

Convenience Store Energy Efficiency



MichaelsEnergy

Webinar

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Department of Commerce
Division of Energy Resources

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Michaels Energy



Introduction and Acknowledgements

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Michaels Energy would like to acknowledge the following utilities for contributing financially toward audits in their territory: Alliant Energy, Austin Utility, Connexus Energy, Lake Region Coop, Sterns Coop, and Windom Public Utility. We would also like to thank the following people for contributing their knowledge and expertise toward the research: Tom Fliss, Holiday; Todd Bornholdt, Kwik Trip; Jim Colvin, Bright Way Lighting; and Rick Guse, Total Refrigeration.

Speakers



Nancy M. Kelly, P.E., C.E.M.

Managing Engineer – Energy Programs

- 29 years of engineering experience, including 17 years in energy efficiency
- Registered engineer in Minnesota, Wisconsin, and California
- Leads energy audits and energy analysis to determine potential energy savings for small businesses in MN



Michaels Energy



Locations:

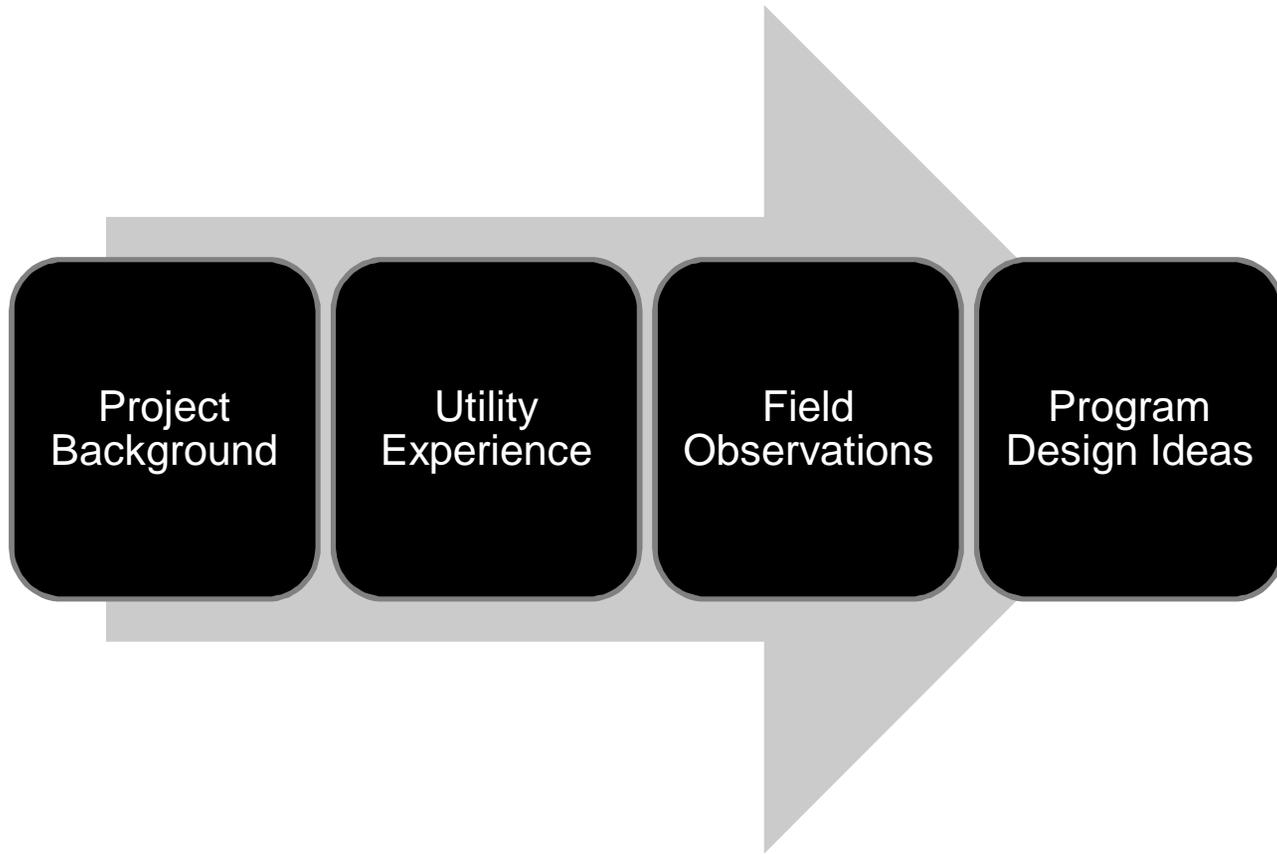
- La Crosse
- Cedar Rapids
- Madison
- Green Bay
- St. Paul

Michaels Energy has extensive experience supporting utility energy efficiency programs.

Our engineers provide technical, program management, and administrative support for demand-side management (DSM) programs.

This experience includes commercial and industrial (C&I) retrocommissioning and custom efficiency programs, demand response, C&I new construction, C&I program evaluation, and more.

Improving Energy Efficiency in C Stores

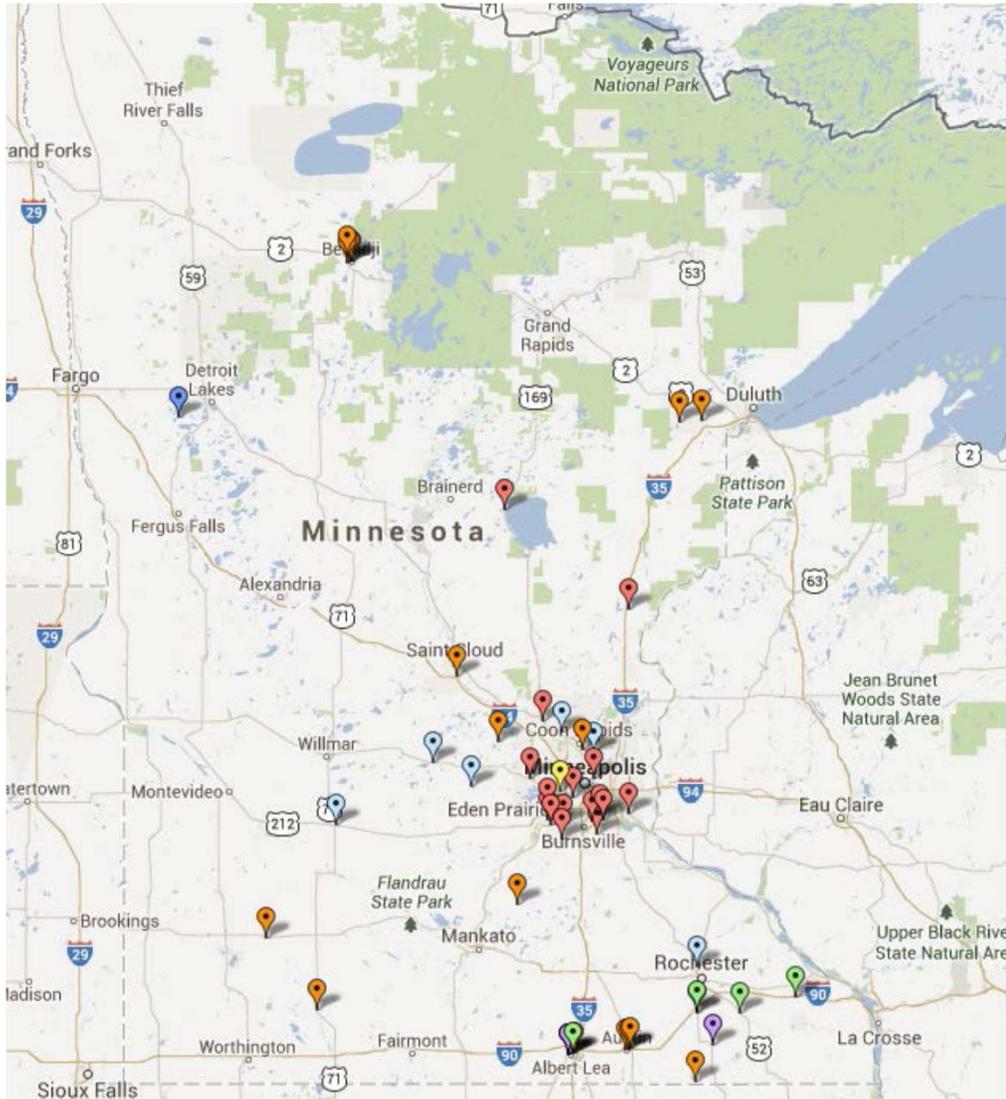


Why C-Stores?

- Highest Electrical Energy Intensity
 - 49.4 kWh/ft² (CBECS)
 - Over 80% Electrical Energy
- Opportunities for Existing and New Stores
 - Outdoor Lighting – 24 hours per day
 - Refrigeration Equipment for Reach-in Coolers
- Great Opportunity for Small Business Program
 - Common Business - 2,000 in MN
 - Audits, Education, Project Management
 - Incentives



50 Stores Participated in Study



50 Stores
- 5 In depth
- 45 short audits

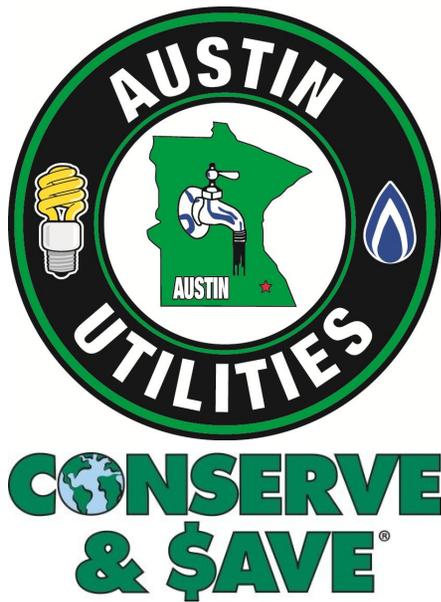
12 Utilities

Ownership:
- 29 Corporate
- 21 Independent

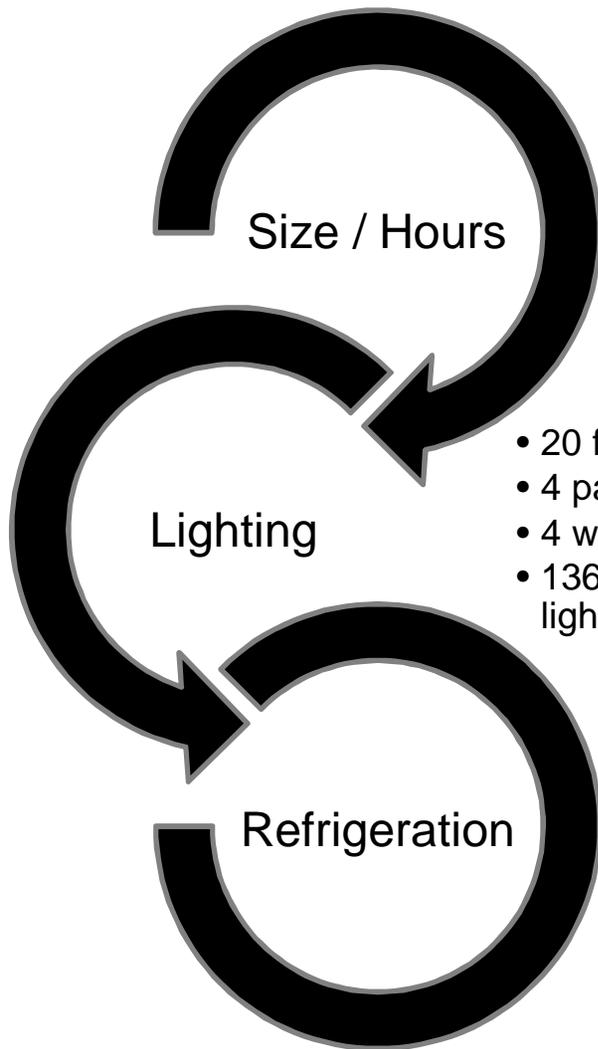
Car wash?

Hours – 18 or 24?

Kelly Lady – Austin Utilities



Store Profile



- 4.400 ft²
- 18/7
- 24/7

- 20 fuel canopy lights
- 4 parking lot pole lights
- 4 wall packs
- 136 4 Ft T8 interior lights

- 8 door walk-in cooler
- 3 door walk-in freezer
- Motors
- Door Heaters
- Compressors



Scope of Work

Review Energy Use and Understand Technologies



Review of Codes and Market



Development of Standardized Calcs and Audit Materials



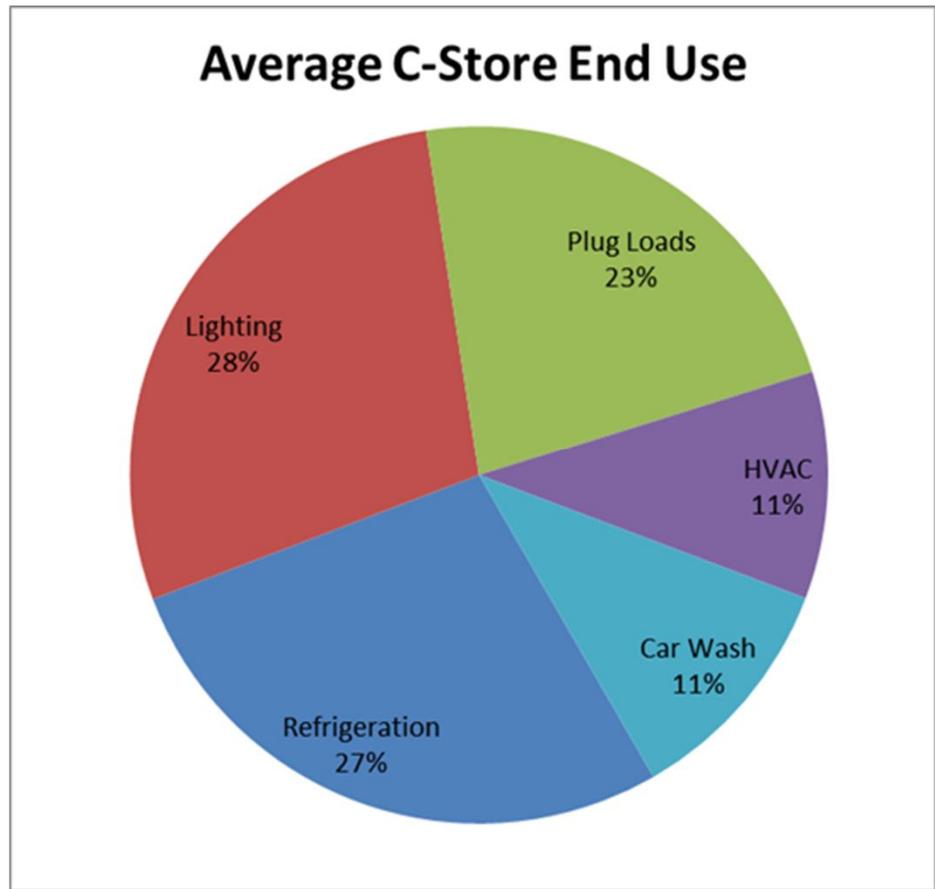
Test audit delivery with 45 businesses



Data Analysis and Program Design

Results – First Five Stores

- Water –
 - ✓ Electric domestic water heaters (2%)
 - ✓ Gas water heating for car washes
- Lighting
- Refrigeration
- Plug loads - variable
- HVAC - mostly A/C



CBECS Energy Use Intensity = 49.4 kWh/ft²



Applicable Code Revisions

New performance standards for self-contained equipment (reach-in refrigerators and freezers and open refrigeration equipment) went into effect in 2009 and standards for walk-in coolers and freezers were effective in 2011.

Automatic Door Closers and Strip Curtains

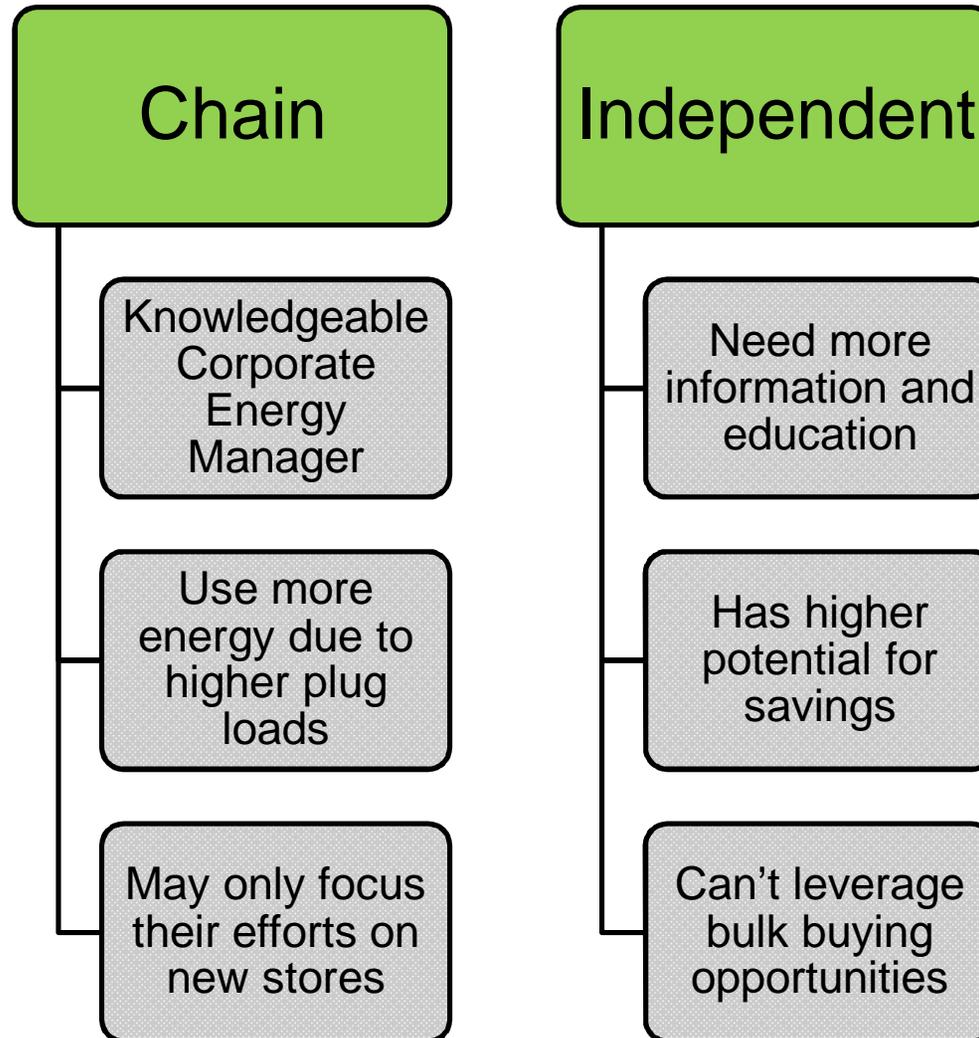
ECM motors

Lighting Efficacy > 40 lumen/watt

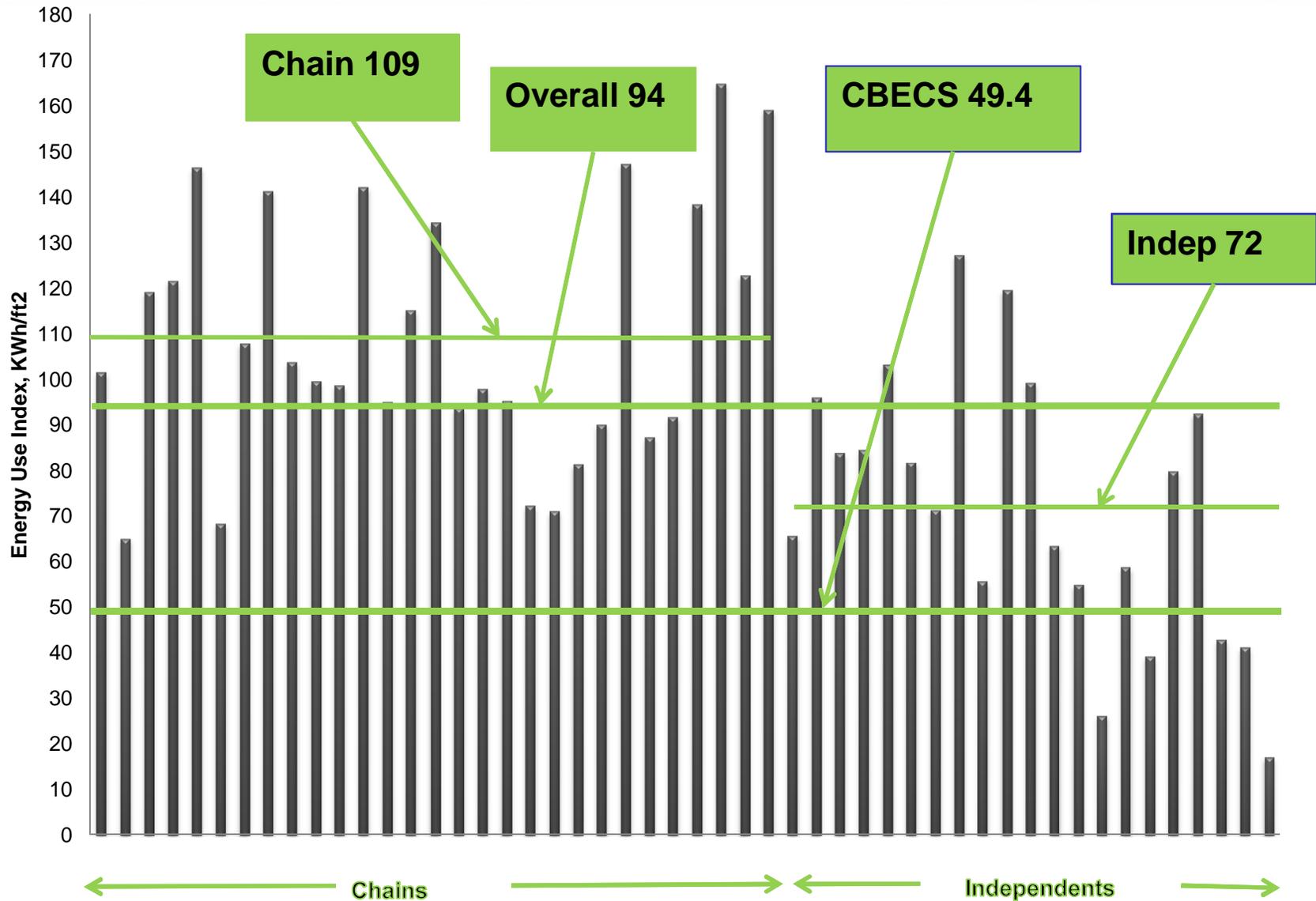
Door Heater Controls



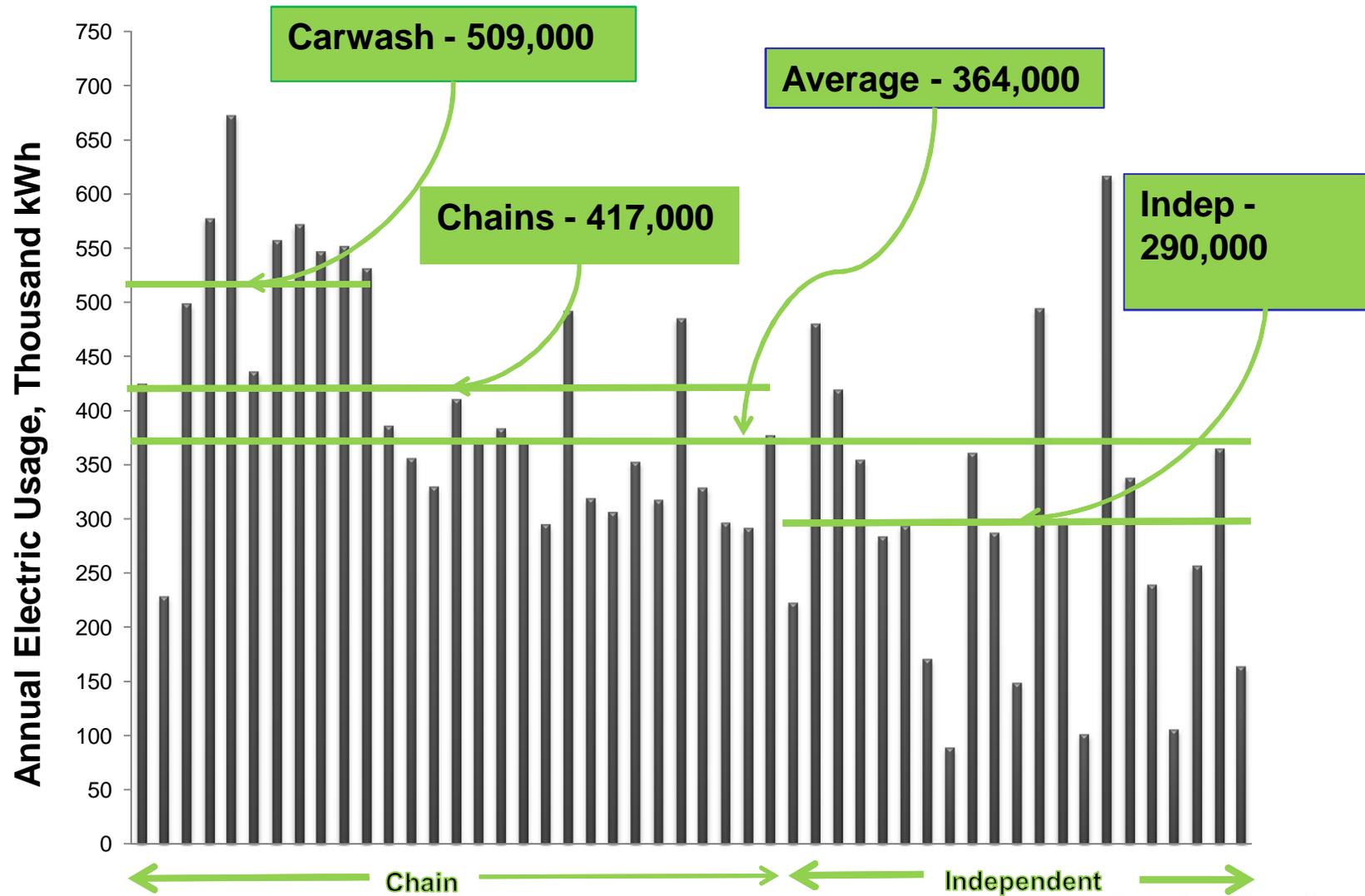
Ownership Structure



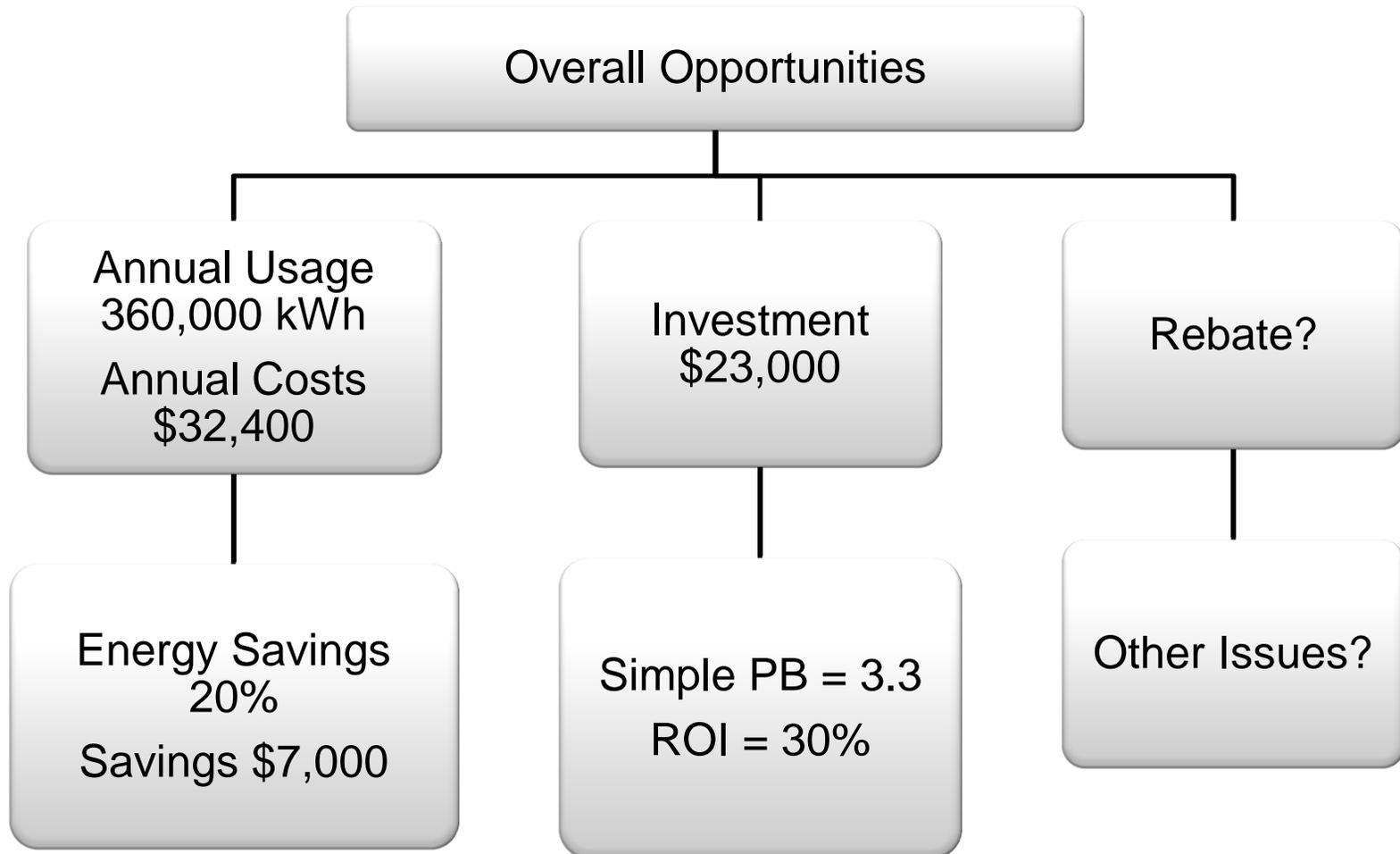
EUI - Study Results for 50 Minnesota C Stores



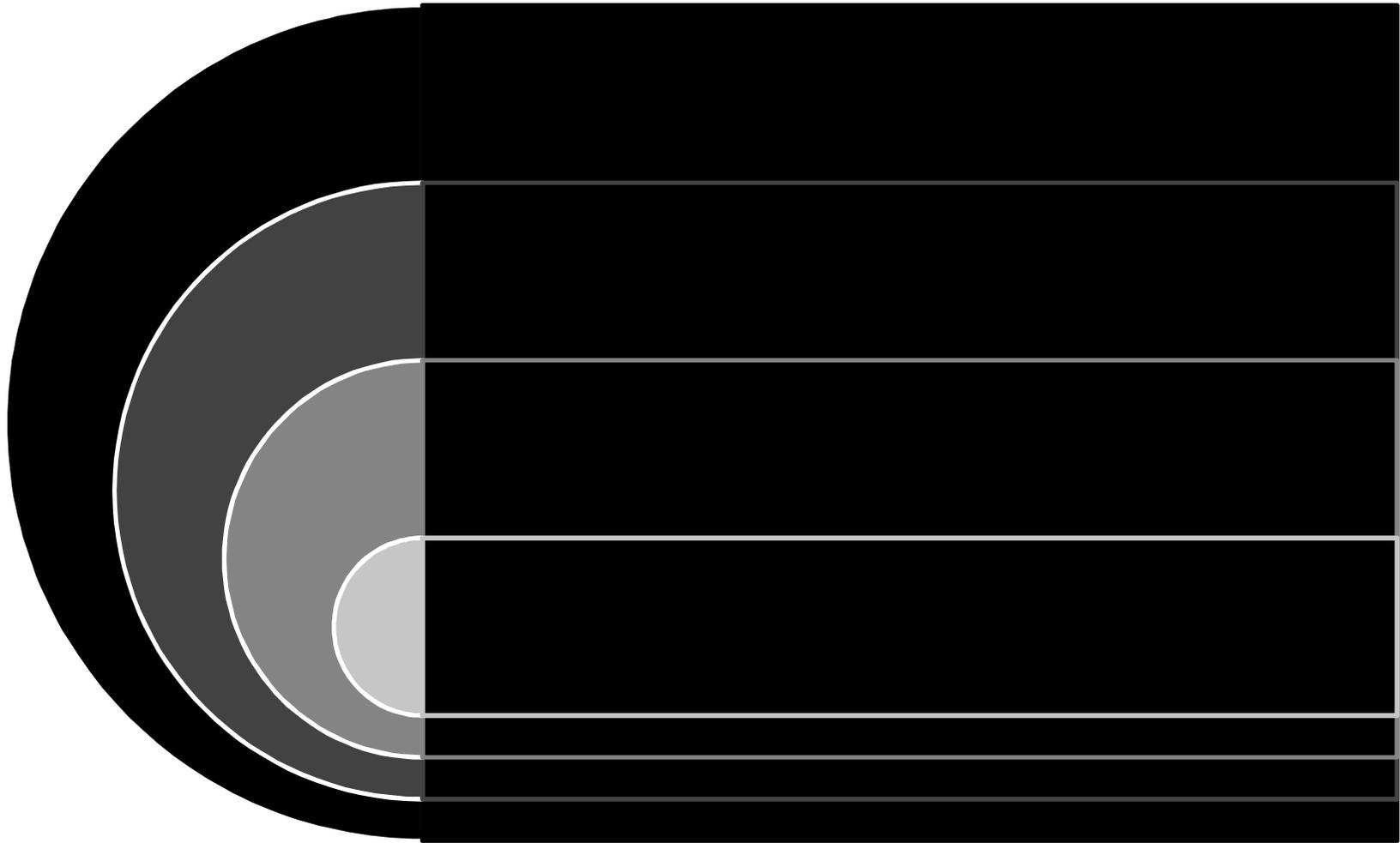
Annual Energy Use, kWh



Overall Opportunities



Current Rebate Levels



Opportunities – 24 Hrs with “Good” Rebate

20 Fuel Canopy LED Lights	11 Anti-sweat Heaters	8 ECM Motors	2 Strip Curtains
Cost \$7,800	Cost \$2,300	Cost \$2,200	Cost \$460
Rebate \$3,500	Rebate \$660	Rebate \$560	Rebate \$0
Payback 1.6 year	Payback 2.2	Payback 3.6	Payback 0.6
ROI 62.8%	ROI 44.5%	ROI 27.4%	ROI 156.5%

Fuel Canopy Lights



LED Lights 100 watts each



Metal Halide 458 watts each

Opportunity in 86% of Stores Audited

Visible and Straightforward

Lasts 100,000 hours

Lifetime savings of 350,000 kWh (\$35,000)



Strip Curtains



Old Style

New Style

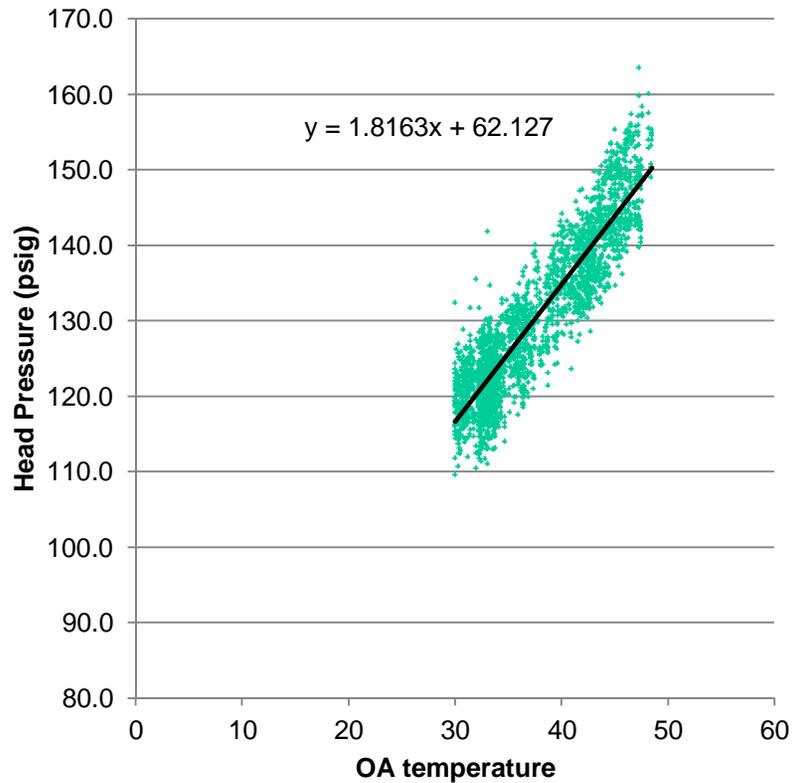
Opportunity in 82% of Stores Audited

Employees don't like them

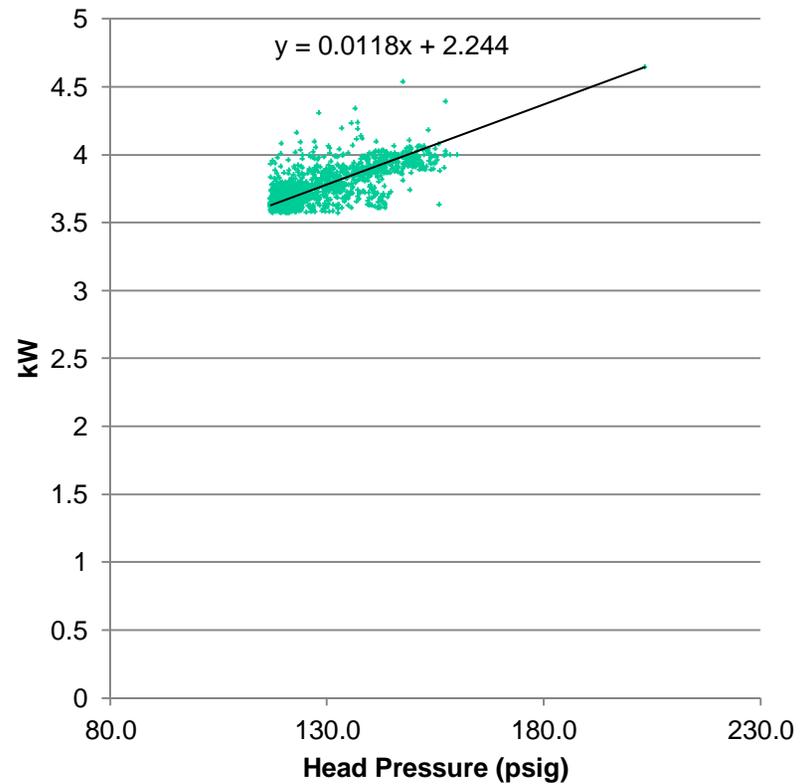


Floating Head Pressure Controls

Head Pressure Correlation



Power Correlation



The Store of the Future

LED Lighting

Heat Recovery

Controls for Refrigeration System

Exhaust Hood Controls



Benefits of Targeted C Store Program

For Store Owners

Potential for
\$7,000 Savings

Payback Less
than 2 years

22% Energy
Cost Reduction

For Utilities

Potential for 20%
Energy Savings

86,000 kWh
14 kW per store

Small Business
Opportunity

Ideas for Program Design

Prescreen Businesses

- kWh per year
- Hours
- Size
- Car wash?



Offer Targeted Program

- Lighting and Refrigeration
- Rebates encourage deep retrofits



Conduct Site Visits

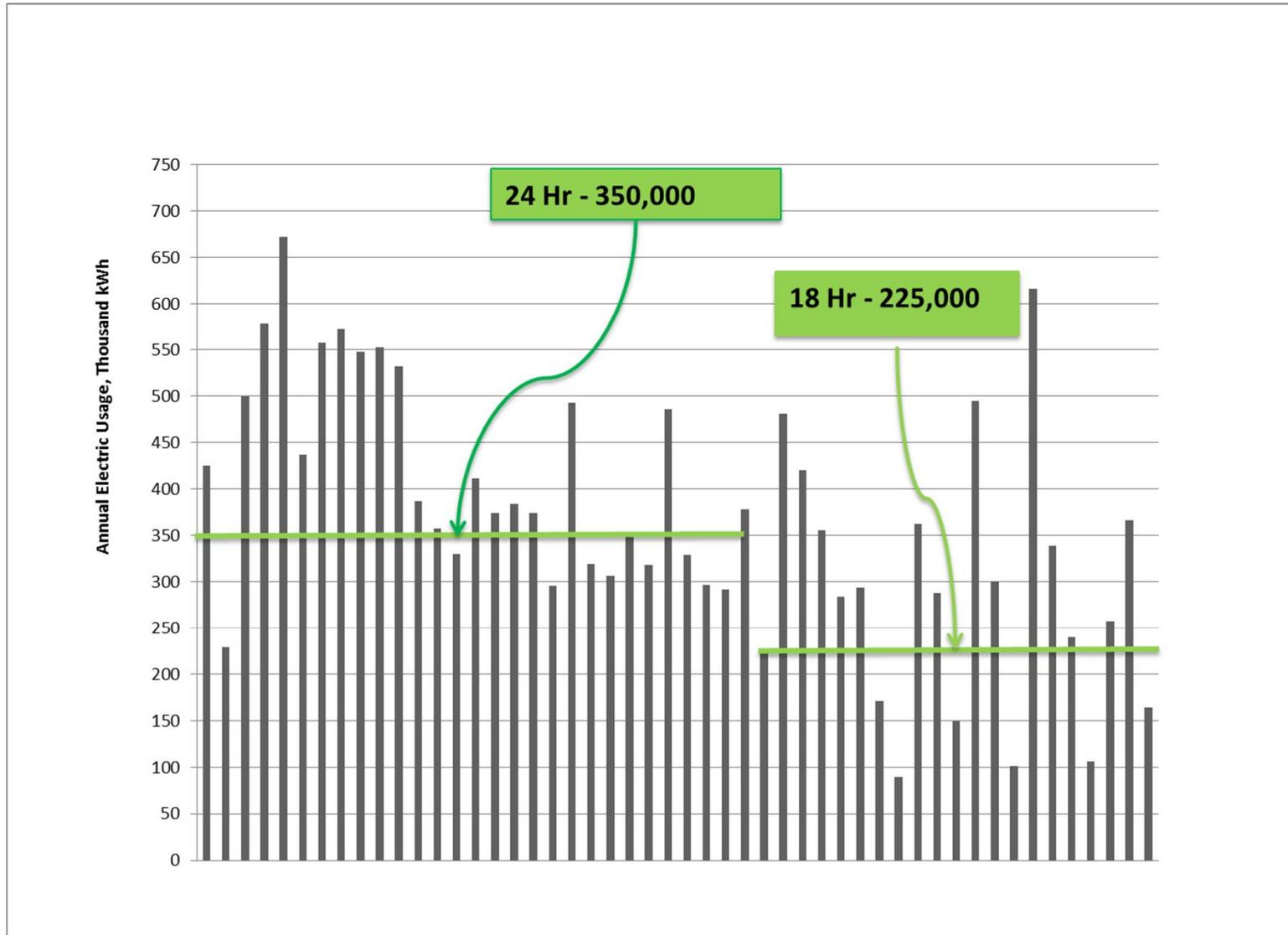
- Free Audit
- Report on site
- Trade Allies
- Savings Verifiable



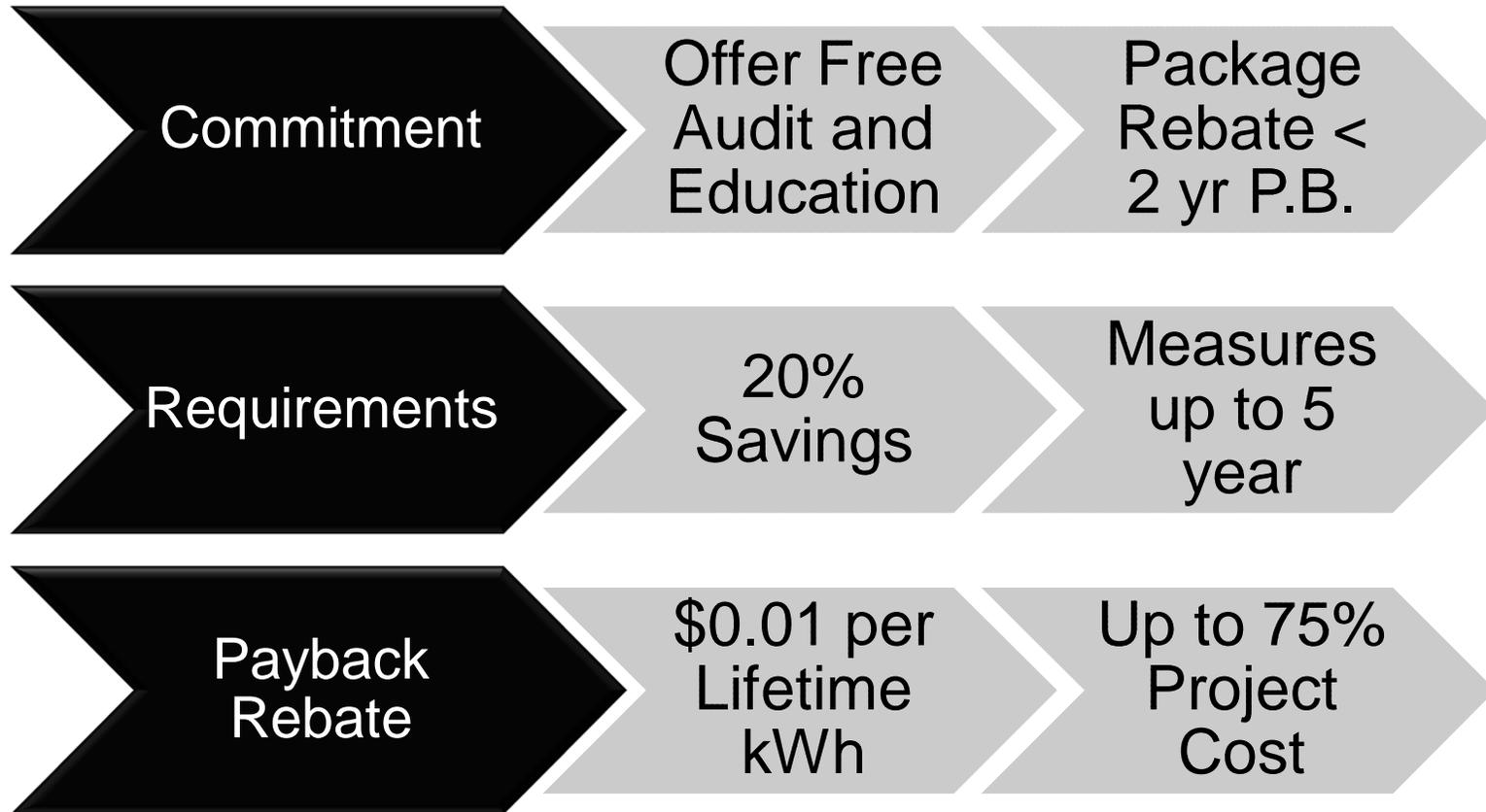
Follow-up

- Qualified Contractors
- Measures Installed
- Paperwork Submitted
- Rebate Issued

Prescreen



Targeted Program - Design



Engaging the Business Owner

Engage

- Produce report on site
- Include pictures
- Brief and easy to read

Instruct

- Benchmark
- List of actions

Financial Analysis

- Is this a good investment
- Relate to operating costs
- Provide rebate info



Follow-up

Connect with Local Contractors

Decision from Store Owner

Installation of Measures

Complete Paperwork and Issue Rebate



Targeted Program - Example

Store Profile

Annual
Usage
415,000
kWh

Annual
Cost
\$32,744

24
hr/day

Target:
20%
Savings
or
83,000
kWh



Targeted Program - Example

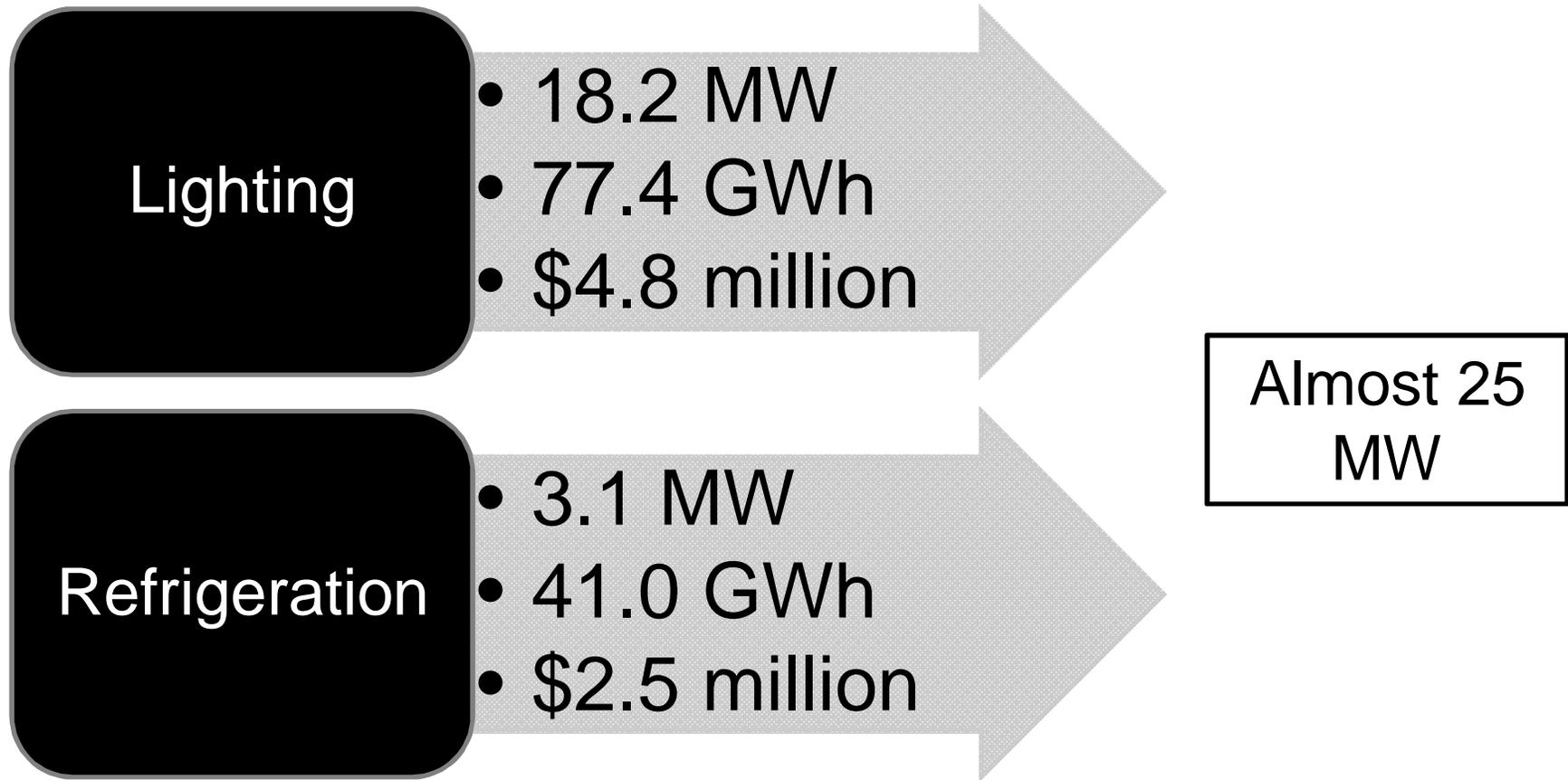
Measure	Cost	Annual kWh Savings	Annual Savings	Lifetime kWh Savings	Rebate	PB	Cum. % Savings
Lighting	\$ 15,000	66,000	\$ 5,500	780,000	\$ 7,800	1.3	16%
Anti-Sweat Heaters	\$ 2,700	13,000	\$ 900	160,000	\$ 1,600	1.2	3%
ECM Motors	\$ 2,200	6,000	\$ 450	90,000	\$ 900	2.9	1%
Floating Head	\$ 2,100	5,500	\$ 350	55,000	\$ 550	4.6	1%
Totals	\$ 22,000	90,500	\$ 7,200	1,085,000	\$ 10,850	1.6	21%



Conclusions

- C-Stores provide great opportunity for small business partnership
 - High Energy Use Index
 - Uniformity of Conservation Opportunities
 - Target lighting and refrigeration
 - Combine quicker payback with longer life projects for deep energy savings

State-wide Impact – 2,000 C-Stores



Questions?



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