’s per pound of product.
Challenges

- Realizing the significance of the undertaking
- Enterprise-level ISO certification in a matrix organization
- Maintaining support and momentum
Thank you!
Tapping into DOE's Portfolio of Manufacturing Energy Efficiency Resources – Industrial Assessment Centers

Bert Hill
Manager, Health Safety and Environment
Volvo Group North America

Better Buildings Summit
June 2015
The Volvo Group is one of the world’s leading manufacturers of trucks, buses, construction equipment and marine and industrial engines. The Volvo Group also provides complete solutions for financing and service.
The Volvo Group’s vision is to become the world leader in sustainable transport solutions by

- creating value for customers in selected segments
- pioneering products and services for the transport and infrastructure industries
- driving quality, safety and environmental care
- working with energy, passion and respect for the individual
Corporate core values

Quality  Safety  Environmental care
Volvo Group North America Energy Milestones

- **2009**: NRV joins Save Energy Now Leader program
- **2010**: NRV first in US to achieve dual 50001 EnMS/SEP certification (Platinum level)
- **2011**: VENNA founded
- **2012**: Mack Trucks achieves second Climate Leadership Award since 2007
- **2013**: VGNA joins Better Plants at corporate level (8 plants)
- **2014**: Hagerstown achieves 50001/SEP Platinum Certification
- **2015**: Mack Trucks achieves second Climate Leadership Award since 2007

- **NRV achieves a 29 per cent improvement in energy intensity**
- **Macungie pilots Environmental Defense Fund Climate Corps Intern program**
- **VENNA founded**
- **Macungie achieves 50001/SEP – first Platinum Mature Pathway**
- **VGNA raises Better Plants participation to Challenge Level**
- **VGNA achieves Better Plants goal**
Completed IAC Assessments

- Nova Bus
  Plattsburgh, NY
- Powertrain Production
  Hagerstown, MD
- Remanufacturing
  Charlotte, NC
- Volvo Penta
  Lexington, TN
# IAC Assessment summary

<table>
<thead>
<tr>
<th>Facility</th>
<th>Scope</th>
<th>Potential savings identified</th>
<th>Average simple payback</th>
<th>Example Energy Saving Recommendations</th>
</tr>
</thead>
</table>
| Nova Bus Plattsburgh | Production of complete buses | $41,223 (assessment just completed) | 18 months | • Destratification fans  
  • Rainfall harvesting  
  • Wood pallet grinder |
| Powertrain Hagerstown | Engine and transmission production | $173,614 | 15 months | • Self-recuperative burners  
  • Heat recovery  
  • Vibration analysis |
| Powertrain Remanufacturing Charlotte | Truck engine and part reconditioning | $17,556 (15% implemented) | 17 months | • Re-use dynamometer cooling water  
  • Convert electric parts washer to NG  
  • Replace flexible air hoses and reduce pressure |
| Volvo Penta Lexington | Assembly of marine engines and drives | $56,911 (30% implemented) | 6 months | • Pressure pad controllers  
  • Replace CA blowers with air knives  
  • Part sensors to lower paint oven temp when not in use |
Example Assessment Recommendation (AR)

Volvo Group North America
Experience with IAC Assessments

• Timely scheduling and completion
• Enthusiastic students
• Thorough technical detail
• Outside the box thinking
Thank you!
One Team, One Planet.

Bridgestone Americas’ commitment to helping ensure a healthy environment for current and future generations to enjoy
Bridgestone Corporation

- Founded in Japan in 1931, headquartered in Tokyo
- The world’s largest tire and rubber company
- Manufactures tires and a broad range of diversified products, which includes Industrial Products, Building Products, Chemical Products and Sporting Goods.
- Products sold in more than 150 nations and territories around the world
Brief Background of Bridgestone Americas (BSAM)

- Nashville, Tennessee-based BSAM is the largest subsidiary of Bridgestone Corporation with 50,000 teammates in North and South America.

- BSAM and its subsidiaries develop, manufacture and market a wide range of Bridgestone, Firestone and associate brand tires to address the needs of a broad range of customers, including consumers, automotive and commercial vehicle original equipment manufacturers, and those in the agricultural, forestry and mining industries.

- The company is also engaged in retreading operations throughout the Western Hemisphere and produces air springs, roofing materials, and industrial fibers and textiles.

- BSAM also operates the world’s largest chain of automotive tire and service centers.

![Tires for every need](image)
Long-term Vision

In harmony with nature (Biodiversity)

Promote ecological conservation and restoration

Mid-term target
2020

Long-term vision
2050 and beyond

In balance with nature (contribution > footprint)

Towards 100% Sustainable materials

Contribute to globally-agreed target (over 50% reduction)

Reduce emissions across products’ life cycle

Back casting

Balancing with earth’s capacity

Sustainable society

Bridgestone Group’s Environmental Mission
To help ensure a healthy environment for current and future generations...

Reduce CO₂ emissions

Value natural resources

Value natural resources

In harmony with nature
Global goals to:

- **Reduce** CO2 from entire products lifecycle by 35% per sales

- **Improve** tire rolling efficiency by 25%, resulting in less fuel use and CO2 emissions while driving

(By the year 2020, based on a 2005 benchmark.)
Operations | Embracing New Technologies

• Clean, efficient hydrogen fuel cells power material movers at our tire plants in Warren County, Tenn., and Aiken County, S.C.

• We reduce our energy consumption by using low energy lighting and high efficiency fans in our plants.

• Through energy savings measures in our plants, the company saved Millions and continues to reduce greenhouse gasses on our way to achieving 25% reduction by 2020.
• Two Bridgestone Americas tire plants, the new Americas Technical Center in Akron, Ohio and a retail store in Tennessee are all LEED certified
• New Aiken OTR manufacturing facility is also being built to LEED specifications
• First tire plants in the world to earn certification
• All Bridgestone Americas manufacturing facilities are ISO 14001 certified, even those that are not required to be
Combined Heat and Power Qualification Screening Results for

Bridgestone Americas Tire Operations
Wilson, NC

Isaac Panzarella, Christina Kopitopoulou
DOE Southeast CHP TAP
North Carolina Clean Energy Technology Center
North Carolina State University
October 15, 2014
DOE CHP Technical Assistance Partnerships (CHP TAPs)

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Market Opportunity Analysis.
Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors

- Education and Outreach.
  Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, end users, trade associations, and others.

Technical Assistance.
Providing technical assistance to end-users and stakeholders to help them consider CHP, waste heat to power, and/or district energy with CHP in their facility and to help them through the development process from initial CHP screening to installation.

http://eere.energy.gov/manufacturing/distributedenergy/chptaps.html
**DOE CHP TAP Technical Assistance Process**

1. **Screening and Preliminary Analysis**
   - Quick screening questions with spreadsheet payback calculator.

2. **Feasibility Analysis**
   - Uses available site information. Estimate: savings, installation costs, simple paybacks, equipment sizing and type.

3. **Investment Grade Analysis**
   - 3rd Party review of Engineering Analysis. Review equipment sizing and choices.

4. **Procurement, Operations, Maintenance, Commissioning**
   - Review specifications and bids, Limited operational analysis.
## Preliminary Assessment

<table>
<thead>
<tr>
<th>SBU</th>
<th>PLANT</th>
<th>Generator MW</th>
<th>Investment M$</th>
<th>ROI, years, Range, simple with CHP only (2)</th>
<th>CO2 reduction TM–CO2/Y</th>
<th>Cost saving/yr including M$/Yr</th>
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<tbody>
<tr>
<td>Tire Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A</td>
<td>A</td>
<td>10</td>
<td>22</td>
<td>7.10</td>
<td>(21,000.)</td>
<td>Study by DOE screening 1/30/15</td>
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<td>B</td>
<td>B</td>
<td>8</td>
<td>16</td>
<td>12.90</td>
<td>(17,500.)</td>
<td>Delayed for longer payback</td>
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<td>16.90</td>
<td>(21,000.)</td>
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<td>25–30</td>
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# CHP Project Schedule

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<td>2</td>
<td>3</td>
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<tr>
<td>A</td>
<td>Phase 2 Study</td>
<td>Detailed Design</td>
<td>Procurement</td>
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<tr>
<td>B</td>
<td>Phase 1 Study</td>
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<td>Detailed Design</td>
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<td>C</td>
<td></td>
<td>Analyze</td>
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<td>D</td>
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<td></td>
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<tr>
<td>E</td>
<td></td>
<td>Analyze</td>
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</tr>
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</table>
Initial Objectives

1. Reduce impact of unplanned electricity outages
2. Achieve related energy savings
3. Meet BSI Corporate carbon emissions reduction target
4. Benefit from NC State Tax Credit and Federal Tax Credit incentives
CHP Screening: 18.2 MW Gas Turbine

Fuel Consumption: 193.9 MMBtu/hr

CHP Performance Summary

- Fuel Consumption: 1,698,394 MMBtu/year
- Electricity to Facility: 154,315 MWh/year
- Thermal to Facility: 526,524 MMBtu/year
- Electrical to Facility: 17.6 MW (60.1 MMBtu/hr equiv.)
- Thermal to process: 80.85 MMBtu/hr
- Steam: 66,967 lb/hr
- Unrecovered heat: 0
- Annual Efficiency: 72.7%

Annual Energy

- Fuel: 1,698,394 MMBtu/year
- Electrical: 154,315 MWh/year
- Thermal: 708,307 MMBtu/year

Efficiency: 72.7%
Federal: Credit is equal to 10% of expenditures, with no maximum limit stated. Eligible CHP property generally includes systems up to 50 MW in capacity that exceed 60% energy efficiency, subject to certain limitations and reductions for large systems. This credit applies to eligible property placed in service after October 3, 2008.

State: Tax credit equal to 35% of expenditures with a maximum of $2.5 million per installation. The allowable credit may not exceed 50% of a taxpayer's state tax liability for the year, reduced by the sum of all other state tax credits. The credit is taken in five equal installments beginning with the year in which the property is placed in service. If the credit is not used entirely during these five years, the remaining amount may be carried over for the next five years.
Depreciation: Under the federal Modified Accelerated Cost-Recovery System (MACRS), businesses may recover investments in certain property through depreciation deductions. CHP technologies are classified as five-year property. The depreciation schedule used is: 20%, 32%, 19.2%, 11.52%, 11.52%, 5.76% in years 1 - 6 respectively.*

Visit DSIRE – The database of policies and incentives for renewable energy and energy efficiency at www.dsireusa.org for details and references.
Findings and recommendations

Findings:
- Installing a Gas Turbine CHP system can produce nearly all the electricity and thermal needed for facility.
- Simple paybacks range from 5.9 years w/out incentives to 3.7 years w/ incentives.
- Significant reduction of carbon emissions of 53% associated with site electric and boiler fuel consumption.

Recommend feasibility analysis to:
- Refine inputs and operating conditions.
- Better evaluate current and new utility rates, including natural gas infrastructure upgrades if required.
- Accurately model economic performance.
Real pleasure for the opportunity

THANK YOU