3M Science. Applied to Life.™

ENERGY MANAGEMENT 3M CANADA

Andrew Hejnar MSc EnMS, P.Eng, CEM, CPEnMS

Since 1902

- Subsidiaries in **71 countries**
- Sales in nearly **200 countries**
- **~89,000** employees
- International sales **$18B**
- **200+** factories
- Sales: **$30.3B**
- Free Cash Flow: **$5B**
- R&D investment: **$1.8B**
- **55,000+** products
- **+100,000** patents

2015 figures

Science improving lives for more than a century

- Wetordry™ Sandpaper
- Scotch® Masking Tape
- Scotch® Cello Tape
- Scotchlite™ Reflective Signage
- 3M™ Flat Fold Disposable Respirator with Valve
- Scotch-Brite™ Sponge
- Micropore™ Medical Tape
- Command™ Adhesive Strips
- Post-it® Notes
- 3M™ Aluminum Conductor Composite Reinforced (ACCR)
- Cubitron™ Abrasives
- 3M™ 360 Encompass™ System
- Scotch® Magnetic Tape

3M Canada

First 3M subsidiary (1951)

Employs 1,800 people

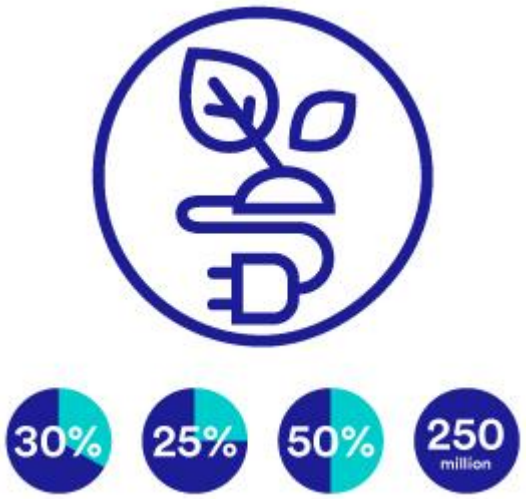
Seven manufacturing facilities

- *Abrasives*
- *Tapes*
- *Healthcare*
- *Scotch-Brite*

First subsidiary to have full time energy manager

2025 Goals

Raw Materials



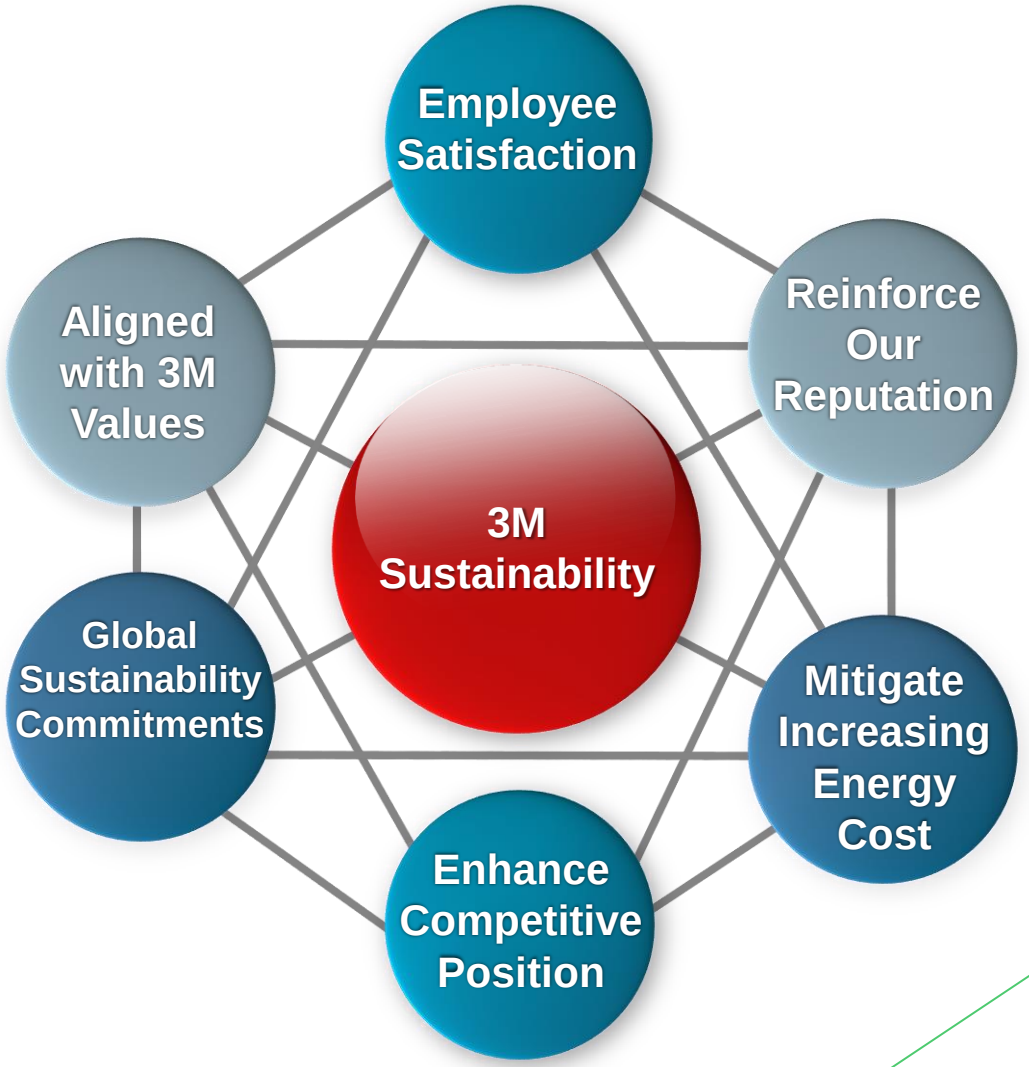
Energy & Climate

Water

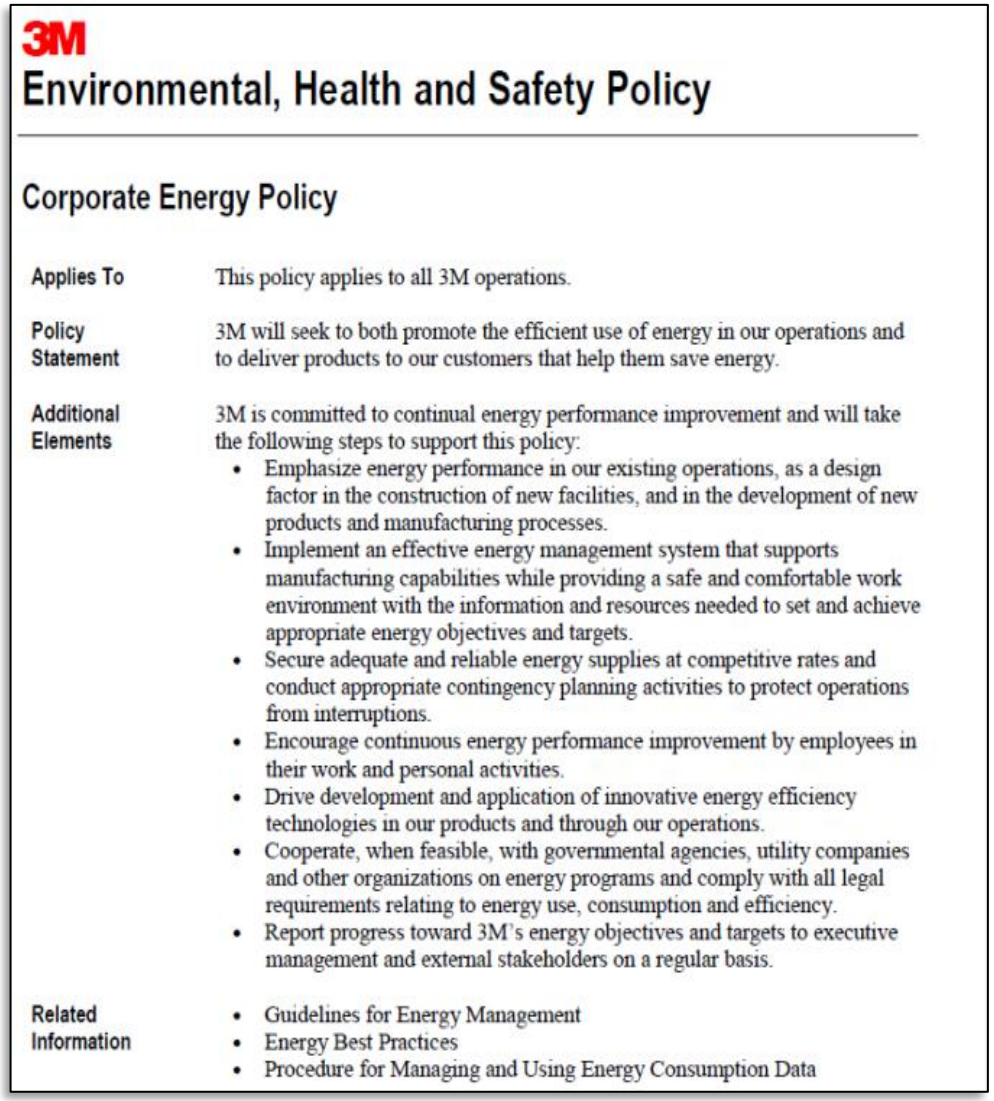
Health & Safety

Education & Development

What Motivates Energy Management at 3M?



Energy Policy



3M

Environmental, Health and Safety Policy

Corporate Energy Policy

Applies To

This policy applies to all 3M operations.

Policy Statement

3M will seek to both promote the efficient use of energy in our operations and to deliver products to our customers that help them save energy.

Additional Elements

3M is committed to continual energy performance improvement and will take the following steps to support this policy:

- Emphasize energy performance in our existing operations, as a design factor in the construction of new facilities, and in the development of new products and manufacturing processes.
- Implement an effective energy management system that supports manufacturing capabilities while providing a safe and comfortable work environment with the information and resources needed to set and achieve appropriate energy objectives and targets.
- Secure adequate and reliable energy supplies at competitive rates and conduct appropriate contingency planning activities to protect operations from interruptions.
- Encourage continuous energy performance improvement by employees in their work and personal activities.
- Drive development and application of innovative energy efficiency technologies in our products and through our operations.
- Cooperate, when feasible, with governmental agencies, utility companies and other organizations on energy programs and comply with all legal requirements relating to energy use, consumption and efficiency.
- Report progress toward 3M's energy objectives and targets to executive management and external stakeholders on a regular basis.

Related Information

- Guidelines for Energy Management
- Energy Best Practices
- Procedure for Managing and Using Energy Consumption Data

❖ 3M's Energy Policy

3 Pillars of Successful Energy Management

Metering& Targeting

Technology & Projects

People

Vehicle to achieve this is SEP with ISO 50001

Energy Management System (EnMS)

ISO 50001 Energy Management System

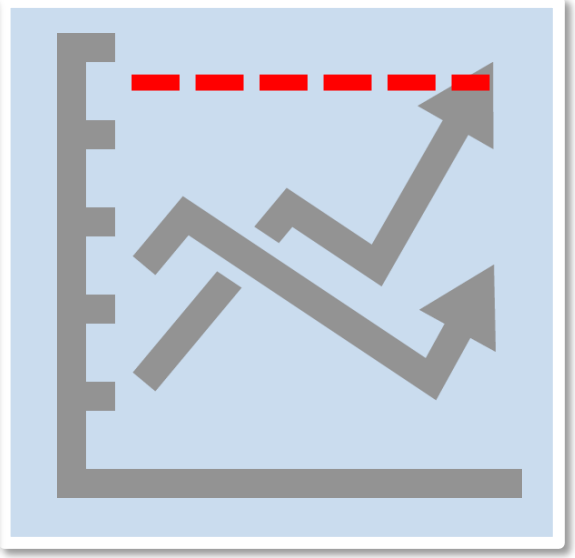
Voluntary international standard framework to manage energy

Based on “Plan-Do-Check-Act” continuous improvement cycle

- Leads to improved energy performance
- Integrates energy efficiency into management processes
- Many core elements in common with ISO 9001 (quality) & ISO 14001 (environment) standards

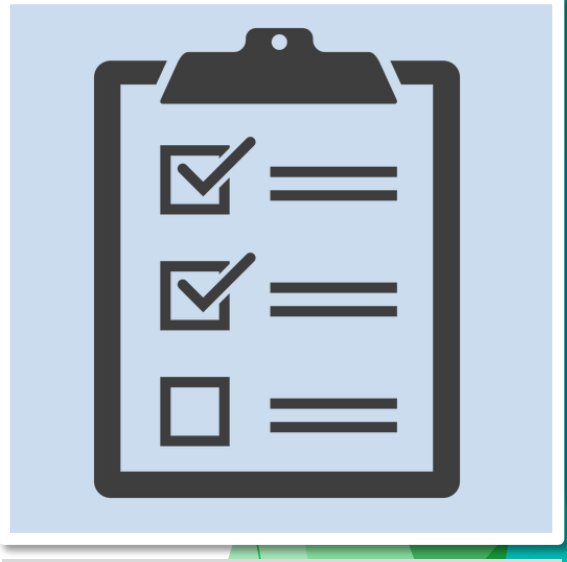
1st Pillar of EnMS: Metering & Targeting

I. What you can't measure you can't control – make energy visible
II. Sub-metering
III. Energy Map – identify where energy is used and how much it costs



IV. Establish energy baselines
V. Establish energy targets normalized for product types, outside weather conditions and any other related variables

VI. Provide real-time energy information for operating personnel



VII. Provide energy consumption reporting for management for tracking and budgeting

2nd Pillar of EnMS: Technology

Combined Heat & Power (CHP)

Where does CHP makes sense?

- Stable and low natural gas prices
- High electricity cost
- Steady electrical base load
- Steady heat sink for heat recovery
- Government/local utility support

LED Lighting

Why?

- Mature technology
- Significant energy savings (60-90%)
- Better illumination and light quality
- Longer life – less maintenance cost

Compressed Air Optimization

- The most expensive energy – 7 HP of electricity used to produce 1HP of compressed air
- Replace with equipment not requiring compressed air (ex. electric blowers, mixers etc.)
- Reduce air leaks – most plants leak at 20-30%

HVAC

- Conditioning of air is very expensive - $3 per CFM per year
- Air balance studies to reduce exhaust and makeup air
- Re-commissioning of existing equipment
- Evaporative Cooling

Heat Recovery

- Production equipment such as dryers and boilers
- Compressors
- Chillers (condenser water)

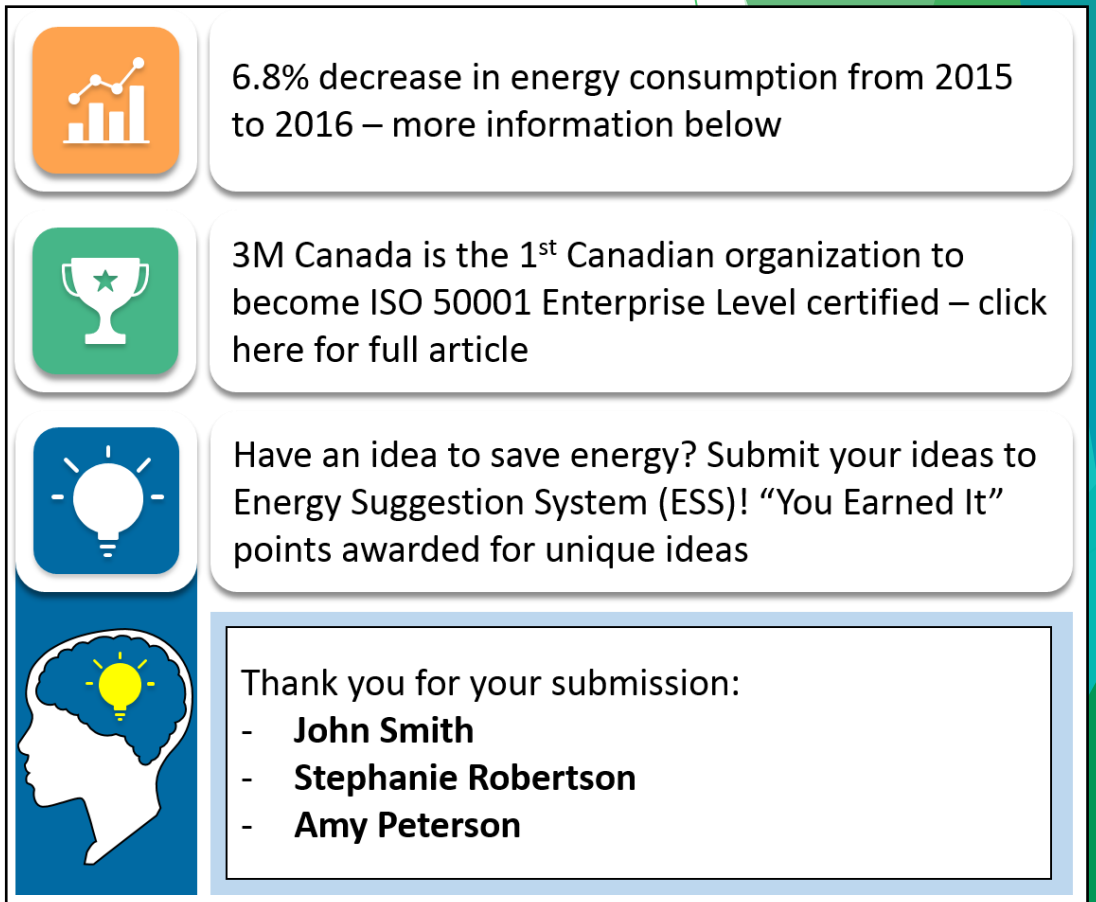
3rd Pillar of EnMS: People

Why?

- They operate equipment that consumes energy
- They know the equipment
- Better employee retention and satisfaction
- Increased trust in management

How?

- Energy Conservation Awareness Campaigns
- Energy Training
- Employee Suggestion Program
- Communication
- Let them know they matter



Sample Energy Newsletter: Brockville Tape

ISO 50001 Energy Management

Superior Energy Performance®

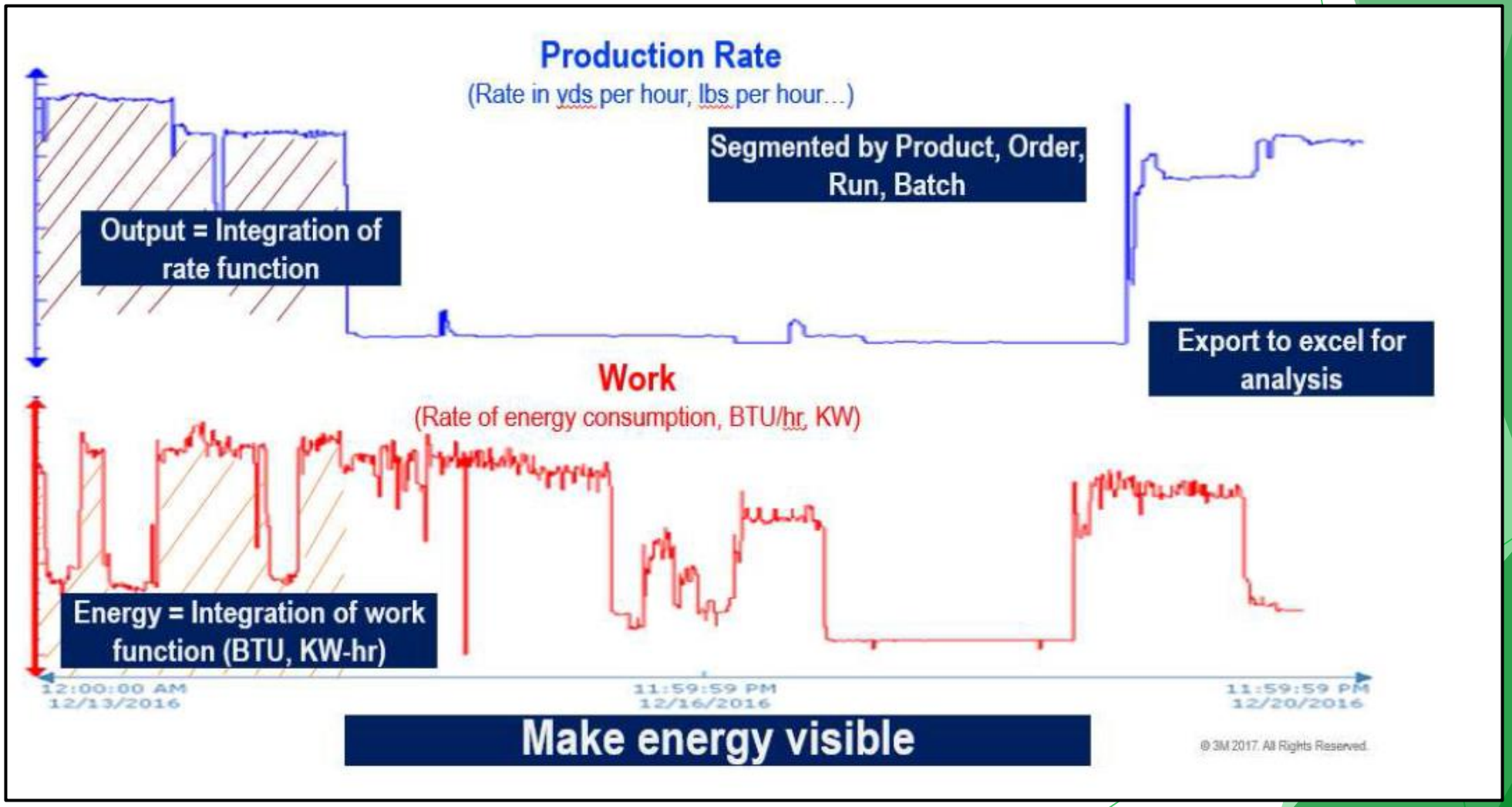
Location	Certification
Canada	SEP/ISO 50001 – First Canadian Enterprise with six facilities certified (all SEP)
US	SEP/ISO 50001 – Enterprise with six facilities certified (all SEP)
Germany	ISO 50001 - six plants certified
Poland	ISO 50001 - two plant certified
Korea	ISO 50001 - one plant certified
France	ISO 50001 - one plant certified

3M Canada Brockville PSD Plant

Pilot for The Commission for Environmental Cooperation (CEC) as part of Clean Energy Ministerial in collaboration with Natural Resources Canada (NRCan), Mexico's National Commission for the Efficient Use of Energy (CONUEE) and the US Department of Energy (DOE)

3M

Digitalization & Industrial Energy Management



Digitalization & Industrial Energy Management

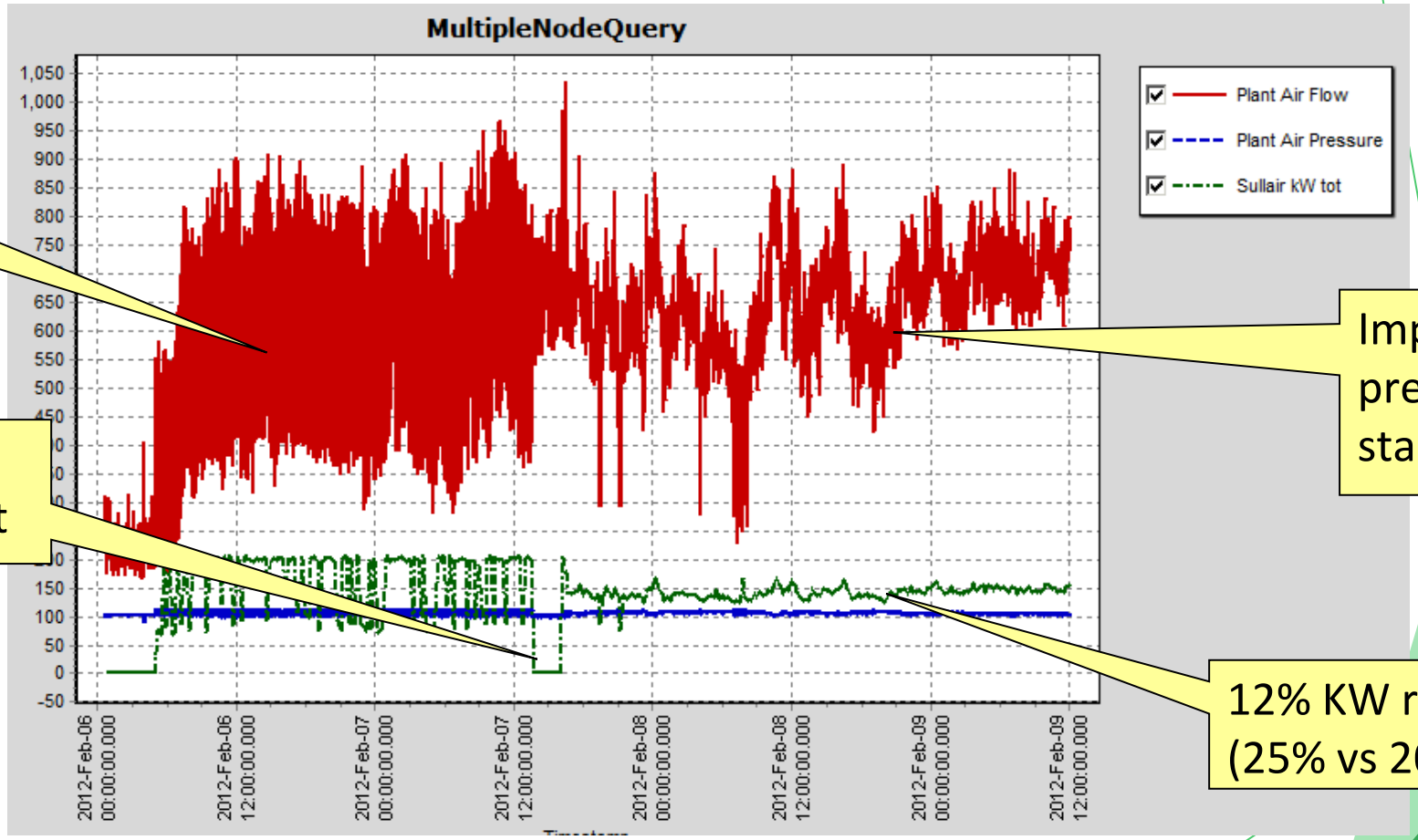
- Project approval process modified to include energy metering
- Utility metering thresholds used as guideline

Utility	Threshold Criteria
Chilled Water	> 50 TONS
Compressed Air	> 75 SCFM
Natural Gas / LP	400 MBtu / hr
Electrical	35 kW
Steam	900 lbs / hr

Air Compressor "Spiral Valve" Optimization

Poor performance, erratic power usage

Analyzed cause, shutdown and correct



Improved pressure & flow stability

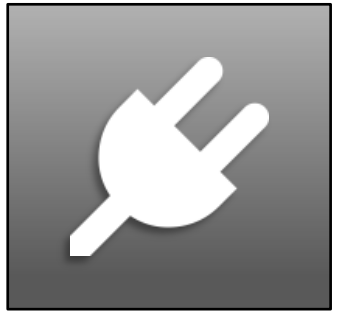
12% KW reduction (25% vs 2010 baseline)

3M Canada Energy Management Achievements

2008 - 2017

Total Savings	Government Incentives
$15 M	$9 M

3 x Canadian Industry Program for Energy Conservation (CIPEC) Awards
2014 – Corporate Stewardship
2016 – Energy Management National Award
2016 – Employee Awareness



Type	Savings
Electricity	126 GWh
Natural Gas	20 Mm^3
CO_2e emission	103,00 MT

EnMS Benefits

- Increased Awareness of Energy Performance
- Improved Procurement & Engineering Practices
- Improved O&M Practices
- Increased Idea Generation Suggestion System

Improved Energy Performance = Lower Cost

Questions?