



Focus on Energy Business Programs: Supply Chain Characterization and Baseline Study

October 31, 2005

Prepared by:
KEMA, Inc.
Madison, Wisconsin
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Purpose of the Research

- **Technology/Market Characterization**
 - ❖ Identify the key market actors within each technology market
 - ❖ Identify key decision makers and points in the process for program intervention
 - ❖ Identify key barriers to implementation of energy-efficient equipment
- **New Construction Market Characterization**
 - ❖ Role of market actors in decisions affecting efficiency
 - ❖ Perceptions of energy efficiency and sustainability
 - ❖ Barriers to energy-efficient design and construction
 - ❖ Program interventions to encourage energy-efficient or sustainable design
- **Baseline Market Indicators**
 - ❖ Establish baseline market indicators to track changes over time

Topics Covered

■ Markets

- ❖ Lighting
- ❖ Motors
- ❖ HVAC
- ❖ Refrigeration
- ❖ Compressed Air

■ New Construction

■ Commercial Sector

- ❖ Education
- ❖ Health
- ❖ Groceries
- ❖ Restaurants

■ Industrial Sector

- ❖ Metal Casting – Ferrous and Non-Ferrous
- ❖ Pulp and Paper
- ❖ Food Processing – Dairy and Meat
- ❖ Plastics

Research Methodology & Respondents

- In-depth interviews
 - ❖ Distributors
 - ❖ Manufacturers
 - ❖ Equipment dealers
 - ❖ Contractors
 - ❖ Industry experts
 - ❖ Design firms
 - ❖ Developers
- Secondary Sources
- Computer Aided Telephone surveys
 - ❖ 4 commercial sectors in Commercial Omnibus
 - ❖ 4 industrial sectors in Industrial Omnibus
 - ❖ Dairy farms in Agricultural Omnibus
 - ❖ Motor dealers
 - ❖ HVAC installation contractors
 - ❖ Lighting installation contractors
 - ❖ Refrigeration contractors

Completed Data Collection

	number completed
In-depth Interviews	
Lighting Distributors/Suppliers	5
Compressed Air Equip. Dealers	3
Compressed Air Efficiency Consultants	2
HVAC Distributors	5
HVAC Commission Vendors	2
Refrigeration Equipment Manufacturers	4
Large Refrigeration Customers	3
NC-industry experts	3
NC-developers	5
NC-Designers	8
Motor Manufacturers	3
CATI surveys	
Commercial Omnibus	264
Industrial Omnibus	126
Agricultural	74
HVAC Installation Contractors	37
Refrigeration Contractors	23
Lighting Installation Contractors	35
Motor Dealers	23

Lighting

Key Findings

- Contractors are aware of Focus programs but have not been proactive in using the program to promote efficient lighting.
 - ❖ Distributors are less aware of Focus than contractors.
 - ❖ Contractors and distributors less consistent in promoting efficient technologies than designers and engineers. Contractors have more influence than distributors on equipment selection.
 - ❖ Smaller contractors more hopeful about customer acceptance and business case for efficient equipment than large contractors.

Implications

- Target program promotion to mid-size contractors: 25–99 employees. They're relatively motivated and serve a large swath of the market.
 - ❖ Market lighting measures hard to end-users via account management and training.
 - ❖ Target incentives to technologies with moderate current penetration but good potential: Fluorescent/HID, controls.
 - ❖ Improve the ease of use of programs by making Focus staff contacts and areas of responsibility more transparent to lighting retailers, wholesalers, and potential program applicants.



Motors

Key Findings

- WI market share of NEMA premium motors and VSDs are roughly equal to national levels.
- Dealer efforts to promote efficient motor system components are roughly equal to national levels.
- Dealers are aware of and participate in Focus.
- Dealers and manufacturers feel that programs have been at least somewhat effective.

Implications

- Need to try some fresh ideas. Fleet management concept currently being piloted.
- Research to establish potential benefits of a motor bounty type program.

HVAC

Key Findings

- **Contractors report they are already selling high efficiency**
 - ❖ Is this a misperception of definition of high efficiency?
 - ❖ Is market shifting rapidly to ASHRAE 90.1?
- **Opportunities differ based on market event**
 - ❖ New construction and renovation projects require program intervention at their earliest stages. Identify and track large new construction and renovation projects and leverage LEED.
 - ❖ For planned replacements, supply-side intervention efforts should focus on contractors.
 - ❖ Emergency replacement efforts should be directed toward distributors.
- **Opportunities in bidding situations are greatest prior to RFP being issued**
 - ❖ Educate general contractors and owners on the importance of emphasizing energy efficiency in project bid structures.
- **Technical opportunities**
 - ❖ Promote proper sizing, installation, and the use of commissioning.
 - ❖ Reduce percentage of packaged units system in new construction.
 - ❖ Leverage national efforts to next level high efficiency air conditioners.
 - ❖ Promote retro-commissioning.

Refrigeration

Key Findings

- Initial cost, reliability concerns and impact on sales (product presentation) are customer barriers to the purchase of refrigeration efficiency measures.
- Many opportunities to increase the penetration of existing efficiency improvements in the WI market. Opportunities for both large, complex improvements and lower cost measures.
- Use of Focus incentives among grocery stores very low.

Implications

- Small number of large “players” in supply chain create opportunity and need to develop relationships.
- Target large chains for more complex, high-end measures such as cases, floating head pressure, and compressor racks.
- Target smaller stores and independents with rebates for low-cost measures such as strip curtains, night covers, gasket repair, closers, alarms, anti-sweat heater controls).
- Support contractors with analysis tools in combination with sales training.

Findings & Implications – Compressed Air

Key Findings

- There has been an increase (since 2003) in the systems approach to compressed air systems – both customer demand and distributor offerings.
- Focus and CAC are partially credited with this positive change
- Still much opportunity for improvements in compressed air efficiency
- Barriers to adoption persist

Implications

- Continue promoting systems approach
- Continued need for education and incentives for facilities audits
- Provide Focus training to corporate decision makers
- Continue supporting feasibility studies through incentives
- Review training and technical review to increase credibility in industry
- Streamline incentive application process
- Review tradeoff between incentive levels and program requirements

New Construction

Key Findings

- Developer/owner has final say on building.
- Designer has very large influence on decisions.
- First cost is a major decision criterion, even among developers interested in energy efficiency and green design.
- Although there are many barriers to energy efficient and green new construction, there are opportunities for Focus to influence the market.
- Large developers (who continue to own their property) and owner occupants present the greatest opportunity for energy efficient/green buildings.
- The greatest opportunities to influence building performance are before the building is designed.

Implications*

- Establish relationships with key developers and designers in order to influence decisions before design begins. Identify "teams" that consist of designers promoting energy efficient and green construction who work with long standing developers who are open to energy efficient and green construction.
- Develop case studies that include operating cost information to testify to success of approaches.
- Consider developing a *reference list* with contacts of people who have built green buildings and buildings with newer energy efficiency components.
- Provide technical or design assistance for major retrofits. Consider promoting this service by establishing ongoing relationships with the three WI IFMA chapters.
- Offer financial incentives through the custom rebate program for new construction component improvements.
- Work with local communities on green ordinances.

* Implications assume limited funding for new construction activities.

Commercial Sector – Findings^{*}

- The size of a business matters. Smaller organizations not well suited to effectively monitor energy use and design strategies for reducing energy costs
- The barriers to implementing energy efficiency improvements are consistent across commercial sectors
 - ❖ Overstated bill savings
 - ❖ Budget constraints
 - ❖ Perception that all is done
- Much room for improvement in general energy management, maintenance, and replacement policies
- Opportunity for lighting upgrades in grocery and restaurant (challenge is high percent of renters)
- Low awareness of Focus in grocery and restaurants
- Low use of Focus when making capital improvements
- Frequent capital budgeting among commercial customers
- Capital investments are made for reasons other than energy savings
- External players (supply chain actors) often influence purchase decisions

^{*} See individual sectors for more detail.

Commercial Sector – Implications

Smaller Businesses

- Use trade allies to increase awareness and promote Focus.
- Develop strong on-going relationships with business associations to leverage opportunities to promote energy efficiency products and services, and Focus on Energy programs.
- Continue offering prescriptive rebates.
- Promote energy management practices among small businesses through targeted and short (1/2 day) trainings. Consider offering abbreviated trainings or teaser courses at business association meetings.

Larger Businesses

- For large businesses, especially in concentrated markets, use an account management approach (similar to the approach being used for grocery stores).
- Continue offering prescriptive and custom rebates.
- Increase awareness of Focus among trade allies and through business associations.
- Continue to promote energy management practices through Practical Energy Management.

Commercial Market Indicators

Metric	Baseline Measure			
	Schools	Restaurants	Grocery Stores	Health Care
Awareness of Focus	85%	49%	47%	69%
Energy Management Practices				
Assigned staff to energy management function	81%	42%	39%	57%
Have stated energy savings goals	56%	38%	31%	37%
Track energy use at the facility level	74%	48%	35%	65%
Qualify potential investments by costs and savings	75%	42%	47%	56%
Replacement Practices				
Upgrade fluorescent ballasts on replacement	66%	33%	26%	55%
Upgrade motors on replacement	52%	17%	8%	46%
Investments in Energy Using Equipment				
Projects >\$10,000 in past 3 years (B3) ¹	84%	44%	42%	67%
EE investment to at least one system ²	98%	86%	95%	89%
EE investment to more than one system ²	70%	59%	50%	74%
EE investment to at least one non-lighting system ²	85%	73%	73%	81%
Received Focus services for recent project ²	38%	9%	9%	15%

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3i)
- all energy efficient investments may not be eligible for Focus on Energy services

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Industrial Sector – General Findings^{*}

- Focus has established visibility and gained participation from a significant segment of the targeted industries.
- Some technology-specific offerings appear to be having an effect, for example compressed air and steam systems.
- The key barriers across this sector are the perception of measure performance risk and budget constraints.
- There is much room for improvement in general energy management, maintenance, and replacement policies.

^{*} See individual sectors for more detail.

Industrial Sector – Industry Findings

Super Segment 1: Paper, Meat Packing, and Foundries (particularly ferrous)

- Are highly concentrated
- Under severe profit pressure
- Tightly ration investments
- Unlikely to invest to save energy only → need to work energy efficiency into projects undertaken for other reasons.
- Projects are big and Focus resources constrained

Super Segment 2: Plastics and Dairy Products

- In better economic shape
- Have lower investment hurdles.
- Low costs less critical as a competitive advantage

Industrial Sector – General Implications

- Establishing personal relationships with the largest energy users within the sectors is essential for having an impact on investment decisions. Focus has limited funds to address the very largest industrial improvements and may be most effective in providing third party information on energy efficiency possibilities and *demonstrated* savings.
- The program should take advantage of the industries in which capital investment is already occurring (such as plastics) to leverage major opportunities for improved systems. Companies (and industries) that are growing are already making capital investments and may also be open to measures with a longer payback.
- Promoting energy management practices throughout the industries may prime companies to invest in energy efficiency as their economic situations improve.

Industrial Sector – Industry Implications

Super Segment 1: Paper, Meat, Foundries

- Suggests account management for top 5–7 facilities in each sector.
- Concentrate on technical assistance and M&V to overcome perception of risk.

Super Segment 2: Plastics and Dairy

- Current mix of training, incentives, support of technology channels, and technical assistance should be effective for this group.
- May be worthwhile to add account management for top few to develop case studies and experience in providing assistance to establish stronger energy management functions.

Industrial Market Indicators

Market Indicators	Baseline Indicators (percent of respondents)					
	Plastic	Paper	Meat	Dairy	Iron	NF Met
Awareness of Focus	80%	100%	64%	74%	58%	73%
Energy Management Practices						
Assigned staff to energy management function	47%	92%	55%	43%	75%	20%
Have stated energy savings goals	46%	75%	36%	44%	42%	27%
Track energy use at the facility level	54%	92%	55%	69%	67%	33%
Qualify potential investments by costs and savings	59%	75%	73%	69%	58%	27%
Replacement & Maintenance Practices						
Upgrade fluorescent ballasts on replacement	35%	67%	55%	54%	17%	40%
Compressed air leak detection once in 2 years	33%	100%	50%	50%	n/a	67%
Investments in Energy Using Equipment						
Projects >\$10,000 in past 3 years (B3) ¹	60%	92%	73%	86%	58%	47%
EE investment to at least one system ²	81%	80%	100%	100%	83%	86%
EE investment to more than one system ²	57%	50%	57%	86%	33%	29%
EE investment to at least one non-lighting system ²	67%	70%	71%	100%	33%	71%
Received Focus services for recent project ²	29%	20%	29%	11%	0%	43%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3l)
- all energy efficient investments may not be eligible for Focus on Energy services

Dairy Farms

- Dairy farms are different than the other sectors (although in many ways they look like small businesses in any sector) and present challenges to investment in energy efficiency. The number of milking operations continues to decline and few dairy farmers have plans to expand their operations. Many indicate budget constraints as a barrier to investment in energy efficiency, although they realize that there is more they can do.
- Few dairy farms have a formal capital budgeting process and most do not track energy use – especially small farms. Few have plans to expand their operations.
- Dairy farmers purchase much of their equipment, including HVAC, water heating and lighting, from general agricultural supply dealers.
- Dairy farmers rely on dealers for recommendations on much of the equipment they purchase.
- Greatest opportunities may be in upgrades to existing equipment upon failure or planned replacement.
 - ❖ Heat recovery systems on milk cooling compressors and in-line coolers to pre-cool milk are only energy-efficient measures with significant market penetration.
 - ❖ A lot of incandescent lighting, mercury vapor lighting still in place.
- Focus should work directly with general agriculture supply companies to promote energy efficiency.
 - ❖ These companies must have knowledge and supply of energy-efficient equipment to reach a large portion of the dairy farm sector.
 - ❖ They are in the front-line of equipment replacement.
 - ❖ Farmers often defer to suppliers/dealers on equipment decisions.
- Need to educate farmers about their relative energy costs through benchmarking information.
 - ❖ Few farmers track energy consumption.
 - ❖ Many do not use financial criteria to evaluate projects.
 - ❖ Believe energy prices are not high enough to justify action.
- Great untapped potential for interior lighting upgrades and VSDs on vacuum pumps.
- Measures that increase cow comfort, for example HVLS fans, may have instant appeal.

Potential Market Indicators: Dairy Farms

Metric	Market Segment			
	Small	Medium	Large	All
Awareness of Focus (E1)	63%	64%	100%	64%
Energy Management Practices				
Have stated energy savings goals (B3)	26%	41%	25%	30%
Track energy use at the facility level (B1A-1)	16%	43%	50%	23%
Qualify potential investments by costs and savings (B4A_4)	41%	63%	75%	47%
Replacement Practices				
Upgrade fluorescent ballasts on replacement	6%	6%	25%	6%
Upgrade motors on replacement	11%	18%	33%	13%
Percent Dairy Farms Using Focus on Energy	27%	47%	33%	32%



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Research Objectives

Focus on Energy Business Programs hired KEMA (with Quantum Consulting) to conduct a comprehensive baseline and market segmentation analysis to support the design of Program Year 5 offerings. The research had three main objectives:

- **Technology/Market Characterization**
 - ❖ Identify the key market actors within each technology market
 - ❖ Identify key decision makers and points in the process for program intervention
 - ❖ Identify key barriers to implementation of energy-efficient equipment
- **New Construction Market Characterization**
 - ❖ Role of market actors and perceptions of energy efficiency
 - ❖ Barriers to energy-efficient design and construction
- **Program interventions to increase adoption of energy efficient equipment and practices**
- **Baseline Market Indicators**
 - ❖ Establish baseline market indicators to track changes over time.

Research Topics

■ Markets

- ❖ Lighting
- ❖ Motors
- ❖ HVAC
- ❖ Refrigeration
- ❖ Compressed Air

■ New Construction

■ Commercial Sector

- ❖ Education
- ❖ Health
- ❖ Groceries
- ❖ Restaurants

■ Industrial Sector

- ❖ Metal Casting –
Ferrous and Non-Ferrous
- ❖ Pulp and Paper
- ❖ Food Processing –
Dairy and Meat
- ❖ Plastics

Research Methodology

- Computer Aided Telephone surveys
 - ❖ 4 commercial sectors
 - ❖ 4 industrial sectors
 - ❖ Dairy farms
 - ❖ Motor dealers
 - ❖ HVAC installation contractors
 - ❖ Lighting installation contractors
 - ❖ Refrigeration contractors
- In-depth interviews
 - ❖ Distributors
 - ❖ Manufacturers
 - ❖ Equipment dealers
 - ❖ Contractors
 - ❖ Industry experts
 - ❖ Design firms
 - ❖ Developers
- Secondary research

Completed Data Collection

	Number Completed
In-depth Interviews	
Lighting Distributors/Suppliers	5
Compressed Air Equip. Dealers	3
Compressed Air Efficiency Consultants	2
HVAC Distributors	5
HVAC Commission Vendors	2
Refrigeration Equipment Manufacturers	4
Large Refrigeration Customers	3
NC-industry experts	3
NC-developers	5
NC-Designers	8
Motor Manufacturers	3
CATI surveys	
Commercial Omnibus	264
Industrial Omnibus	126
Agricultural	74
HVAC Installation Contractors	37
Refrigeration Contractors	23
Lighting Installation Contractors	35
Motor Dealers	23

See Appendix A for more detail on response to the commercial and industrial omnibus surveys. Each section includes details on completions for that market or sector.

Layout of the Report

- The report is presented in 14 sections and Appendices A–J. The additional report sections are:
 - ❖ Lighting
 - ❖ Motors
 - ❖ HVAC
 - ❖ Refrigeration
 - ❖ Compressed Air
 - ❖ New Construction
 - ❖ Education
 - ❖ Health
 - ❖ Groceries
 - ❖ Restaurants
 - ❖ Metal Casting – Ferrous and Non-Ferrous
 - ❖ Pulp and Paper
 - ❖ Food Processing – Dairy and Meat
 - ❖ Plastics

Listing of Appendices

A.	Data collection completes
B.	Lighting
C.	Motors
D.	HVAC
E.	Refrigeration
F.	Compressed Air
G.	New Construction
H.	Commercial Omnibus
I.	Industrial Omnibus
J.	Agricultural Omnibus

Each appendix includes the data collection instruments (in-depth interview protocol or CATI survey instrument) and tables with the CATI results.



Lighting



Data Collection & Analysis

- Objectives
- Key Sources
 - ❖ 35 CATI interviews with population-based sample of WI lighting installation contractors.
 - ❖ 5 in-depth interviews with with commercial and industrial lighting distributorships with locations in Madison, Milwaukee, and Eau Claire.
 - ❖ Analysis of other primary sources and market research.

Firms in the WI Contractor Market

- Sample frame includes all firms with electrical contracting or lighting contracting as their 'Primary SIC' for listing in Dun & Bradstreet.

Population of Firms By Number of Employees

Employment Size Category	Number of Establishments	Percent of Total Sector Employment
1	142	2%
2 to 4	220	9%
5 to 9	130	12%
10 to 24	90	19%
25 to 49	28	13%
50 to 99	18	17%
100 to 249	9	18%
250 to 499	3	11%
	640	100%

Profile of WI Lighting Contractors

- Large contractors account for roughly ½ of total projects. Contractors in the 5–24 employee range account for about 1/3 of projects.
- New construction accounts for ½ of project revenue. No pattern by establishment size.
- About ½ of all projects done directly for owner/occupant; about 1/3 for general contractors.

	Number of Employees				All
	1 - 4	5 - 24	25 - 99	100+	
Volume and Importance of Lighting Work					
Mean number of C&I lighting projects in last 12 months	18	101	133	2,733	1,200
Mean percent of annual revenue from lighting projects	35%	54%	30%	20%	30%
Percent of Revenue by Project Type					
New Construction	61%	32%	61%	48%	47%
Renovation & Remodeling	25%	26%	26%	40%	32%
Replacement of Failed Equipment	9%	22%	5%	6%	10%
Percent of Projects by Client Type					
General Contractor	44%	34%	44%	31%	36%
Facility owner/occupant	49%	46%	47%	69%	56%

Lighting Distributors Interviewed (in-depth)

■ Firm Profiles

- ❖ Number of employees ranged from 7 to 32 with an average of 21
- ❖ 3 firms supplied lighting only; 1 electrical equipment supplier; 1 manufacturer's representative
- ❖ Percentage of revenue from sales of lighting to WI customers: <5% to 100%

■ C&I Lighting Sales

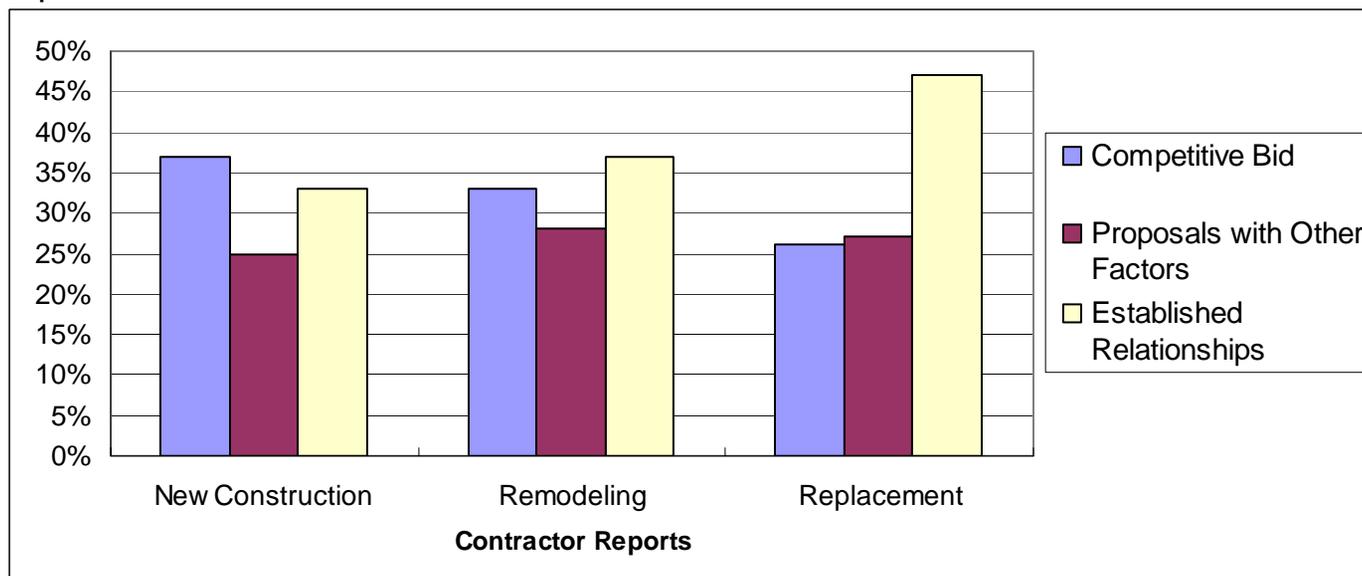
- ❖ All report >\$50,000 in annual lighting equipment sales to C&I customers
- ❖ Roughly 40% of sales are made to electrical contractors or other installers; 1/3 to other distributors or retailers; 1/4 directly to end users

Lighting Design Services Offered (Distributors)

- **Offerings**: 4 of the 5 firms offered lighting design and fixture layout services as well as and lighting equipment specification services.
- **Process**: Respondents report working with the client, architects, and engineers on both remodeling and new construction projects in a dynamic process to identify equipment preferences and lighting options.
- **Frequency**: According to 3 respondents, lighting design and spec services were provided in an average of 40% of their commercial lighting projects, ranging from 10% to 80% of the time.
- **Fees**: Most distributors do not charge for the design, layout, and specification services for their commercial lighting customers.

Sales Modes by Project Type (Contractors)

- Competitive bid most frequently used in new construction, but difference from other project types is not great.
- Roughly ¼ of projects are let on proposals that involve aspects other than price.
- Established relationships are an important source for all types of projects, but especially replacement.
- Distributors reported a range of 0–100% for the percent of C&I projects involving a competitive bid.



Decision Making (Distributors)

- Distributors indicate that they exercise *some* influence on equipment installed in about 40% of C&I lighting projects.
- Distributors offer a range of lighting options to C&I customers on projects.



Influencers of Equipment Selection (Contractors)

■ New Construction

- ❖ Contractors report specifying equipment in 43% of new construction.
- ❖ Contractors say the most important influence on lighting decisions in new construction is the lighting designer. They were identified by contractors representing ½ of all projects.

■ Remodeling

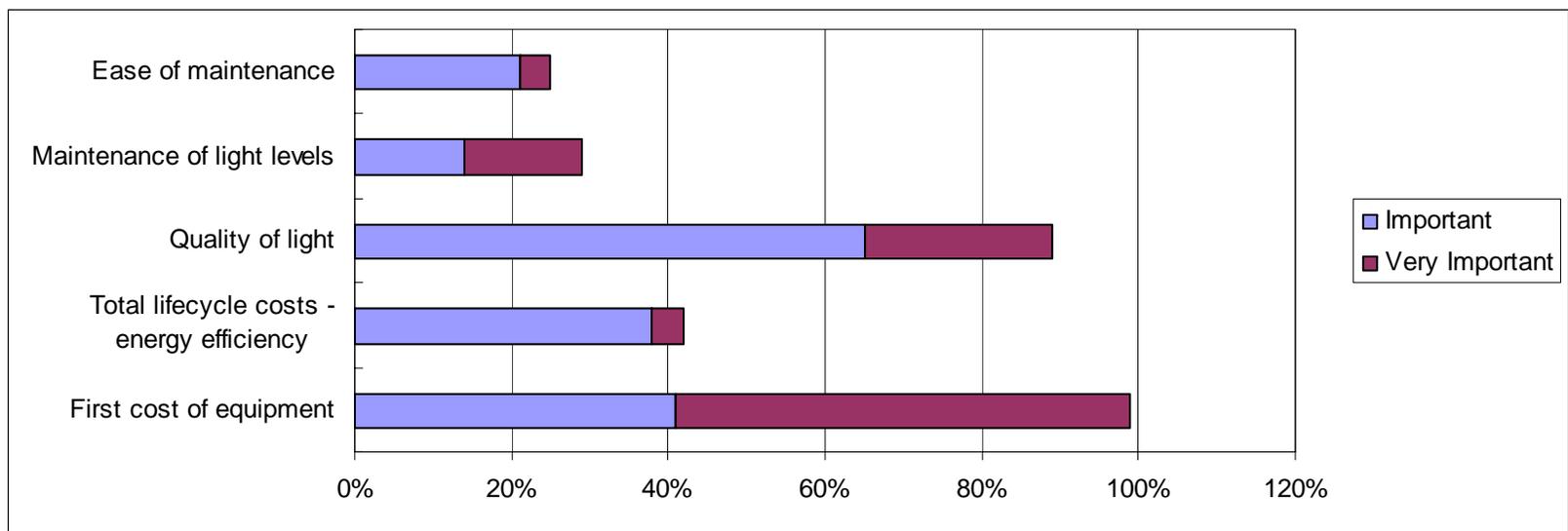
- ❖ Contractors report specifying equipment in 68% of remodeling projects.
- ❖ Contractors say the most important influence in remodeling projects is general contractor. They were identified by contractors representing 56% of all projects. Second biggest influence is the installation contractor, mentioned by 21%.

Influencers of Equipment Specification (Distributors)

- Distributors indicate that they exercise *some* influence on equipment installed in about 40% of C&I lighting projects.
- Distributor report meeting the needs expressed by the customer and the initial cost of lighting equipment as the most important factors in what they specify.
- One of the respondents discusses total lifecycle costs when making lighting recommendations to C&I customers.
- When trying to sell energy-efficient lighting equipment, most of the distributors reported citing comparative operating costs, lamp life, and maintenance costs, in addition to payback.
- Two distributors also cited lighting quality or lumen depreciation when selling energy-efficient lighting equipment.

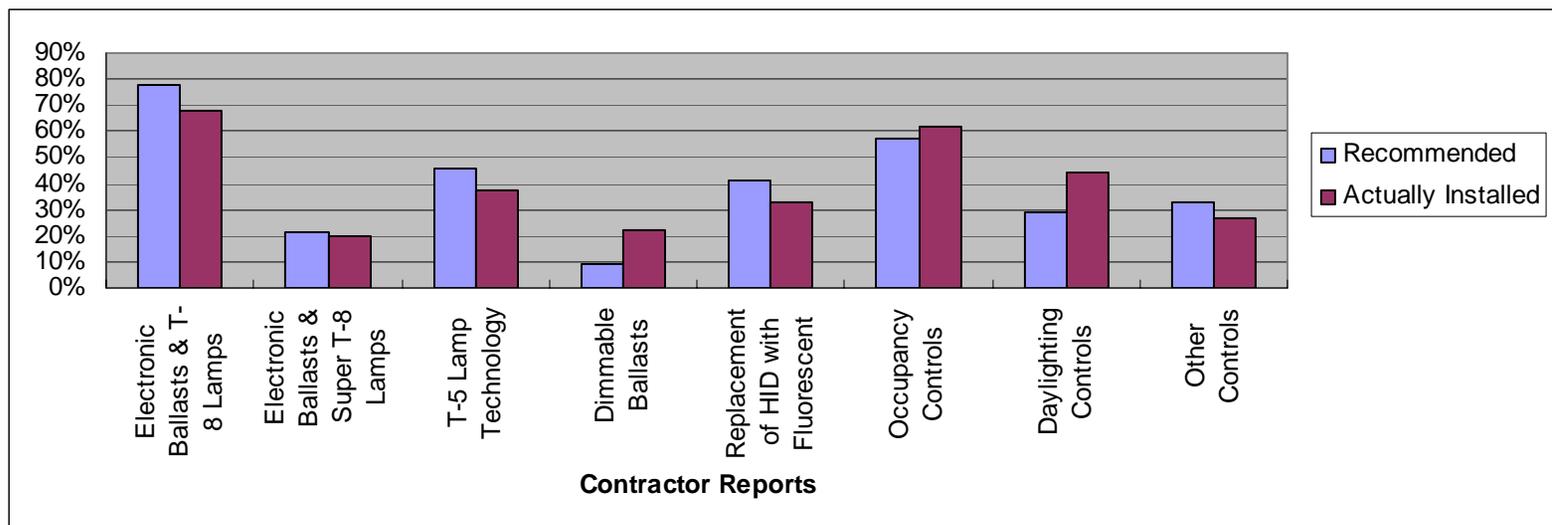
Contractor Criteria for Equipment Selection

- First cost is by far the most important criterion for lighting equipment selection, followed fairly distantly by quality of light.
- Only 42% consider life cycle cost at all important; 4% very important.
- Larger contractors accord no importance at all to ease of maintenance or maintenance of light levels as factors in equipment selection decision.



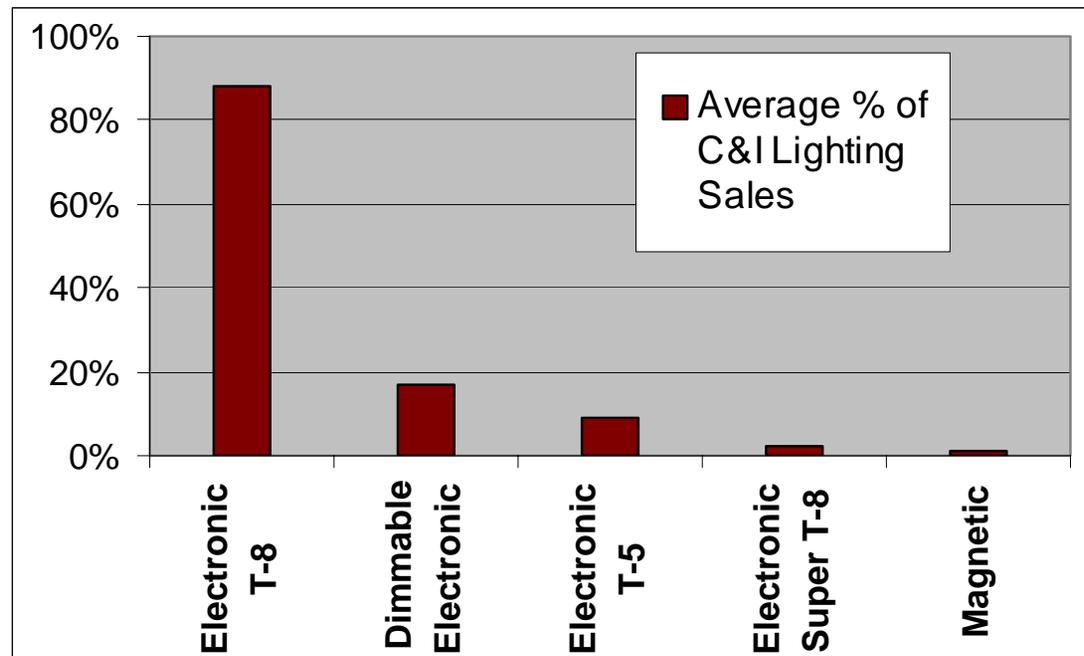
Recent Contractor Specifications & Installations

- Share of installation can be higher than share of recommendations due to working on jobs specified by designers and general contractors.
- Designers and architects are more likely than contractors to specify day lighting controls, occupancy controls, and dimmable ballasts.
- T-5 technology, use of fluorescents to replace HID, occupancy, and daylighting controls showing strong presence.
- Most reported customer objections focus on cost with some exceptions. T5s – appearance; dimmable ballasts, occupancy controls, fluorescent/HID – lack of familiarity with performance.



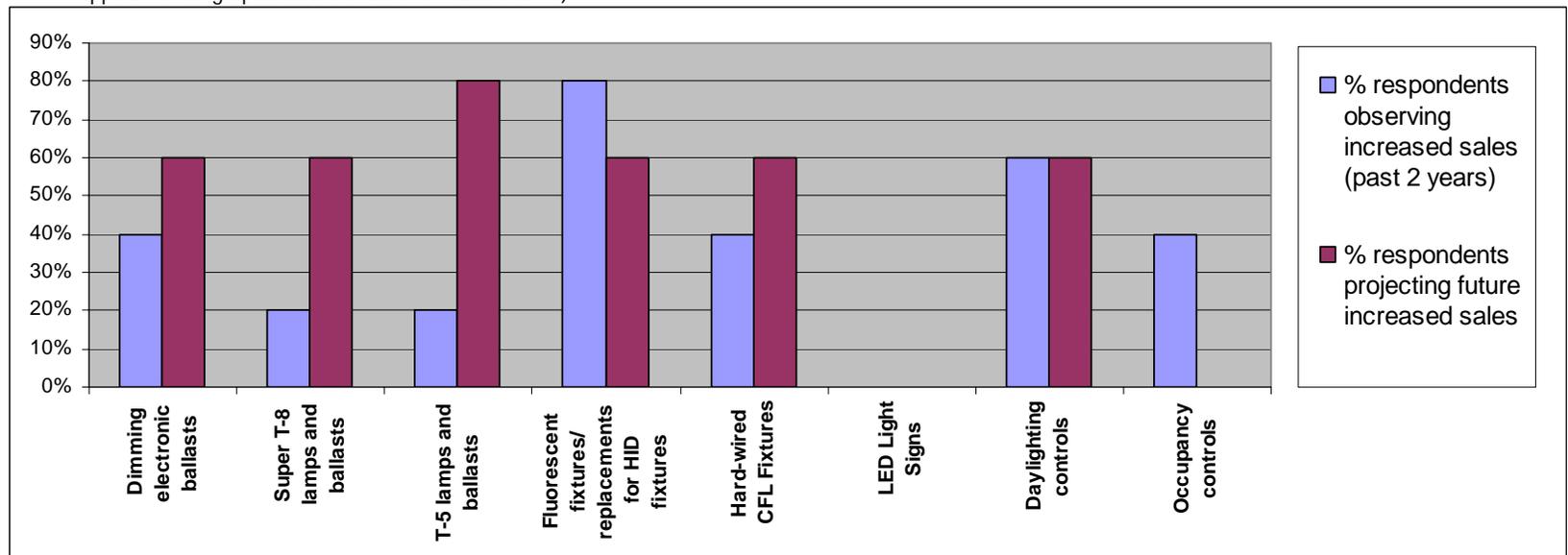
Distributor Lighting Sales by Equipment

- Currently, the majority of fluorescent lighting sold by distributors is electronic ballasts with T8 lamps.
- Reported distributor market share for electronic ballast/T8 combination corresponds closely to market share reported by contractors.



Observed and Projected Sales Trends (Distributors)

- All 5 distributors interviewed report that sales of efficient lighting technologies listed above have increased or remained stable over the past 2 years.
- Respondents anticipate increased sales for dimming electronic ballasts, T8 and Super T8 lamps and ballasts, and hard-wired CFL fixtures. Most frequently cited reason for this expectation: growing consumer awareness of energy efficiency options.
- LED sign sales have been stable and respondents expect them to stay that way. (They do not appear on the graph below because the values are 0).



Contractor Perception of Business Case for Promotion of Efficient Lighting

- Most important reason: increase revenue and margins – 73%
- Other reasons: equipment is more durable (39%); environmental consciousness
- No mention at all of customer satisfaction and retention
- 17% say energy efficiency is very important with 24% of these saying it is important to their competitive position
- Smaller contractors more likely to place competitive value on offering energy efficiency viewing it as a way to build a niche
- Large contractors place little competitive value on energy efficiency offerings

Contractor Awareness of & Response to Focus on Energy

- Awareness of Focus is high, but participation by lighting contractors is fairly weak.
- Large portion of medium and large contractors participate, but number of projects is very low compared to annual volume.
- 19 of 35 respondents offered opinion on effectiveness of Focus in promoting efficient lighting: 23% thought it was effective; 3% thought it was very effective.
- Suggestions for improving effectiveness focus overwhelmingly on improved outreach and marketing to customers and contractors, also the usual griping about low incentives.

	Contractor Number of Employees				All
	1-4	5-24	25-99	100+	
Aware of Focus	55%	32%	83%	99%	71%
Participated in Focus projects (% of those aware)	48%	25%	97%	91%	78%
Mean number of Focus projects in past 12 months	2.0%	3.0	6.3	1.0	4.5
Participated in Focus training	<1%	53%	85%	100%	32%

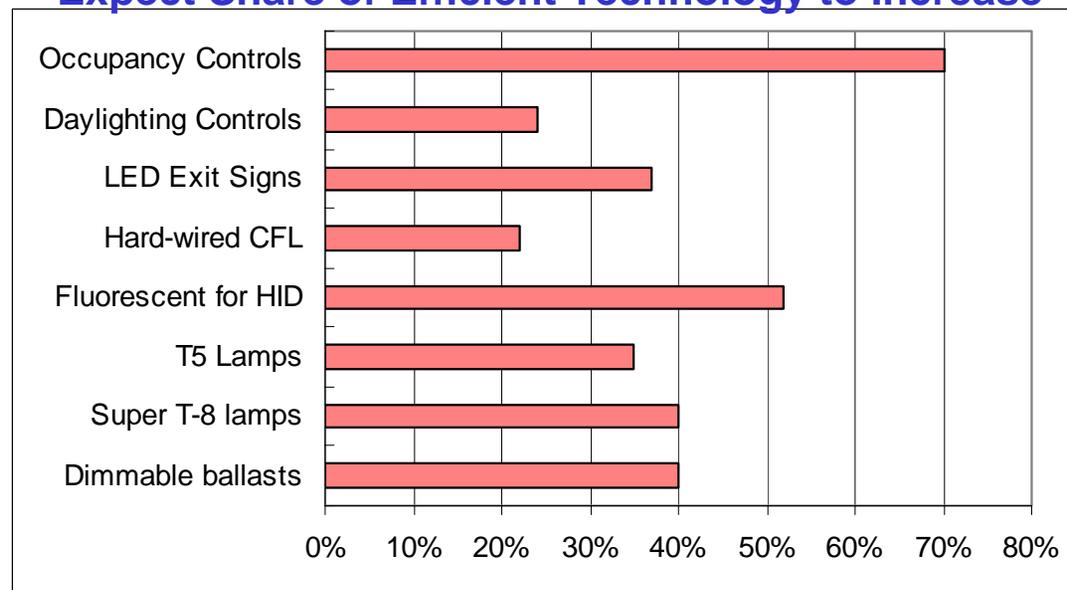
Distributor Awareness of & Response to Focus on Energy

- **Overall awareness**: 3 of 5 respondents are aware of the programs Focus offers for businesses.
- **Focus training**: 2 respondents participated in one training program sponsored by Focus 3 or more years ago. The main benefit both respondents cite is the opportunity to network and establish Focus contacts they could call later with questions.
- **Focus incentives**: 2 respondents have supplied lighting equipment on projects that received Focus funding, though only one respondent could estimate that 10% of their C&I lighting projects received Focus incentives in the past 12 months.
- **Focus effectiveness**: Of those aware of Focus, 2 rank Focus's efforts to promote energy efficiency has been "somewhat effective" and a third ranked Focus's efforts "not very effective." Biggest difficulty cited was finding the correct person within Focus to answer their questions about program eligibility in a timely fashion.

Contractor View of Technology Acceptance Trends

- Smaller contractors generally much more optimistic about efficient technology acceptance than larger contractors. Consistent with assessment of efficiency as a business strategy.

Percent of Contractors Who Expect Share of Efficient Technology to Increase



Key Findings — Distributors

- 4 of the 5 distributors interviewed said it is very important for them to offer energy-efficient lighting technologies or design options in order to maintain their firm's competitive market position.
- While distributors *offer* energy-efficient lighting technologies, they do not report having a big influence on what is selected.
- Meeting customers' needs (whether first cost or energy efficiency) is the most important factor cited by distributors to run a profitable business. ["For some customers, energy efficiency is extremely important to cut long term costs; for others, short term product costs are more of a concern and efficiency is not as important."] Other factors cited include: knowing sales strategies and advertising, good inventory management, having a well-organized/executed marketing plan in place, and commitment to customers and the industry.
- Increased energy awareness among C&I consumers has driven increases in energy-efficient lighting and fixtures. Still, many customers focused on first costs.
- Distributors anticipate increased quality for daylight sensing, emergence of better LED technology for more applications, a growing T-5 market, and a wider variety of CFL fixtures.

Program Implications

■ Key Findings

- ❖ Contractors are aware of Focus programs but have not been proactive in using the program to promote efficient lighting.
- ❖ Distributor are less aware of Focus than contractors, but appear to have some influence in the equipment selection process.
- ❖ Contractors and distributors less consistent in promoting efficient technologies than designers and engineers. Contractors have more influence than distributors on equipment selection.
- ❖ Smaller contractors more hopeful about customer acceptance and business case for efficient equipment than large contractors.

■ Suggested Strategies

- ❖ Target program promotion to mid-size contractors: 25–99 employees. They're relatively motivated and serve a large swath of the market.
- ❖ Market lighting measures hard to end-users via account management and training.
- ❖ Target incentives to technologies with moderate current penetration but good potential: Fluorescent/HID, controls.
- ❖ Improve the ease of use of programs by making Focus staff contacts and areas of responsibility more transparent to lighting contractors, wholesalers, and potential program applicants.

Potential Market Indicators: Lighting

- Contractor and distributor reports of market share for key efficient technologies.
- Percent of contractors attributing high importance to promotion of efficiency as a business strategy.
- Increase in percent of contractors reporting life-cycle cost as an important criterion in equipment selection.



Industrial Motors and VSDs



Motors & VSD Introduction

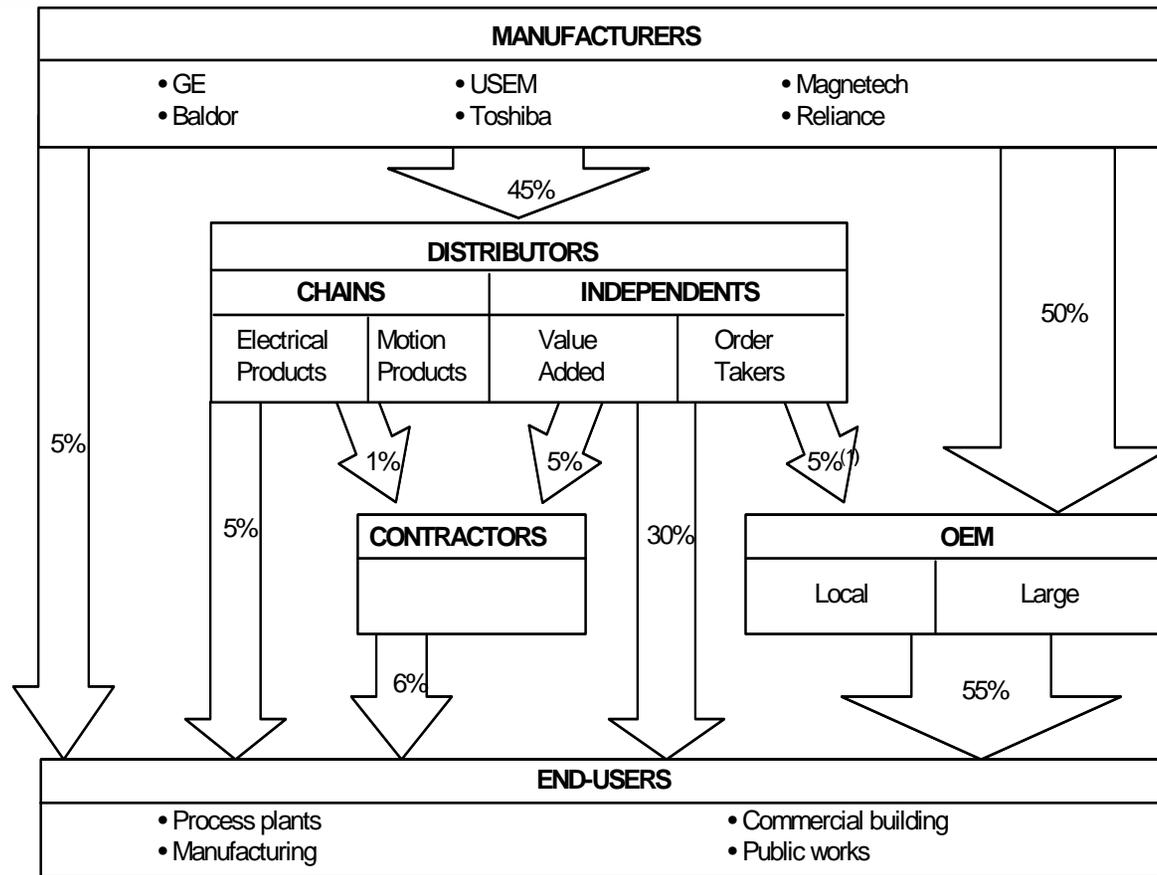
■ Objectives

- ❖ Leverage previous research on motors market characteristics and structure
- ❖ Concentrate on activity indicators and Focus opportunities

■ Key Sources

- ❖ C&I Omnibus for this study
- ❖ 23 surveys with motor dealers
- ❖ 3 interviews with motor manufacturers

Structure of the U.S. Motor Market



Firms in the WI Dealer Market

By Number of Employees

Employment Size Group	% Total Sector Emp.	# of Establishments
1 to 4	15%	507
5 to 24	40%	288
25 to 99	32%	59
100+	14%	7
	100%	861

By Primary SIC Designation

SIC	Industry Name	# of Establishments
5063-0000	Electrical apparatus and equipment	147
5063-9905	Motors, electric	29
5085-0000	Industrial supplies	209
5084-0000	Industrial machinery and equipment	341
5085-0501	Other	135

Profile of WI Motor Retailers

- Larger dealers offer a greater range of installation, repair, and inventory services.
- Larger dealers sell a significantly greater volume through supply contracts.
- Motor sales are an important source of revenue for all firms in the business, regardless of primary SIC.

Business Characteristics	5-24 emps	25+ emps	Total
<i>Products and Services Sold</i>			
Sales of motors, VFDs, other industry equip	100%	100%	100%
Motor installation	48%	97%	55%
Motor rewind & repair	71%	97%	74%
Motor inventory services	40%	92%	48%
Motor sales to dealers	94%	7%	81%
<i>Relative Importance of Retail Motor Sales</i>			
Percent of annual revenues from motor sales	41%	30%	40%
Percent of motors sold direct to facility owners	42%	53%	43%
Percent of motors sold to contractors	21%	10%	19%
<i>Sales Mode</i>			
Percent of motor sales over phone or counter	64%	49%	62%
Percent of sales through competitive bid	25%	18%	24%
Percent of sales through supply contracts	11%	27%	13%

Market Share of NEMA Premium Motors

- High hp units constitute a larger portion of sales to end-users than national shipments: over 50% go to original equipment manufacturers.
- Reported WI share of NEMA Premium motors is consistent with national figures, which include sales to original equipment manufacturers. Also confirmed by manufacturers.
- Manufacturers interviewed report 20–29% NEMA Premium share for the distributor channel.

- WI NEMA Premium market share equal to or slightly higher than comparable national figure.

Horsepower	U.S. 2003		WI Sample Dealers 2004	
	% of Total Shipments	% NEMA Premium	% Total Sales to End Users	% NEMA Premium
1–5	61%	14%	36%	21%
5–20	27%	26%	24%	41%
20–50	8%	42%	18%	46%
>50	5%	37%	19%	56%
Total		20%		36%

Trends in NEMA Premium Market

- Distributor-reported drivers for NEMA Premium share: greater customer awareness, fuller product lines.
- Manufacturer-reported drivers for NEMA Premium share: greater customer awareness (associated utility and manufacturer rebates), nervousness over energy price increases.
- Current difference in price: difference in wholesale prices for NEMA Premiums: 8–17% depending on hp. Higher deltas reported by dealers.
- Discounting: distributors report no difference in discount off list price for NEMA Premium v. EPACT, sold singly (63%) or in quantity (54%).

	Distributor Results	Manufacturer Perceptions
Sales of motors increased: 2003–2004	70%	N/A
Share of NEMA Premium increased: 2003–2004	49%	All agreed
Percentage difference in Price: EPACT v. NEMA Premium stayed the same: 2003–2004	84%	All agreed

Promotion Practices for Premium Motors

- Larger distributors are much more proactive than smaller ones in promoting NEMA premium motors.
- Virtually all distributors claim to have MotorMaster or similar life-cycle costing software.
- Manufacturers support promotions with marketing collateral, savings calculators, web sites, participation in utility and national programs.

- Manufacturers report that national chains and EASA members are most active in promoting NEMA premium motors.

Premium Efficiency Promotion Practices	5-24 emps	25+ emps	Total
Promote Premiums in all or most phone/counter sales situations	45%	89%	52%
Calculate life-cycle costs in some sales situations	59%	89%	63%
Include NEMA Premium option in bid responses in most bid situations	1%	97%	15%
Include NEMA Premium option in bid responses in some bid situations	53%	1%	45%

Barriers to Promotion of NEMA Premium Motors

- Dealers perceive lack of customer interest in the economics of premium efficiency motors (life-cycle costs).
- Dealers perceive high first costs as a barrier reinforced by a lack of understanding regarding energy savings estimates.
- Manufacturers identify a number of barriers to dealer promotion of premium efficiency motors: perception that additional sales revenues are not worth the sales effort; perception that the economics don't work for the customer.

Distributor Perceptions of Customer Purchase Policies

Premium Efficiency Promotion Practices	5-24 emps	25+ emps	Total
Percentage of customers with efficiency-related motor purchase guidelines	22%	64%	28%
Percentage of customers with motor purchase policies that specify NEMA Premium	43%	91%	52%
Percent of customers that apply life-cycle cost criteria to motor purchases	6%	15%	8%

Rewind Practice

- Accelerating replacement is the biggest contribution dealers can make to motor fleet efficiency.
- Dealers recommend replacement over rewind in about 35% of cases — no difference between large and small distributors.
- Dealers report using a variety of rules of thumb for the replace v. repair recommendation
 - ❖ Age of motor
 - ❖ Size
 - ❖ Extent of repairs needed
 - ❖ Cost of repair.
- 'Breakpoint' hp for repair hasn't moved recently, suggesting stable relationship between costs of repair and replacement. Currently between 20 and 30 hp.

VSD Market Conditions

- Integrated units regarded by manufacturers and dealers as niche market. It is not growing.
- Both manufacturers and dealers report that the market for separate VSDs is growing.
- Factors contributing to growth: lower prices, changes in manufacturing processes, and changes in original equipment manufacturer equipment.

- Typical applications
 - ❖ Pumps
 - ❖ Fans
 - ❖ Conveyors

	Integrated Units	Controllers Only
Percent of VSDs sold as integrated units	24%	N/A
Percent of motors in range sold as integrated units	9%	N/A
Percent of integrated VSDs sold for variable torque applications	39%	56%
Percent sold directly to facility owners	56%	50%

Vendor Assessment of Programs

- Virtually all sample dealers knew of Focus and supplied motors to Focus-supported projects.
- All large distributors and 38% of small distributors had participated in Focus training. All had participated in manufacturer and/or Department of Energy training.
- Program strategies: cash incentives to dealers deemed most effective (!), followed by cash incentives to customers and provision of life-cycle costing tools. Effective level of incentives = \$6/hp.
- Manufacturers identify local and national programs as very important for increase in NEMA Premium motor share.

Program Implications

■ Key Findings

- ❖ WI market share of NEMA premium motors and VSDs are roughly equal to national levels.
- ❖ Dealer efforts to promote efficient motor system components are roughly equal to national levels.
- ❖ Dealers are aware of and participate Focus.
- ❖ Dealers and manufacturers feel that programs have been at least somewhat effective.

■ Implications

- ❖ Need to try some fresh ideas. Fleet management concept currently being piloted.
- ❖ Research to establish potential benefits of a motor bounty type program.

Potential Market Indicators: Motors

- Premium Efficiency Motors
 - ❖ WI market share of NEMA premium motors versus national market share
- Rewind versus Repair
 - ❖ Percent of potential repairs for which replacement recommended
 - ❖ Decrease in 'breakpoint' for replacement versus repair
- VSDs
 - ❖ Increase or decrease in sales volume versus national trends



HVAC



HVAC Introduction

■ Objectives

- ❖ Leverage previous research on HVAC market characteristics and structure
- ❖ Concentrate on activity indicators and Focus opportunities

■ Key Sources

- ❖ C&I Omnibus for this study
- ❖ Supply-side HVAC data collection for this study
- ❖ WI supply chain study completed by Quantum for ECW and Focus in 2003

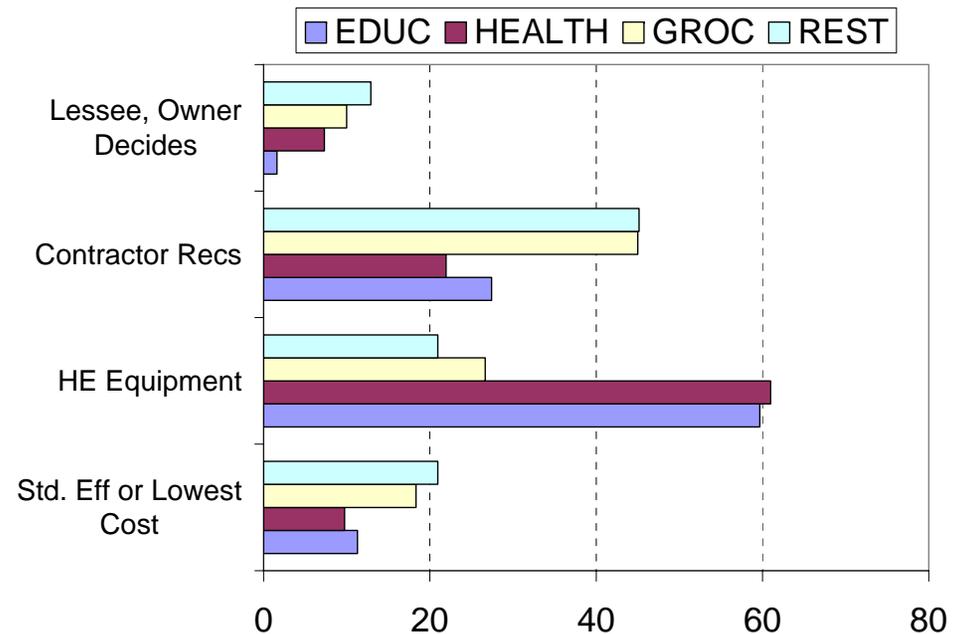
End User HVAC Characteristics

- Commercial presence of air conditioning relatively high
 - ❖ 79% – Health Care
 - ❖ 75% – Education
 - ❖ 67% – Restaurants
 - ❖ 61% – Grocery Stores
- HVAC Maintenance
 - ❖ Mostly in-house for Education and Health Care
 - ❖ Most outsourced for Grocery Stores and Restaurants
 - ❖ Service contracts tend to cover periodic assessment and maintenance of system energy efficiency
 - ❖ HVAC as common as lighting as part of \$5k+ construction/renovation projects (50+%)

End User HVAC Efficiency Reports

- Self-reported penetration of high-efficiency HVAC is relatively high
- Contractors have strong influence on Grocery Store and Restaurant air conditioner replacement

When a cooling unit fails in your facility, do you typically replace with . . .



Primary HVAC Supply-side Interviews

■ Contractors

# Employees	Employment	# of Establishments	Surveyed
1	442	442	0
2 to 4	1,784	732	0
5 to 9	1,802	278	6
10 to 24	2,775	193	12
25 to 49	1,817	56	12
50 to 99	1,543	25	2
100 to 249	1,689	11	4
250 to 499	260	1	1
Total Market	12,112	1,738	
Total in Sampled Pop	9,886	564	37

- Distributors: Population of establishments with >10 employees is ~30, 5 interviews conducted
- 2 interviews with commissioning providers

2003 WI C&I Supply Chain Study

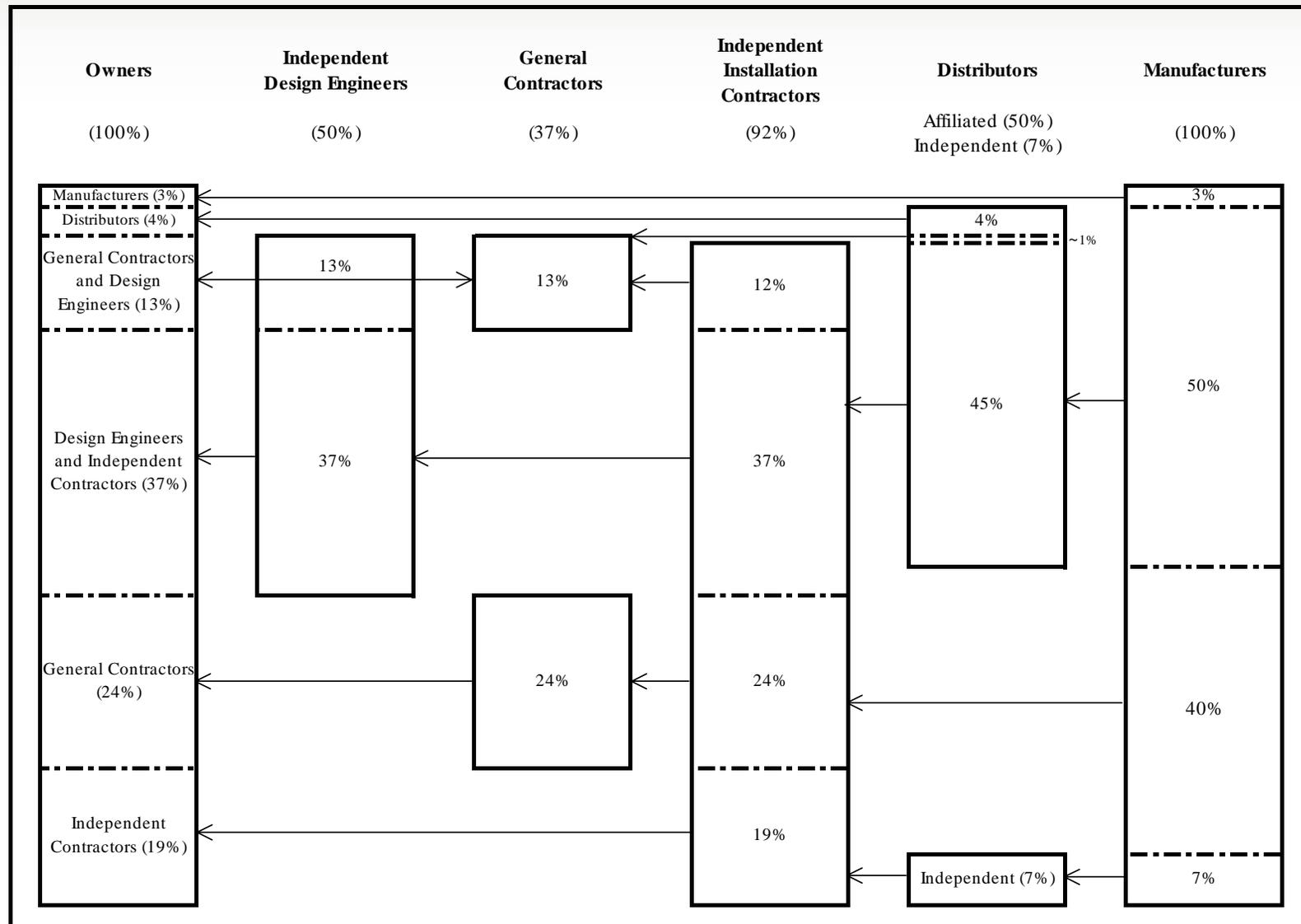
■ Objectives

- ❖ Identify and describe supply-side relationships and roles
- ❖ Identify key business practices
- ❖ Assess perceptions of energy efficiency importance/barriers
- ❖ Recommendations for increasing energy efficiency

■ Data collection for 2003 study

Market Actor	Ind. Boiler Interviews	Compressed Air Interviews	Pump Interviews	Food Processing	Pulp & Paper	HVAC	Total
Industry Experts	3	4	3	4	5	6	25
Manufacturers	5	5	5	10	10	10	45
Distributors	--	6	--	--	--	10	16
Contractors	--	--	--	--	--	30	30
Designers	10	5	5	10	10	10	50
Total	18	20	13	24	25	66	166

HVAC Product Flow (2003 WI Supply-side Study)

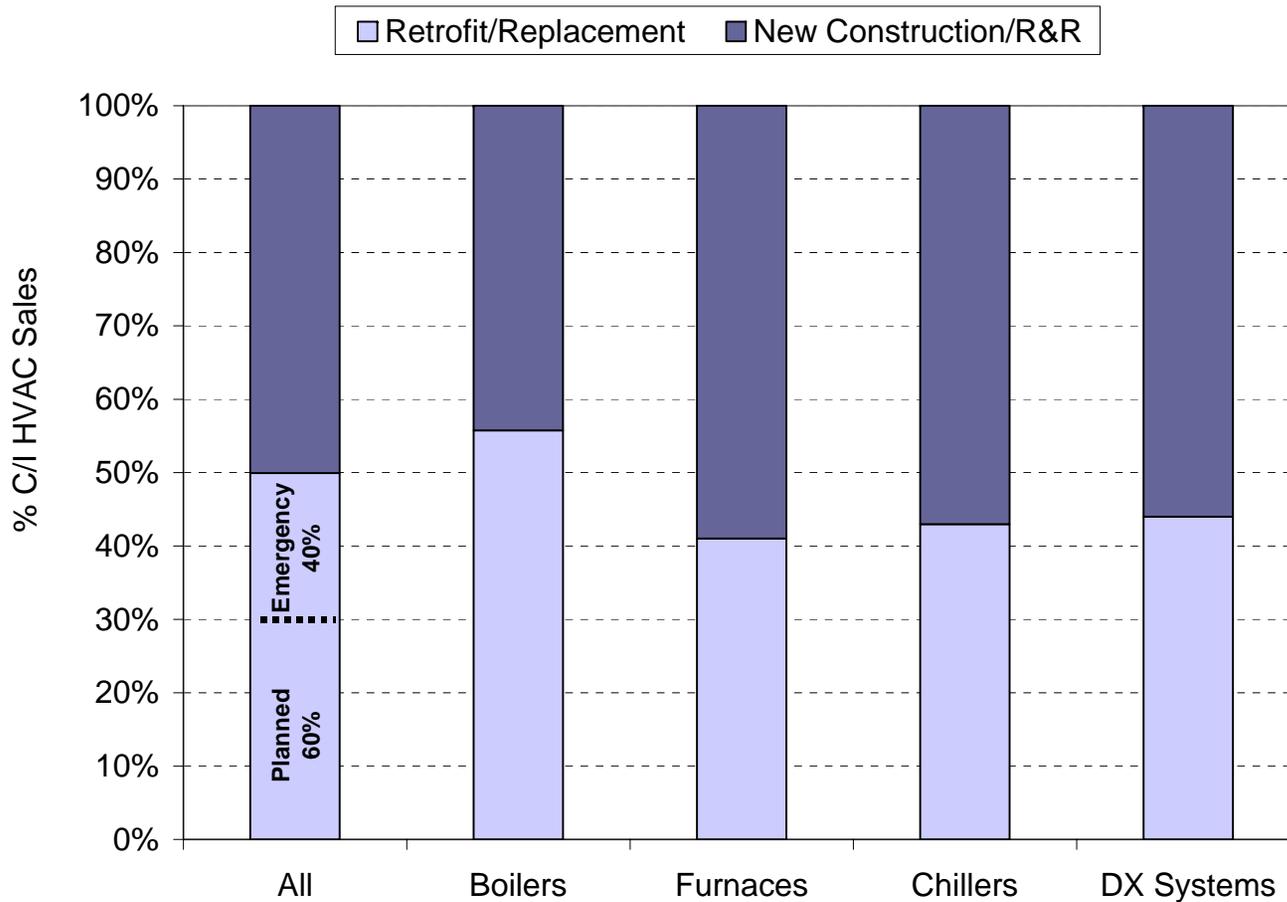


Market Actors & Decision Process (2003 WI Supply-side Study)

- Previous research indicated significant segment-driven variation in market actor importance

Characteristic		Supply-Side Market Actor				
		Manufacturers	Distributors	Designers	General Contractors	HVAC Contractors
Market Event	New Construction/ Renovation	Low-Med	Low	High	Med	Low
	Planned Replacement	Low	Low	Low-Med	Low	High
	Emergency Replacement	Low-Med	High	Low	Low	High
Bid Structure	Plan and Specify	Low	Low	High	Med	Low
	Design Build	Low	Low	Med	High	Med
Tech/System	Large Projects & Boilers/Chillers	Med	Low	High	Low	Med
	Small Projects & Furnaces/DX	Low	Low	Low-Med	Low	High

Relative HVAC Sales by Market Event (2003 WI Supply-side Study)



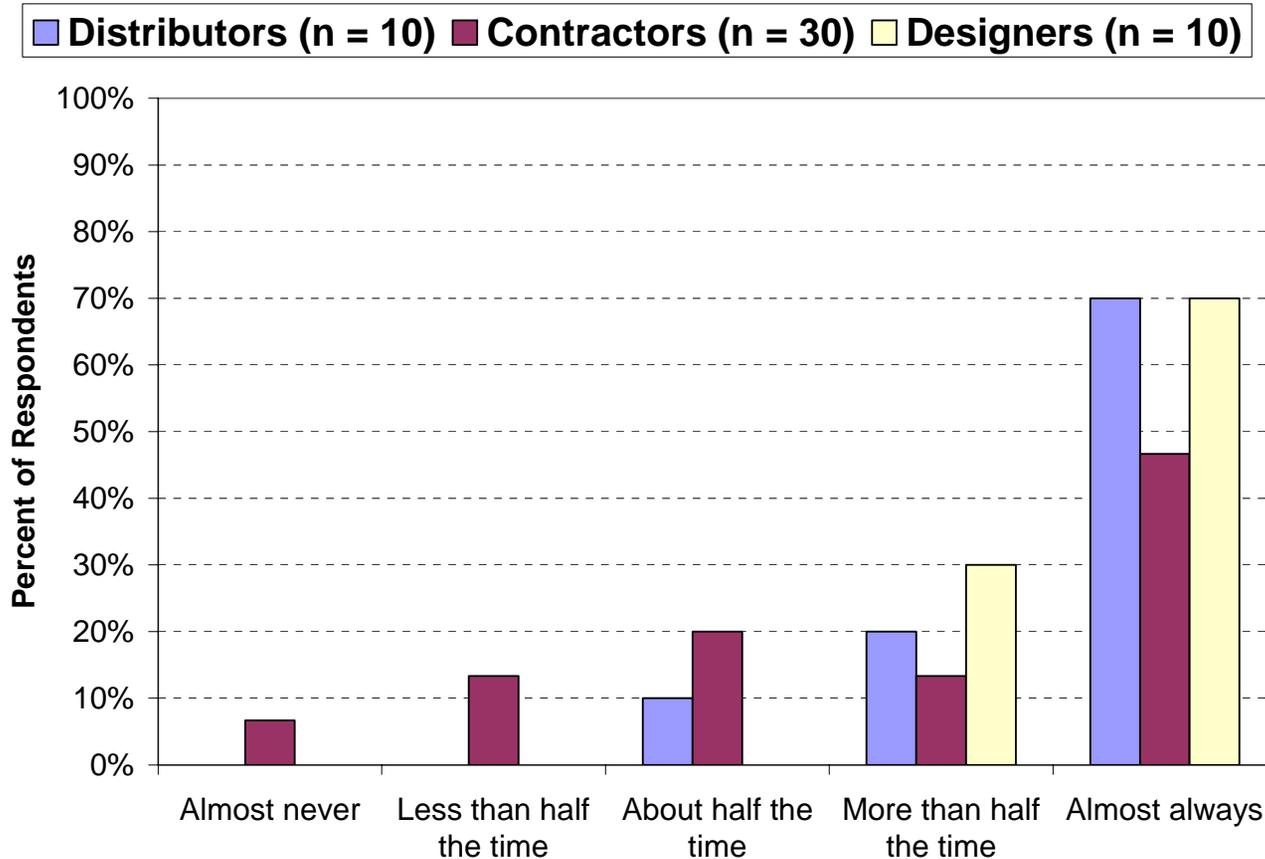
Key HVAC Industry Drivers (2003 WI Supply-side Study)

- Downward pressure on prices
- Perceived topping out of equipment-based efficiency improvements
- Increasing interest in enhanced controls and systems approach to increasing energy efficiency
- Slow economy – customers overhauling existing boilers, not replacing
- Effects of ASHRAE 90.1 on product lines

HVAC Business/Product Features (2003 WI Supply-side Study)

	For Firm	For Products
Manufacturers		Energy efficiency Reliability Comfort Serviceability Noise level
Distributors	Customer Service Long-term relationships Quality products Technical support	Reliability Energy efficiency Noise level Manufacturer's brand
Contractors	Quality of work Expertise of staff Reputation of firm	Reliability/Serviceability Controllability Energy efficiency
Designers	Comprehensive service Quality of work Use of customized approach	Reliability Energy efficiency

Promotion of HVAC Energy Efficiency Among Market Actors (2003 WI Supply-side Study)



HVAC Suppliers' Perceptions of Supply-side Barriers (2003 WI Supply-side Study)

- None — end users are to blame for lack of demand
- Lack of knowledge (among contractors and designers)
- Limited sales skills (among contractors)
- Concern over reliability of unproven new technologies, particularly boilers
- Price-driven nature of spec and bid projects
 - ❖ e.g., designers dis-incented to invest time in efficient systems — fixed price/fixed hours constraints

Contractor-Reported High Efficiency Sales & Incremental Costs (current study)

- Self-reported contractor sales of high efficiency units are high across the board (sales-weighted)

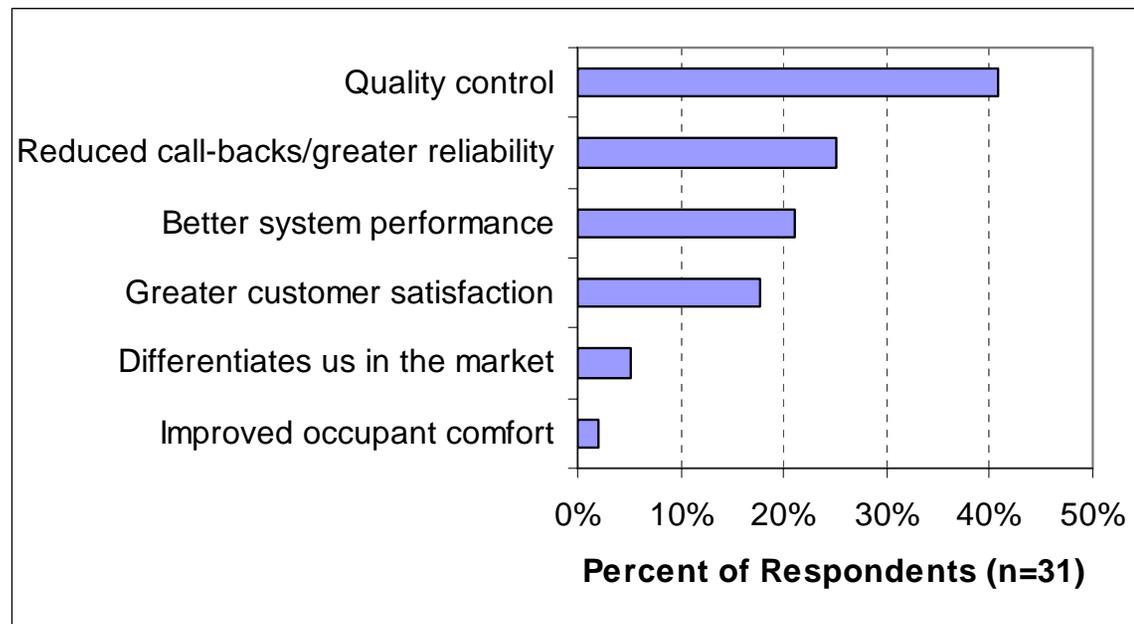
Unit	Size	Total Units Sold	Capacity Sold (thousands of tons)	High Efficiency		
				Efficiency Definition	% of Sales that are HE	Incremental Cost (%)
Packaged HVAC	< 11 tons	6,515	39	10.3 EER	56	16
Packaged HVAC	11 to 20 tons	2,443	37	9.7 EER	65	15
Packaged HVAC	> 20 tons	1,271	32	9.5 EER	65	16
Packaged HVAC	All	NA	NA	Economizers	77	NA
Packaged HVAC	All	NA	NA	Demand Control Vent.	46	NA
Furnaces	< 100 kBtu	15,498	93	90% AFUE	92	34
Furnaces	> 100 kBtu	9,842	246	88% AFUE	82	40
Boilers	< 1 MM Btu	3,267	82	87% TE	65	28
Boilers	> = 1 MM Btu	1,004	100	85% TE	80	28
Boilers	All	NA	NA	Condensing	36	NA
HVAC	All	NA	NA	Formal Commissioning	57	NA
Chillers	All	816	82	NA	NA	NA

Commissioning (current study)

- 37% of contractors report use of commissioning
- Contractors report that the commissioning is done by (totals more than 100% because more than one response allowed)
 - ❖ 86% HVAC contractor
 - ❖ 31% manufacturers representative
 - ❖ 17% commissioning agent
- 97% bundled commissioning in with normal price

Commissioning (cont.)

■ Contractor-reported benefits of commissioning



- Primary reason commissioning is not performed — costs perceived as greater than benefits (n=15)

HVAC Sizing (current study)

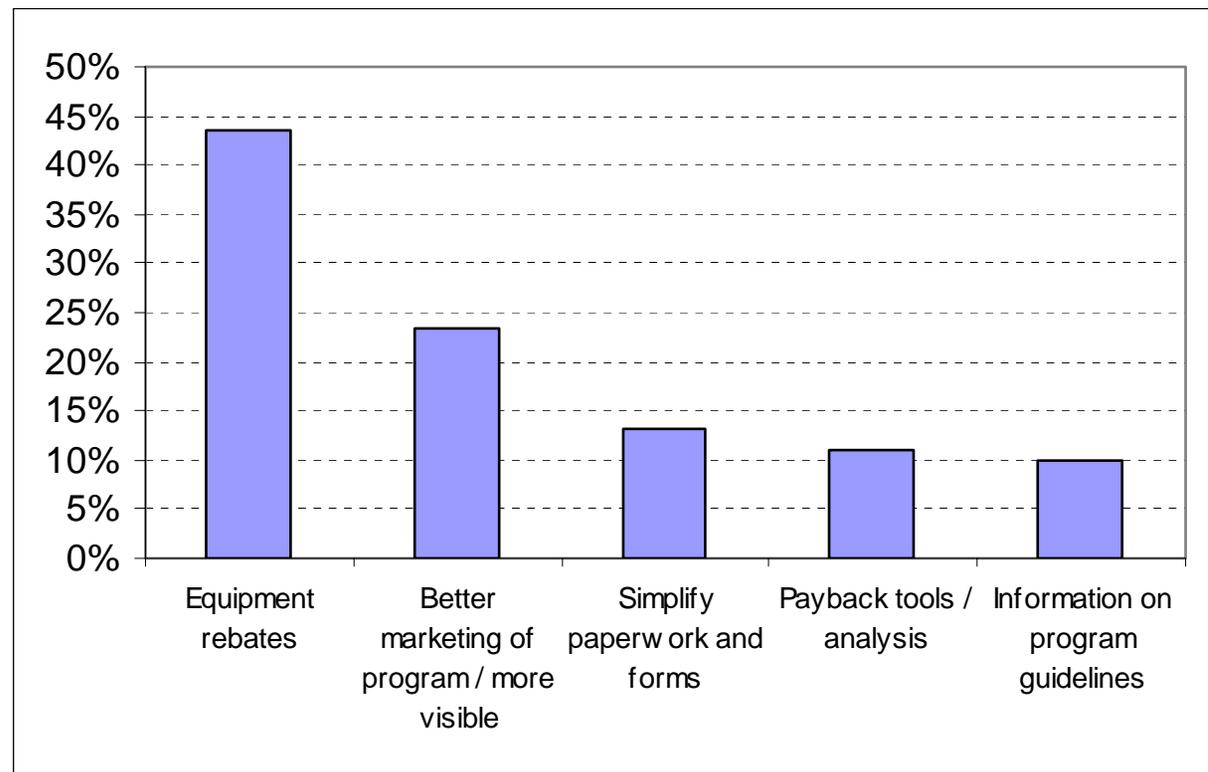
- For replacement situations, contractors reported
 - ❖ Old sizing correct in ~60% of cases
 - ❖ Oversizing existed in ~30% of cases (undersize ~7%)
- Replacement sizing reportedly done with a relatively equal mix of
 - ❖ Calculation (Manual J*, heat loss, etc.)
 - ❖ Non-calculation approaches (rules of thumb, same size as previous, customer spec, etc.)
- Furnaces were reported to be mis-sized more often than air conditioners and boilers

Focus HVAC Related (current study)

- HVAC contractor awareness of Focus is high
 - ❖ ~63% overall, 47% for small, 88% for large
- Previous participation, Focus mailings, utilities, and Focus rep are the primary bases for awareness
- Of those aware, 91% reported receiving Focus tech support or incentives
 - ❖ Of those, ~4/5ths said incentives, the rest said tech support
 - ❖ \$ and calcs for payback and savings cited as helpful
- Relatively even split between those reporting HVAC incentives are “about right” and “too low”

Focus HVAC Related (cont.)

- Contractor preferences for services to help promote energy efficiency



HVAC Distributor Interviews (current study)

- Manufacturers generally support energy efficiency, but end-user market is still very price competitive/first-cost oriented
 - ❖ Energy efficiency more successful in design-build
 - ❖ “Value engineering” can be a problem
- High efficiency most successful in WI in heating
- High efficiency air conditioning in WI difficult due to climate and rates
- Focus rebates perceived as low, application costs as somewhat high given rebate levels
 - ❖ Suggest more focus in new and remodels
- Reports of incentive availability being unreliable

Key Findings & Implications

- Contractors report they are already selling high efficiency
 - ❖ Is this a misperception of the definition of high efficiency?
 - ❖ Is market shifting rapidly to ASHRAE 90.1?
- Technical opportunities
 - ❖ Promote proper sizing, installation, and the use of commissioning
 - ❖ Reduce percentage of packaged units system in new construction
 - ❖ Leverage national efforts to next level high efficiency air conditioners
 - ❖ Promote retro-commissioning

Key Findings & Implications (cont.)

- Opportunities differ based on market event
 - ❖ New construction and renovation projects require program intervention at their earliest stages. Identify and track large new construction and renovation projects and leverage LEED.
 - ❖ For planned replacements, supply-side intervention efforts should focus on contractors.
 - ❖ Emergency replacement efforts should be directed toward distributors.
- Opportunities in bidding situations are greatest prior to RFP being issued
 - ❖ Educate general contractors and owners on the importance of emphasizing energy efficiency in project bid structures.
 - ❖ Make efforts to improve coordination and remove dis-incentives.

Key Findings & Implications (cont.)

- **System type (and size) determines program intervention point**
 - ❖ Target program efforts on designers for larger projects and central plants
 - ❖ Target program efforts to contractors for smaller jobs with packaged units
 - ❖ Encourage substituting more efficient boiler and chiller systems where appropriate
- **Other program implications**
 - ❖ Provide tools and services that help contractors and distributors sell energy efficiency
 - ❖ Address supplier concerns about energy-efficient product and service reliability
 - ❖ Efforts to work with suppliers should be personalized and sustained
 - ❖ Leverage manufacturers and key trade associations to influence the large population of smaller contractors
 - ❖ Provide case studies and demonstration projects

Potential Market Indicators: HVAC

- Distributor reports of share for key efficient technologies
 - ❖ Contractor self-reports interesting, but less reliable than distributors
- Percent of contractors attributing high importance to promotion of energy efficiency as a business strategy (unaided)
- Percent of market actors citing lowest first cost as primary end-user decision-making criterion
- Percent of contractors reporting life-cycle cost as an important criterion in equipment selection
- Contractor and customer reports of use of independent commissioning
- Contractor and customer reports of use of specific commissioning practices (to reduce over-reports)



Refrigeration



Refrigeration Introduction

■ Objectives

- ❖ Develop insight into refrigeration market characteristics and structure
- ❖ Concentrate on activity indicators and Focus opportunities

■ End user data collection

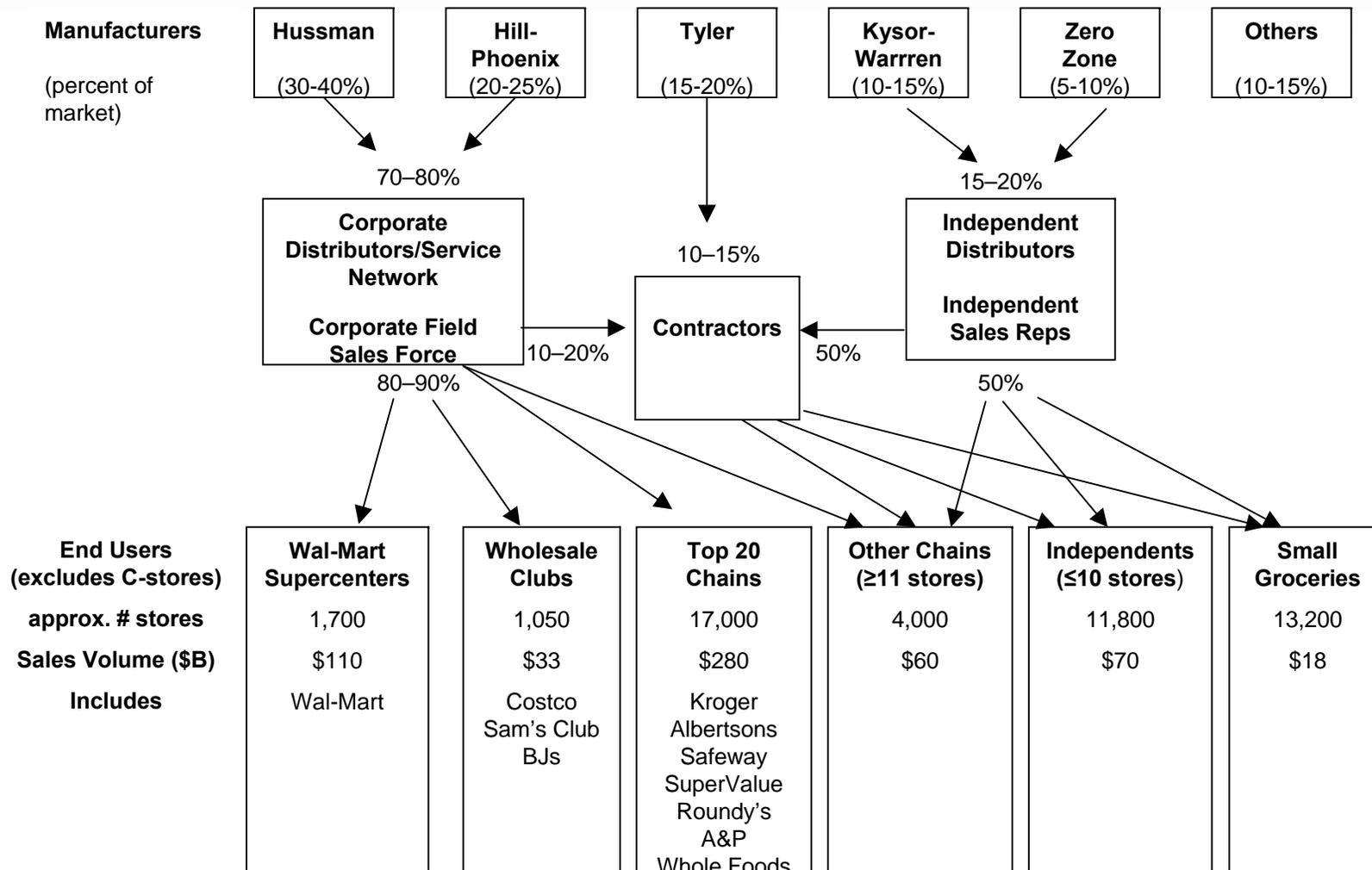
- ❖ Commercial omnibus survey
- ❖ 3 large grocery chain in-depths

■ Supply-side data collection

- ❖ 23 contractor surveys
- ❖ 4 equipment manufacturer in-depths

Supermarket Refrigeration Equipment Market

\$2.0-2.5 Billion – estimated flow



Supermarket Refrigeration Equipment Market – estimated flow discussed

- The chart is designed to show the relative flow of equipment through the distribution system.
- Equipment market shares are estimates based on manufacturers' annual reports.
- Store shares are based on information from the Food Marketing Institute.
- Hussman and Hill-Phoenix primarily sell through corporate networks, but some equipment may go through contractors.

End User Refrigeration Characteristics

- At least 2/3 of commercial users surveyed in all business types reported refrigeration equipment
 - ❖ 100% – Restaurants
 - ❖ 94% – Grocery Stores
 - ❖ 83% – Health Care
 - ❖ 71% – Education
- Refrigeration maintenance
 - ❖ Mostly in-house for Education (62%) and Health Care (75%)
 - ❖ Mostly outsourced for Grocery Stores (67%) and Restaurants (54%)
 - ❖ Outsourced contracts cover energy efficiency maintenance for more than half of grocery stores, less than half of others
- Refrigeration included in almost 2/3 of \$5k+ grocery store construction/renovation projects

Market Actors & Decision Process

- \$3 billion national refrigeration equipment market dominated by large case manufacturers
 - ❖ Hussman
 - ❖ Hill-Phoenix
 - ❖ Tyler
 - ❖ Kysor-Warren
 - ❖ Zero Zone
- Case manufacturers act as system integrators of compressors, valves, control systems, etc.
- Sales and installation handled by case manufacturers or contractors

Market Actors & Decision Process (cont.)

- Larger refrigeration contractors buy direct from manufacturer (71%); small contractors more often buy from equipment wholesaler (51%) or manufacturer's rep (27%).
- Food wholesalers – e.g., SuperValu (3rd largest in country), Roundy's (9th largest), Fresh Brands – buy equipment direct from manufacturer for their own stores; also influence selection of – and sometimes buy – equipment for stores they supply.
- 30% of grocers say contractors influence design approach and equipment selection, but only 11% say contractors have the most influence.

Market Actors & Decision Process (cont.)

- Contractors say efficiency ranks below reliability, first cost and effect on sales in purchase decisions.

Please rate, on a 5-point scale, the importance store decision makers assign to each of the following equipment attributes:	Weighted Mean Importance
Reliability	4.7
Initial cost	4.7
Appearance/contribution to sales	4.5
Manufacturer reputation/relationship with vendor	4.0
Immediate availability	3.9
Compatibility with other equipment	3.6
Life cycle cost	3.6
Energy efficiency	3.4
Availability of financing	3.0
Ease of maintenance	2.7

Market Actors & Decision Process (cont.)

- 89% of contractors say they recommend energy-efficient equipment in most or all sales situations
- Contractors say that
 - ❖ 19% of their customers apply life-cycle costing
 - ❖ 39% of their customers specifically ask for high efficiency

Contractor-based High Efficiency Sales

- Self-reported contractor sales of high efficiency units are relatively high for all but fan motor replacements.

Equipment Type	Average Units Sold	% High Efficiency
Low temperature (freezer) cases	150	77%
Medium temperature (refrigerated) cases	156	79%
Replacement doors	74	51%
Compressors	155	48%
Evaporator fan motor replacements	105	22%

Contractor Estimates of High Efficiency Measures

Contractors report that a relatively high percentage of stores have energy-efficient “technologies or measures in place,” but there is ample opportunity for more.

Measure*	Percent of Stores with Measure
Anti sweat heater controls	65
Permanent split capacitor evaporator fan motors	61
Heat recovery for hot water	57
Ambient subcooling	53
Efficient lighting in cases	53
Energy Management Systems	52
Strip curtains for walk in coolers	51
Demand controls for defrost cycle	48
Heat recovery for space heating	39
Mechanical subcooling	34
High efficiency compressors	32
Floating head pressure controls	24
Electronically commutated evaporator fan motors	4
What percent of low temperature cases have doors	82
What percent of medium temperature cases have doors	47

*Thinking about the Wisconsin food stores that you service, approximately what percentage of stores have each of the following technologies or measures in place?

Customer Use of High Efficiency Measures

- Customers report installing a number of refrigeration energy-efficient measures in projects >\$5K.

Percent of customers doing refrigeration projects who reported using specific EE measures	GROC %	EDUC %	HEALTH %	REST %
Doors on cases	83.3	35.7	55.6	46.2
Cycling of anti-sweat heaters	41.7	0.0	20.0	0.0
Floating head pressure control	38.5	6.3	10.0	15.4
Efficient evaporator fan motors	38.5	31.3	45.5	30.8
Variable capacity compressors	23.1	31.3	63.6	23.1
Night covers for cases	8.3	0.0	10.0	15.4
HE low temp. cases	50.0			
HE medium temp. cases	50.0			
Replaced open w/ closed cases	36.4			
Low-heat/no-heat case doors	20.0			
Energy management system	16.7			
Ns	16	11	13	13

Customer Use of High Efficiency Measures (cont.)

- Customers also report implementing other, smaller scale energy-efficient actions over the past three years.
 - ❖ Note that fewer small groceries generally took these actions than medium-sized stores.

Percent of customers taking small EE actions over past three years	GROC %	GROC SMALL %	GROC MEDIUM %	GROC LARGE %
Compressor tune-up	56.3	46.2	66.7	0.0
Replaced door gaskets	42.2	30.8	47.2	100.0
Installed strip curtains on a walk-in cooler	29.7	19.2	38.9	0.0
Replaced or installed automatic closers	23.4	15.4	27.8	50.0
Installed anti-sweat heater controls	21.9	15.4	27.8	0.0
Energy Audit	20.3	15.4	22.2	50.0
Installed night covers on cases	17.2	23.1	13.9	0.0
Ns	64	26	36	2

In-depth Findings – Market Events & Sales Channels

- **Small amount of growth and some remodeling each year.** According to the Food Marketing Institute, about 3–4% of supermarkets close each year, 4–6% new stores are built, and 6% of stores are remodeled (which often involves a change-out of cases.)
- **The average life of cases in WI varies from as little as 5–7 years to as long as 10–15 years according to case manufacturers.** Life span depends on store policies and profitability. Self contained cases tend to be shorter-lived because they get dirty and performance is affected.
- **Manufacturer sales can be direct or through contractors.** Some manufacturers sell directly to the customer or wholesaler who then provides it to their stores. Other manufacturers sell through contractors, but support them in making the sale.
- **Large chain/wholesalers play a role in many purchase decisions.** Corporate offices for large chain/wholesalers make purchase decisions for stores they own. They provide advice for stores they supply, but the final decision is made by the store owner.

In-depth Findings – Energy Efficiency Trends

- **There are very few open front cases in low-temperature (freezer) applications.** “Overall maybe 90% doors, 7% coffins, 3% open freezers. Almost everybody now recognizes the huge energy cost of open low-temperature multi-decks.”
- **Most WI chains still use open medium-temperature cases** (with some having a majority of closed medium-temperature cases). “There’s a perception that open cases sell more food, but there’s no data supporting that.” ZeroZone’s web site claims 41% energy savings for closed versus open medium-temperature cases.
- **Trend of 10 years ago toward doors on medium-temperature cases has slowed in the last 5 or so years.** Stores are staying with open dairy cases, partly because milk vendors will supply rolling racks pre-stocked allowing the grocer to eliminate the labor cost of stocking the shelves.
- **Trend in produce toward 4–5 deck meat-style cases.** These cases provide better temperature control, hold more product, and display better, but use ~900 Btu per linear foot more than a single-deck.

In-depth Findings – Energy Efficiency Trends (cont.)

- **Current trend in case design toward narrower temperature differentials (TDs)** — which helps reduce energy consumption. This is made possible by more efficient coil designs and improved controls.
 - ❖ For low-temperature cases, TDs were typically 10° across the board in the past, but have now dropped to 8° or even as low as 7° for glass cases.
 - ❖ For medium-temperature cases, TDs have come down from 10°–15° to as low as 4°–5°.
 - ❖ Customers have the choice of regular-price system with higher TDs or higher-price system with lower TDs. More than half of new stores are going with the lower TDs, according to a major manufacturer.
- **For stand-alone cases, customers are more interested in product presentation and first cost** according to one respondent, a manufacturer of stand-alone cases.

In-depth Findings – Energy Efficiency Trends (cont.)

- **Case manufacturers see little near term opportunity for major technological improvements in case efficiency.** Case manufacturers cite continuation of existing trends as the predominant technological influences in energy efficiency. In general, most technologies are available from all the manufacturers.
- **Manufacturers will continue to develop more efficient coils, use floating head pressure control and ambient sub-cooling** to take advantage of WI's cool climate. "We have stores with a 125 hp rack running on 10 hp all winter long."
- **Manufacturers cited several relatively simple measures with energy savings potential:** strip curtains, door alarms for walk-in freezers, and energy management systems for small grocery and convenience stores.
- **Fiber optics and LEDs in case lighting are close to commercialization,** although costs are still said to be "hundreds of dollars per door." This may be the next opportunity for substantial improvement in efficiency.

In-depth Findings – Barriers

- **Primary barriers** are first cost (especially for independent stores), the perception that energy-efficient technologies such as closed cases and ASH controls affect merchandising, and concerns about the reliability of energy-efficient technologies.
- **Manufacturers believe that stores see risks and drawbacks associated with some technologies.**
 - ❖ Demand-defrost may offer energy savings, but if problems arise, a service call is required, then “you’ve blown your whole year’s savings.”
 - ❖ Night covers may raise sanitation concerns since they can trap dirt.
 - ❖ There were concerns that glass would not clear as fast with the older ASH controls, thereby affecting sales, and that turning heaters on and off caused doors to wear out faster. Today’s ASH technologies are said to have overcome these problems, but old perceptions may persist.
 - ❖ Sophisticated controls may not be the right thing for stores without an adequate maintenance program since a lot of tuning is required.

Focus Refrigeration Related

- Contractor awareness of Focus is high
 - ❖ 83% overall, 80% for small, 87% for large (unweighted)
- Of those aware, over 60% reported working on Focus-supported projects
- Only 15% had participated in Focus training, but 98% had taken other (mostly manufacturer) training
- 90% of contractors said incentives are too low, 2% said about right, and 8% did not know
- Manufacturers and chains repeatedly mentioned rebates as useful for helping energy efficiency meet payback criteria

Focus Refrigeration Related (cont.)

- Contractors see a need for tools to analyze payback as well as for rebates and sales training.

Using a 5-point scale, please tell me how effective you think each of the following approaches would be:	Weighted Mean Effectiveness Rating
Tools to analyze payback	4.8
Cash incentives to customers	4.7
Sales training for contractors	4.1
Training for contractors in energy efficiency	3.6
Cash incentives to vendors	3.3
Training for customers in energy efficiency	3.2

Implications for Focus

- A few, large players at upper end of both supply and demand side raise opportunity (and need) to develop and leverage relationships, as Focus is doing with chains.
- Target large chains for more complex, high-end measures (cases, floating head pressure, compressor racks).
- Target smaller stores and independents for low-cost measures (strip curtains, night covers, gasket repair, closers, door alarms, anti-sweat heater controls). Use rebates to bring down payback on these measures.
- Support contractors with analysis tools in combination with sales training.

Potential Market Indicators: Refrigeration

- Contractor and end-user reports of share for key efficient technologies
 - ❖ Use contractor estimates for “technical” measures such as high efficiency cases, use of floating head pressure, ASH controls, energy-efficient evaporator fan motors, etc.
 - ❖ Use customer estimates for “visible” measures such as cases with doors, walk-in doors with strip curtains, use of night covers, etc.
- Contractor-reported percent of customers who specifically ask for efficient equipment or use life-cycle costing
- Contractor perception of the level of importance customers assign to energy efficiency in equipment selection relative to reliability, first cost, and effect on sales



Compressed Air



Compressed Air Introduction

■ Objectives

- ❖ Leverage previous research on compressed air market characteristics
- ❖ Update key energy-efficiency related trends

■ Key Sources

- ❖ Industrial Omnibus for this study
- ❖ WI supply chain – Focus 2003 (20 in-depth interviews)
- ❖ 5 in-depth interviews
 - 3 distributors
 - 2 CA specialists

Compressed Air Market Overview (2003 WI Supply-side Study)

Compressed air end users and other market players

- Dominant end-use industries in WI
 - ❖ Pulp and Paper
 - ❖ Foundries, Tool and Die
 - ❖ Food and Dairy
- Compressed air sales and service driven primarily by distributors who capture 80% of sales
- Competitive bidding is not as common as in other markets
 - ❖ Distributors have significant influence over design

Compressed Air Market Overview (cont.)

Compressed air products

- Reciprocating and rotary systems dominate WI sales
- 100+ hp systems account for 15% of unit sales but 50+% of total hp
- Key product and service features
 - ❖ Reliability, noise level, and energy efficiency
 - ❖ Energy efficiency was considered the key industry trend
- Although components can be more or less efficient, it is how those components are integrated that determines compressed air energy efficiency

Compressed Air Market Overview (cont.)

Compressed air systems

- Compressed air systems more complex than others, except industrial processes
- New construction offers greatest flexibility in system design and lowest incremental cost (~40% of sales)
- Major retrofits possible without affecting core process equipment (~60%)

Compressed Air Market Overview (cont.)

Drivers in the energy efficiency market for compressed air

- In 2003 compressed air manufacturers said that the Compressed Air Challenge (CAC) *systems* approach was a key industry driver but that distributors were still focused on the *compressor* itself.
- Several manufacturers and observers saw distributors as an obstacle to improved energy efficiency due to distributor lack of expertise in optimization and their perception of more money in selling hp.
- Compressed air system energy efficiency requires participation of specialized consultants that are knowledgeable, trustworthy, and willing to represent the best interest of the end user.

Compressed Air Market Snapshot (2005 Update)

- Compressed air is currently not a growth market in WI
 - ❖ Drop in demand for new compressed air systems and equipment
 - ❖ 50 hp and smaller is the only segment that is growing
- Steady incremental gains in component efficiency are the only new technical/product opportunities
- Project return on investment thresholds for customers continue to drop from a 24-month to a 6–18-month horizon

Compressed Air Market Snapshot (cont.)

- Efforts on end-user side reportedly paying off
 - ❖ Improved understanding of compressed air system costs
 - ❖ Expanded use of feasibility studies, training, and other technical info
- 50% of major manufacturers now reportedly using CAC best practices for compressed air systems
 - ❖ "All the big boys and some of the small"
- Market penetration of the "Systems Approach"
 - ❖ More end-user awareness driving competition toward increasing system efficiency

Compressed Air Market Snapshot (cont.)

- CAC, Focus, and other programs influencing energy efficiency
 - ❖ System efficiency becoming lead selling point of distributors
 - ❖ Public sector and utility programs provide halo effect/credibility for the systems approach
- Market for independent consultants limited locally
 - ❖ Some independent efficiency experts nationally
 - ❖ Distributors capturing consulting market niche, sometimes with separate engineering companies

Compressed Air Market Snapshot (cont.)

- Use of compressed air audits/feasibility studies are more prevalent
 - ❖ Competitive pressures lead customers to take a hard look at large end uses
 - ❖ Improvement in supply-side assessment methods minimize production disruptions
 - ❖ About 30% of the time distributors recommend audits; of these, about 40–50% of customers agree that a compressed air audit is needed

Compressed Air Market Snapshot (cont.)

Demand for compressed air service contracts

- Percent of customers with service contracts
 - ❖ Distributor 1: 20%
 - ❖ Distributor 2: 60%
 - ❖ Distributor 3: 40–50%
 - Most are maintenance-oriented
 - 20% of contracts call for comprehensive services to maintain system efficiency
- Reduced maintenance personnel and the need for predictability of costs are drivers in the demand for service contracts
- Customers without contracts “call when it breaks”

Specialized Consulting Services in Transition

Independent consultants were the first “sellers” of the compressed air systems approach. Their early successes led distributors to pursue this approach with customers.

- Distributors increasingly offer systems-oriented service packages or “independent” consulting practices. Some customers request independent assessments of their compressed air systems from someone other than their distributor. One distributor established a wholly-owned subsidiary to provide independent consulting services under a separate name. This subsidiary provides these services “under another name, but they do what our guys normally do . . .”
- Decrease in WI-based independent compressed air consultant activity. “Systems” consulting provided by a mix of distributors, compressed air consultants working nationally, and some engineering firms associated with WI utilities (providing compressed air reviews as part of broader industrial audits).

Evidence of Market Transformation to the Systems Approach

- Increase in customer interest in systems approach

“Two years ago 2% of customers were interested in the systems approach. Now it is 10%, and three years from now, we’re looking at 40–45%.”

“There is more willingness today versus 10 years ago to look at the compressed air supply, distribution, and demand systems together.”

“Customers are increasingly asking for “innovative solutions” that they wouldn’t have been able to identify on their own.”

Evidence of Market Transformation to the Systems Approach (cont.)

- Longer sales process to incorporate systems approach.

“The sales process used to take two weeks between quote and order; now its 6–18 months. That’s how in-depth we go with the customer in having them adopt a 10-year horizon on their costs of running compressed air systems.”

“There has been an increase in the customer’s need to understand their compressed air systems and identify what energy efficiency options are available on a systems basis.”

- Greater value associated with demand-side (plant and distribution) than supply side (compressor room) audit.

“Supply-side survey is usually first to drop as there are opportunities in the plant—this is where the opportunities typically lie. Again, we often end-up turning compressors off when we’ve dealt with the distribution and end-use problems.”

Case Study: A Market Leader

Ingersoll-Rand's "Solutionizing" approach

- A major change in the corporate policy of I-R's compressed air division
 - ❖ 3-5 years ago, I-R's compressed air services were maintenance-oriented.
 - ❖ I-R wants to be a leading provider of the systems approach.
 - ❖ The "Solutionizing" approach was introduced to emphasize the integration of compressed air components and address how well compressed air systems serve customer goals.
 - ❖ "Solutionizing" involves a full audit analysis based on data logging and comprehensive design engineering.
 - ❖ I-R conducts repeat internal staff trainings on the "Solutionizing" approach.
 - ❖ "Solutionizing" is a trademarked name of I-R.
- Though the "Solutionizing" approach is offered 100% of the time to customers; I-R believes 60% of customers are willing to take this approach.

Drivers for the Systems Approach

- Competitive pressures cause customers to seek out cost savings among large end uses.
- Customers learn about “systems approach” in trainings (CAC, Focus, distributors) and want it.
- Distributors recognize competitive need to offer systems approach to more sophisticated customers. Cannot rely solely on selling equipment as basis of customer relationship.

Barriers to the Systems Approach

- Distributor competition
 - ❖ Suppliers offering quick, low-cost “component-fixes” undermine customers’ understanding and desire for a more thorough and costly (yet higher return on investment) systems approach.
- Informational barriers
 - ❖ Customers wary of being sold unnecessary equipment or system features.
 - ❖ In-house engineering functions (large customers) may not have the required compressed expertise.
- First costs
 - ❖ Front-end costs of full-service systems approach, especially for small companies.

Barriers to the Systems Approach (cont.)

- Existing relationships
 - ❖ Established relationships with suppliers that do not possess expertise with a systems approach
- Economic conditions
 - ❖ Corporate downsizing and growing lists of competing priorities in manufacturing
 - ❖ Reductions or changes in personnel
 - ❖ Energy priorities fall off relative to production priorities

Distributors on the Value of Feasibility Studies & Audits

- Feasibility study is important first step

“There’s an effort to educate end users, and the feasibility study is the first step. Unless they understand how much their compressed air is really costing, they won’t put any weight on it. The growing use of feasibility studies and having the basic information to support good decisions is a big factor.”

- Some customers don’t understand importance of audit

“A customer who doesn’t understand the importance of a good energy audit is a barrier. They don’t understand that it takes money to understand how you can save money. This is often overlooked when the overriding concern is with up-front costs.”

CAC & Focus Compressed Air Feedback

- Distributors tout their own end-user trainings as superior

“Our trainings cost, so attendees pay more attention; trainings are in small intimate groups with a speaker who wrote much of the CAC. What happens is that the attendee is able to interact with the speaker on issues related to their own specific compressed air system. They (attendees) take ownership and then take action.”
- Focus and other programs add credibility to systems approach

“We allow (encourage) the customer to be influenced by Focus and other WI programs. These programs foster a sense of credibility to the opportunity for energy and operational savings. That team work (programs) is valuable, as without these programs we have a steeper uphill grade for offering the systems approach.”

“Customers hear about the ‘systems approach’ in trainings (CAC), and realize that’s what they want. Focus, CAC programs have had a legitimizing function; they’ve opened the eyes of customers to the importance at compressed air systems.”

Pros of the CAC Trainings

- CAC trainings are widely respected for their quality.
- CAC helps customers understand the benefits of the systems approach.
- End users attending CAC trainings become more knowledgeable about their own systems, including knowing what they don't know.
- End users are more inclined to call in a compressed air expert.

Cons of the CAC Trainings

- CAC trainings have had limited reach
 - ❖ CAC trainings offered infrequently
 - ❖ When offered, trainings reach a very small percent of distributors and end users
- A little bit of knowledge can be dangerous
 - ❖ In some cases, CAC trainings motivate end users to modify their systems without adequate knowledge required to do so. End user may actually reduce system efficiencies.

Suggestions for CAC Improvements

- Extend market reach of trainings
 - ❖ Offer online trainings
 - ❖ Integrate delivery with Focus and other programs
- Develop presentations to educate customer's corporate decision makers
 - ❖ Link benefits of energy-efficient systems approach to top-level business objectives
 - ❖ Present case studies and demonstration projects

Pros of the Focus Compressed Air Program

- Focus promotes general understanding, legitimacy, and adoption of a compressed air systems approach.
- More customers are approaching Focus for assistance; previously they had to be sought out.
- Feasibility study incentives remove customer's information barriers. Incentives reduce up-front investigative costs to what customers can afford.
- Focus incentives benefit suppliers in raising customer awareness and demand for their services. Incentives for feasibility studies are better perceived project incentives.
- The Focus adaptive approach allows customers to work with their existing distributor.

Cons of the Focus Compressed Air Program

- Focus incentives criticized
 - ❖ Too low to reduce payback periods, especially for smaller components
 - ❖ A hassle in terms of application requirements
 - ❖ Not adequately systems-oriented (references to “component” incentives as being inappropriate)
- Concerns over quality and requirements of Focus compressed air technical review
 - “We can be convinced of measures, and customers are convinced, but there are situations where Focus reviewers aren’t convinced.”
- Distributors complain that customers’ real business needs or interests are often not understood by Focus

Cons of the Focus Compressed Air Program (cont.)

- Concerns over program inconsistencies over time
 - ❖ Reduced level of incentives
 - ❖ Program changes are not well communicated
 - ❖ Inconsistency breeds distributor reluctance to push program incentives
- Focus trainings are not as well perceived as CAC's
 - ❖ Technical quality is considered limited by interviewees
 - ❖ Emphasis on specific compressed air measures or technologies counters understanding and consideration of whole-system impacts
 - ❖ Distributors conveyed overall inadequacy of compressed air systems approach, undermining efforts to sell the approach

Program Implications

- Continue promoting systems approach
 - ❖ Compressed air systems efficiency message now penetrating distributors and end users
- Provide Focus training to corporate decision makers
 - ❖ Align promotion of systems approach with corporate management objectives
 - ❖ Develop case studies and demonstration projects as marketing tools
- Continue supporting feasibility studies through incentives
 - ❖ Clarify and standardize requirements for audits

Program Implications (cont.)

- Review training and technical review
 - ❖ Leverage CAC and other technical trainings
 - ❖ Work with manufacturers, distributors, and other inside industry experts on both training and technical review. Need to establish credibility within the industry.
- Streamline incentive application process
 - ❖ Separate pre-approvals on audit and implementation bog down process and are somewhat redundant
- Review tradeoff between incentive levels and program requirements
 - ❖ Small component incentives “not worth the hassle”

Potential Market Indicators: Compressed Air

- Customer awareness and demand for systems approach
- Number of distributors and increased frequency of offering systems approach to customers
- Customer utilization of systems approach when making changes to compressed air system



New Construction



Research Objectives

■ Objectives

- ❖ Role of market actors in decisions affecting efficiency
- ❖ Perceptions of energy efficiency and sustainability
- ❖ Barriers to energy-efficient design and construction
- ❖ Program interventions to encourage energy-efficient or sustainable design

Key Sources

- Secondary research
- In-depth interviews
 - ❖ Builders (1) – Madison-based commercial and light industrial construction company
 - ❖ Design Firms (8) – Firms located throughout WI – most interested in promoting energy-efficient design and practice, or “sustainable buildings”
 - ❖ Developers (5) – Firms with commercial property in the Milwaukee and Madison areas ranging from 500,000 to over 3,000,000 sq ft of commercial space, mostly office and retail
 - ❖ Industry Experts (3) – Representing Building Owners and Managers Association (BOMA), the International Facilities Managers Association (IFMA), and a Green Buildings Consultant/program manager

Market Actors

- **Financers** – provide financing for the construction of new buildings. Want to understand the investment and the risks and potential rewards from new approaches.
- **Developers** – one respondent characterized 4 types of developers for purpose of identifying opportunities for improved efficiency and sustainability. Owner-developers and owner-leasers represent the greatest opportunity.
 - ❖ Owner-developer builds the building to occupy or to lease out, but retain ownership
 - ❖ Owner-leaser builds the building and then lease it to themselves
 - ❖ Speculative developer builds a shell without knowing who will buy
 - ❖ Build-to-suit customer lines up the developer to build the building to specifications and to act as general contractor. Opportunity for innovation depends upon customer.

Market Actors (cont.)

- **Owners** Non-developer owners – purchase building to occupy or lease.
- **Design firms**
 - ❖ **Integrated Design/Build firms.** These firms have in-house architectural, engineering, and construction management capabilities to integrate all facets of construction. They assert that by being an integrated firm the ramifications of design decisions on the construction process are understood and accounted for early on keeping costs low and designs efficient.
 - ❖ **Traditional Architecture Engineering (A&E) firms.** These firms have in-house A&E capabilities and work with separate construction firms.
 - ❖ **Stand-alone Architecture or Engineering firms.** These firms have either architectural or engineering capabilities. For some projects A&E firms will partner early in the design phase, for others the architecture firm designs and the engineering firm is brought to the table later in the design phase.
- **Builders** General contractors who construct the building according to design specifications. Some decisions are made or altered during the construction phase and the builder has some input into these in-process decisions.

Market Actors – Influence & Relationships

- **Most work in commercial new construction is conducted among firms with existing relationships.** Developers tend to work with the same design firms and builders. If a bidding process is used, a limited number of firms are asked to provide bids. These relationships foster trust, which increases the designer's influence on decisions.
- **Developers have the final say, but design firms have a major influence on building features.** Both developers and design firms say that the designer has a large influence on building features, including the energy components of the building. One developer said that he relies on the design firm to make recommendations regarding design costs and potential ongoing savings.
- **Design firms are hired very early in the process.** Design firms are hired very early in the process, sometimes before the property is purchased, but most often after a site is selected. There is often a rush to develop a conceptual design once the property is purchased.
- **Builders have limited to no influence on initial design decisions, but do have some influence during the construction phase.** In general, builders will build the building according to the design specifications. However, two factors affect their influence on decisions as the building is in process. First, builders tend to build according to specification with which they are most comfortable – to keep costs down and be assured of quality. Second, decision points arise during the construction phase (due to higher than expected material or other costs) that may force cost cutting measures. Builders (especially those with on-going relationships with the developer or designer) will be a part of the decisions regarding changes to plans.

Industry Experts – BOMA

- Building Owners and Managers Association (BOMA) is primarily concerned with existing buildings. Construction concerns focus on retrofits to existing buildings.
- BOMA reports that the biggest concerns related to retrofit are elevator size requirements, privacy/partitions in bathrooms, and structural requirements to address natural and terrorist disasters.
- BOMA reports that indoor air quality and energy efficiency are also important issues.
- BOMA provides access to energy education programs such as Energy Star and Green Buildings training. Also provides service that provides members access to incentive programs.
- They estimate that most existing buildings do not have energy equipment beyond code and that ~25% of retrofit include energy improvements.
- BOMA members want to know enough to work with experts to identify energy efficiency improvements. They are not interested in being experts themselves.
- Energy efficiency must be promoted to their members as a cost savings.

Industry Experts – IFMA

- A recent survey of International Facility Managers Association (IFMA) members identified four key issues among members: aging buildings, quality of staff, facility budgets, and energy management.
- IFMA provides conferences, trainings, and research on hot topics. Energy management is one of these topics.
- Nationally, members are interested in items that have a payback less than 2.5 years.
- 8% of IFMA members report having a formal plan to implement green building practices.
- IFMA views its membership as sophisticated on energy matters and very involved in major retrofits and new construction.
- Interest in energy management is cost driven. Nationally, energy management is more prevalent among members in areas with high utility rates. One local chapter reports that the key driver is savings and that 75% of new construction and retrofits (in Milwaukee area) “involves energy efficiency of some sort.”
- 2004 Wisconsin annual conference theme was sustainability.
- Local chapter president says that 1–2% of new construction is LEED driven. He points out that a key barrier to LEED is that not all requirements are cost driven. Most projects will focus on LEED elements that offer clear savings.
- Focus program interventions should be in the form of financial incentives that offer easy calculation of savings and streamlined paper work. Providing the incentive to the vendor would mitigate paperwork problems on the part of IFMA members. (Training is good, but incentives are better.)
- IFMA points out that it is key for facilities managers to be aware of program offerings as they are the key people for retrofits.

Project Phase & Design Options

- **Key issues affecting energy use and sustainability are determined at the preliminary design phase and cannot be changed.** Several respondents noted that site selection and building orientation can have a major impact on energy use, are unchangeable once the building is constructed and may have little to no impact on first costs. (Designing specific to the site topography and microclimate can reduce construction and energy costs.)
- **Window glazing options may be limited by early design decisions.** Some developers push for an initial drawing (conceptual design) of the building for use in obtaining financing and other approvals. Once the drawing has established the look of the building some glazing options are also precluded.
- **Some equipment choices may be limited by early design decisions.** The choice of the type of heating system—packaged, chillers, or geothermal heat pumps—has ramifications for the building configuration. These choices are often made early and cannot be modified without substantial redesign costs.
- **Equipment energy efficiency improvements to new buildings have only incremental effects.** Several respondents indicated that efficiency upgrades to HVAC and lighting equipment results in incremental savings, given code levels in Wisconsin. Several indicated that they already design lighting to levels beyond code requirements. The savings from the energy efficiency improvements represents a minor percentage of the costs of the building, and is too small to be used as a carrot to attract tenants or buyers.

Drivers of Decisions

- **First cost is a major factor in the construction of new commercial space.** Developers and designers both point to initial costs as a primary factor in making design decisions. Many developers are operating from “ingrained costs per square foot” although these costs vary by building function and quality (Class A versus Class B office space). Both BOMA and IFMA representatives cite cost as the factor that motivates investment by their members in energy efficiency and green components.
- **Some firms will consider higher initial costs that have a 3-year or shorter payback.** Despite the emphasis on first cost, several developers who own their property do look at operating costs. Several developers said that they consider operating costs when making decisions regarding building equipment and design. They look to the design firm to make recommendations regarding balancing initial and operating costs and will consider a 3-year payback.
- **Speed - design decisions may be made to expedite project completion.** Often there is (financial) pressure to complete design and construction as quickly as possible. This may preclude the use of newer technologies or materials that may be less available (within the tight time frame) or perceived as risky.
- **Building aesthetics is an important factor.** One developer who is inclined toward constructing energy efficient buildings noted that energy efficiency can sometimes conflict with the building’s look. A designer noted that “glass is in.” This aesthetic encourages over glazing, especially when there is public involvement in building permitting. “People like big windows.”

Drivers of Decisions (cont.)

- In general, developers are not interested in cutting edge technology and practices.
 - ❖ They want buildings that are easy to maintain. They recognize the on-going costs and hassles associated with high maintenance equipment and may be hesitant to try equipment that they see as potentially higher maintenance.
 - ❖ They want equipment that is reliable. Again, they may view newer technologies as less reliable as they have not been in the field long enough for operating issues to be resolved.
- Both designers and developers want equipment that is simple to operate. Some mechanical or control systems may be “too complex” for the building operator to use. If they are not operated properly, then the operating savings benefits could be lost. One designer mentioned balancing the savings benefits with the education and training costs to operate the equipment.
- Specialized buildings may have special needs. Some buildings, such as R&D facilities may have specialized concerns related to the use of the facility. These concerns (special ventilation standards, for example) will drive many of the design considerations.

Energy Efficiency & Green Building – Actions & Views

- **Some developers are selecting energy-efficient design and component options.** Design of lighting and building controls beyond code requirements is occurring in some commercial new construction.
- **There is a substantial base of designers in WI trained and motivated to design energy efficient or green buildings.** Most of the designers we talked¹ to were knowledgeable about energy efficiency and green design and had some training specific to this area. Their firms tended to promote this focus in their marketing, even when it was not the primary “value proposition” of the firm.
- **Green or sustainable buildings is an emerging trend, with more designer than developer interest.** Most design respondents indicated that few developers or companies constructing new buildings are motivated to build green or sustainable buildings.
- **Building commissioning does not appear to be a common practice.** No respondents indicated building commissioning as the final stage in the design/construction project. Several of the design respondents recognize the benefits of commissioning and one firm actively promotes it, but it has not gained widespread acceptance. Two designers said that the key to successful commission is one year of monitoring with follow-up adjustments.

¹ There may be some self selection among the design firms willing to complete the in-depth interview on this topic.

Energy Efficiency & Green Building – Actions & Views (cont.)

- **Interest among developers for green or sustainable buildings is rare.** Several respondents noted that there are some developers that are interested in building green or sustainable buildings, but it is not entirely clear what motivates them. More than one designer respondent indicated that developers willing to pursue green options had personal than rather than business motivations – they were just more inclined to do new or different things.
- **Developers will pursue green buildings when it meets business objectives other than operating cost.** One respondent noted that one developer is pursuing constructing a LEED certified building because he thinks the permitting process will be faster.
Another respondent (industry expert) discussed the types of buildings most likely to be built green
 - ❖ Owner occupants
 - ❖ Public sector, especially when there is community pressure or public ordinances
 - ❖ Companies with a strong public image who have the public accessing the building
 - ❖ Businesses with experience building their own facilities
 - ❖ Companies with highly paid employees who want to attract and attain them.
- **The indoor air quality benefits of energy-efficient or green construction are not a major factor.** Few developers or designers discussed the indoor air quality benefits of energy-efficient equipment or green design features. While the designers recognize these benefits, developers did not appear to view indoor air quality as a major issue or to see energy efficiency/green building design as a way to mitigate concerns.

Many Challenges to Energy-efficient Design & Components

- **Higher first cost.** Many energy efficiency and green features have higher first costs. All components, even those without higher first costs suffer from this perception.
- **Split incentives.** The entity paying construction costs is often not responsible for the energy bills.
- **High (and variable) materials costs.** Current material costs (for example steel and drywall) are high and variable. Costs may be higher than estimated during the design phase causing some energy efficiency plans to be waylaid.
- **Value engineering may benefit energy efficiency or cause energy-efficient features to be eliminated to address cost concerns.**
- **Fear of the unknown.** Developers “want proven and simple” technologies that are perceived as
 - ❖ Reliable;
 - ❖ Easy to operate effectively;
 - ❖ Availability when needed during construction; and
 - ❖ Will be installed properly.
- **Financers need to be comfortable with new approaches and technologies.**

Many Challenges to Energy-efficient Design & Components (cont.)

- **Time constraints may preclude green features.** The rush for a conceptual design may eliminate orientation and glazing options that would improve energy performance over the life of the building.
- **The difficulty of proving savings with new construction.** The lack of a “before and after,” side-by-side comparisons, or sufficient modeling tools makes it difficult to convince developers or owners of the savings associated with energy efficiency improvements.
- **Current aesthetic trends lead to over glazing.**
- **Demand for high rate of return** among some owner groups eliminates some energy efficiency and many green options.
- **Low energy prices** in WI create longer paybacks for savings.
- **Lack of expertise among architects and engineers.** Some design respondents pointed out that there is limited expertise among many of their colleagues.

Key Findings

- Developer/owner has final say on building.
- Designer has very large influence on decisions.
- First cost is a major decision criterion, even among developers interested in energy efficiency and green design. Very small but increasing opportunity to sell on other benefits, but must be benefits important to developer.
- Although there are many barriers to energy-efficient and green new construction, there are opportunities for Focus to influence the market.
- Large developers (who continue to own their property) and owner/builders present the greatest opportunity for energy-efficient or green buildings.
- The greatest opportunities to influence building performance are before the building is designed. During each step of the design process, decisions preclude future options for energy efficiency and design. The later that Focus on Energy is involved in a project the more limited the opportunities to influence the building performance.

Program Implications

- Establish relationships with key developers and designers in order to influence decisions before design begins. Identify “teams” that consist of designers promoting energy-efficient and green construction who work with long standing developers who are open to energy-efficient and green construction.
- Develop case studies that include operating cost information to testify to success of approaches.
- Consider developing a *reference list* with contacts of people who have built green buildings and buildings with newer, energy-efficient components.
- Provide technical or design assistance for major retrofits. Consider promoting this service by establishing ongoing relationships with the three WI IFMA chapters.
- Offer financial incentives through the custom rebate program for new construction component improvements.
- Work with local communities on green ordinances.

Potential Market Indicators: New Construction

- Number of new construction projects obtaining custom rebates from Focus on Energy
- Number of new construction projects obtaining technical assistance or advice from Focus
- Number of LEED accredited professionals in Wisconsin



Schools



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 82, 835

	# of Establishments	Employment	Completed Surveys
Small	4,797	29,174	10
Medium	1,997	125,996	46
Large	75	40,214	16
Total	6,869	195,384	72

Structure of the WI School Sector

- 3,189 schools (2,182 public; 1,007 private)
 - ❖ Public schools are larger (475 pupils in average public elementary versus 150 pupils in average private elementary)
 - ❖ Focus has worked mostly with public schools
 - ❖ 63% of schools are elementary
- Medium-sized schools account for 69% of school employees
- Old and deteriorating building stock
 - ❖ 75% of buildings were built before 1970
 - ❖ 25% of buildings were built before 1940
 - ❖ Many built in 1950s and 1960s used sub par construction techniques (built for 30-year life span)—now deteriorating
 - ❖ Only 10% of buildings >50 years have had major renovation
- Larger school districts are generally more sophisticated about energy efficiency

Institutional Objectives & Challenges

- Many schools do not see energy as a controllable cost
- Energy costs not on administrators' radar screens
 - ❖ Small budget item compared to payroll costs
- State budget crunch and revenue controls lead to caution
 - ❖ Preference for low cost/no cost energy-efficient measures
- Schools with declining enrollments (47% of all districts)
 - ❖ Get less revenue under state formula, but many costs (buildings, buses) remain the same
- Complicated decision-making structure
 - ❖ Projects over certain \$ amount require board approval

Trends in Facility Investments

- Drivers of investment in facilities
 - ❖ Educational objectives trump everything
 - Sell energy-efficient windows on student comfort, not energy savings
 - ❖ Lease/purchase mechanisms
 - Allow energy-efficient projects without any upfront costs for schools. Became available in late 1990s, complement Focus incentives
 - Leases are not considered debt so they neither affect public school's revenue cap nor require a referendum
- Inhibitors of investment in facilities
 - ❖ State fiscal problems and revenue controls
 - Only 18% of schools said budget constraints not a barrier
 - 78% of school districts delayed building maintenance/improvement projects in 2002–2003 versus 66% in 1999–2000
 - ❖ Common misperception: if building was built (or equipment installed) in the last 10 years, it must be energy-efficient

Capital Investment Decision Making

- 84% of schools have capital a budget process
- Multiple decision makers
 - ❖ Facility staff most cited, followed by financial officer, and then school board
- Capital decisions are made annually by 75% of schools
- Simple payback is most common financial criteria
- About half of schools won't accept paybacks >7 years, 86% won't accept paybacks >10 years

Recent Investments in Facilities

- 83% of schools have done construction/renovation projects >\$5K in past three years
 - ❖ Only 34% have done more than three projects
- Big disparity in energy efficiency focus between large and small schools
 - ❖ 93% of large schools cited energy efficiency as recent project objective, but only 42% of medium schools and 29% of small schools did
- Projects change out cooling/ventilation systems 82% of time, lighting 71%

Energy Management: Structure & Resources

- 85% of medium and large schools have an individual or a group assigned to energy management
- But only 40% of small schools do
- Most energy managers are facility or buildings and grounds managers
- 75% of schools use consultants/specialty contractors—much higher than other commercial sectors

Organization of Energy Management Function

	Small	Medium	Large
One person assigned	20%	57%	44%
Group assigned	10%	13%	0%
A department	10%	15%	44%
No assignment	60%	15%	13%
N =	10	46	16

Energy Management: Goals & Functions

- **Energy saving goals.** 63% of large schools have energy reduction goals, 54% of medium, 50% of small. But 42% of all schools think that they have done all cost-effective actions to reduce energy costs.
- **Other goals.** 76% strongly agree that energy efficiency offers significant benefits other than energy savings.
- **Outside help.** Large and medium schools are much more likely (80–81%) to use outside help than small schools (44%)
- **Sources of assistance.** Consulting engineers were most cited (41%); large schools cited government/utility energy efficiency programs much more than middle or small schools.

Energy Efficiency: Baseline Lighting

- Small schools behind middle and large schools on T8 and LED exit signs
- Small and medium schools lag large schools on CFL use

Key Indicators of Baseline Lighting Efficiency

	Small	Medium	Large
Majority of fluorescent ballasts = T8?	38%	80%	93%
Use CFLs?	20%	54%	94%
Most Common Exit Signs?			
Incandescent	20%	14%	20%
Fluorescent	40%	10%	7%
LED	40%	76%	73%
Upgrade Lamp/ Ballast on Replacement?	67%	64%	69%

Recent Construction & Renovation: Systems Addressed

Sample Facilities Undertaking Renovation Projects in the Three Years Prior to Survey

	Small	Medium	Large
% Undertaking Renovation Projects	70%	83%	94%
Systems addressed (as % of respondents w/ projects)			
Space heating	67%	62%	57%
Space cooling/ ventilation	83%	81%	85%
Water heating	33%	29%	67%
Cooking	25%	20%	53%
Refrigeration	20%	27%	40%
Chilled water	0%	33%	36%
Lighting	86%	66%	80%

Energy Efficiency: HVAC in Construction & Renovation Projects

- Medium schools lagging behind large ones except for pstats, VSD fans, and EMS
- Cooling energy efficiency may be higher—high % of Don't Knows

Projects in Sample Facilities with Selected HVAC Efficiency Measures

HVAC Efficiency Measures Included in Recent Construction or Renovation Project	Medium	Large
Computer modeling to design or size the system	44%	64%
Commissioning	68%	64%
Cooling equipment with EER of 13 or higher (> 40% DK)	27%	46%
Enthalpy controllers for 'free cooling'	38%	46%
Variable speed fans	63%	91%
High efficiency boilers	57%	70%
High efficiency furnaces	52%	73%
Boiler reset and cutout	53%	73%
Steam trap replacement	36%	50%
Energy management systems	76%	82%
Set back thermostats	80%	82%

Energy Efficiency: Lighting & Other Systems in Construction Projects

- Medium schools lagging behind large ones in most measures

Projects in Sample Facilities with Selected Efficiency Measures

Lighting & Other EE Measures Included in Recent Construction or Renovation Project	Medium	Large
<i>Lighting Measures</i>		
Super T8s/ T5s	0%	33%
CFL fixtures/bulbs	42%	75%
Occupancy controls	67%	92%
Daylighting & related controls	28%	58%
<i>Other Measures</i>		
Refrigeration – Variable capacity compressors	22%	50%
Refrigeration – Efficient evaporator fan motors	44%	15%

Energy Efficiency in Construction Projects: Influencers

- Major influencers
 - ❖ Internal facility staff are most influential with large and small schools
 - ❖ Outside consultants and engineers most influential with mid-sized schools
- Schools are more likely to defer to contractor recommendation for motors (34%) and cooling (27%) than for lighting (12%)
- Focus influence more recognized among large schools than small/medium ones

Energy Efficiency in Construction: Barriers

- Budget constraints are biggest barriers for all schools except large ones
- Biggest barrier for large schools concerns overstated bill savings
- Concerns about reliability of energy-efficient measures or energy-efficient projects not paying off are not significant

Respondents Who Agree or Strongly Agree with Barriers Statements

	Small	Medium	Large
Savings not worth added investment	20%	11%	19%
Efficient equipment is less reliable	10%	13%	12%
Budget constraints prevent investment in energy efficiency	40%	43%	31%
Concerned about overstated bill savings	30%	38%	50%

Energy Efficiency in Equipment Replacement

- 85% of schools have policy for purchasing energy-using equipment, but most of these are informal
- Large schools upgrade fluorescent ballasts on failure most frequently (73%) versus 56–57% for small or medium schools
- 60% of schools replace cooling units with high energy efficiency
- 51% of schools replace motors with high energy efficiency

Program Implications: Large Schools

■ Key Findings

- ❖ Construction and renovation projects are much more focused on energy efficiency than medium and small schools
- ❖ Greater adoption of Super T8s, CFLs, and occupancy controls
- ❖ Have larger, more knowledgeable energy management staff
- ❖ Have been more influenced by Focus than other schools
- ❖ Don't fear budget constraints as much as other schools, but are more suspicious of overstated bill savings, possibly as a result of targeting by performance contractors

■ Implications

- ❖ Don't bother with low-hanging fruit (T8s, etc.)—encourage lower saturation energy-efficient measures: high energy efficiency cooling, daylighting, steam traps
- ❖ Some education still needed
 - 44% think they have done all cost-effective energy-efficient initiatives
- ❖ May be role for Focus as honest broker in reviewing performance contractor proposals

Key Findings: Medium & Small Schools

- Budget constraints are major barrier, more than for large schools
- Most small schools do not have staff assigned to energy management
- Most recent construction/renovation projects have not emphasized energy efficiency
- Small schools lag far behind other schools in installation of T8s, CFLs, LED exit signs, and basic HVAC measures and motor upgrades
- Medium schools lag behind large schools in CFLs, high efficiency cooling, high efficiency furnaces/boilers, steam traps, variable speed fans, and motors
- Small and medium schools are very aware of Focus, but aren't involving it in projects

Program Implications: Medium & Small Schools

- More energy efficiency education needed
 - ❖ 50% of small schools think they have already done all cost-effective energy efficiency projects
- There is energy efficiency potential in all areas, including lighting, in small schools
- For medium schools, target mainly HVAC measures, motors
- Focus needs to reach out more to small and medium schools
 - ❖ Goal: give Focus more of a voice in new construction and renovation projects
- Low-cost/no-cost measures are useful, but to get bigger impacts, Focus may need to push incentives more, package with lease-purchase

Potential Market Indicators: Schools

Metric	Baseline Measure			
	Small	Medium	Large	All Schools
Awareness of Focus (B1)	80%	84%	94%	85%
Energy Management Practices				
Assigned staff to energy management function (B2)	40%	85%	44%	81%
Have stated energy savings goals (B2E)	50%	53%	63%	56%
Track energy use at the facility level (B2H)	44%	80%	81%	74%
Qualify potential investments by costs and savings (B2H)	50%	78%	81%	75%
Replacement Practices				
Upgrade lighting on replacement (A19)	67%	64%	69%	66%
Upgrade motors on replacement	38%	48%	69%	52%
Investments in Energy Using Equipment				
Projects >\$10,000 in past 3 years (B3) ¹	70%	83%	94%	84%
EE investment to at least one system ²	83%	100%	100%	98%
EE investment to more than one system ²	50%	68%	87%	70%
EE investment to at least one non-lighting system ²	67%	85%	93%	85%
Received Focus services for recent project ²	33%	26%	67%	38%

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3l)
- all energy efficient investments may not be eligible for Focus on Energy services

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.



Restaurants



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 58

	# of Establishments	Employment	Completed Surveys
Small	8,509	58,539	33
Medium	1,899	84,119	36
Large	11	4,985	0
Total	10,419	147,643	69

Structure of the WI Restaurant Sector

- Over 10,000 establishments employing nearly 150,000 people throughout the state
 - ❖ Nearly $\frac{3}{4}$ are small, single-site establishments (less than 25 employees)
 - ❖ Less than 2,000 establishments are medium-sized (25–249 employees)
 - 2005 Commercial Omnibus Survey results suggest that the average number of employees in this medium-sized category is 50 (n=36, min 25, max 120)
- Total sales for sector estimated to be less than \$3.5 billion

Structure of the WI Restaurant Sector (cont.)

■ Own/lease

- ❖ 73% of small restaurants own space occupied versus 56% of medium-sized restaurants

■ Business structure

❖ Small restaurants

- 73% are single-location businesses
- 21% are branch or franchise locations based in WI
- 6% are branch or franchise locations based outside of WI

❖ Medium-size restaurants

- 36% are single-location businesses
- 31% are branch or franchise locations based in WI
- 33% are branch or franchise locations based outside of WI

Facility Investment Trends

- Restaurant industry one of fastest growing
 - ❖ People are dining out more
 - 46% of Americans adults eat at restaurants any given day
 - 78% of households order carryout/delivery food at least once a month
 - People working longer hours, don't have time to cook
 - Biggest among 40-60 demographic, can afford to eat out
 - ❖ WI restaurant employment will grow by 12% in 2005–2015 (NRA forecast)
- 54% will increase renovation spending in 2005 to improve ambiance (national survey)
- Most major chains have buildings 5,000–8,000 sq ft
 - ❖ But some hot new chains (Cheesecake Factory) are bigger (11,000 sq ft)
- Increased preference for stand-alone structures rather than inside mall or shopping center

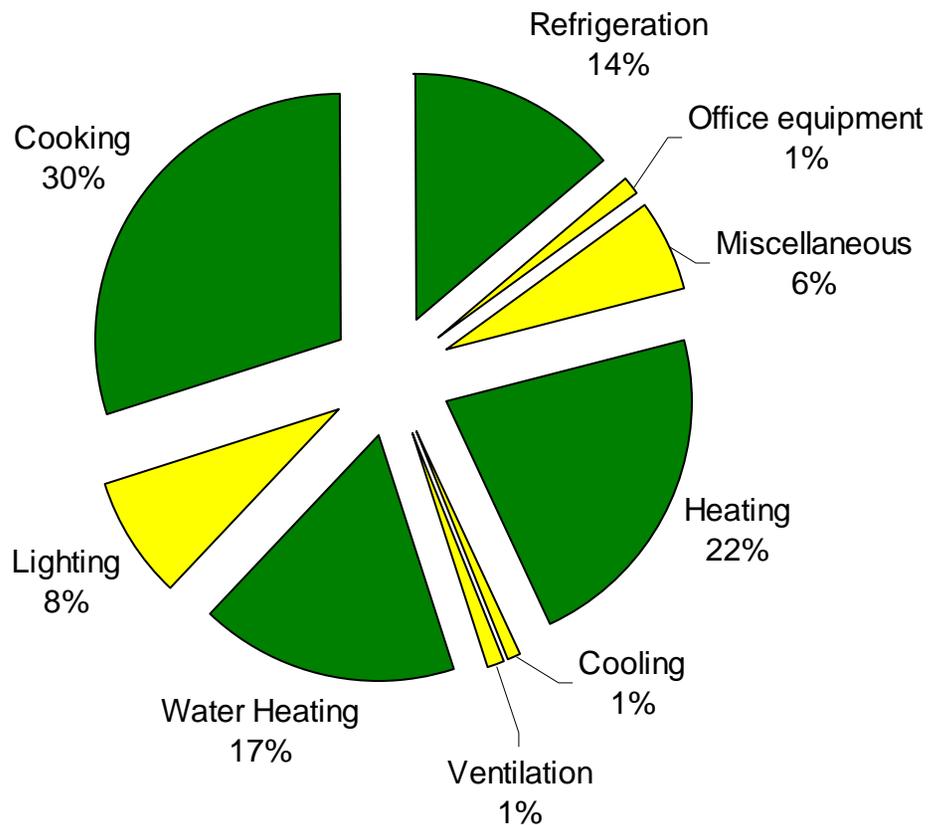
Business Objectives & Challenges

- Typical WI restaurant operates on very low profit margin—just under 3% of sales
 - ❖ Any reduction in operating costs can result in improvement to the bottom line
 - ❖ Energy costs account for 3–5% of overall operating costs
 - ❖ Saving 20% a year on energy costs can increase a restaurant's profits by as much as one-third
- Key business concerns
 - ❖ High labor costs and extremely high turnover
 - ❖ Service and food quality
 - ❖ Consistency and convenience
 - ❖ Waste minimization

Energy Use in WI Restaurants

- Typical WI restaurant consumes just under 150 MWh of electricity and about one billion Btu of natural gas annually
- Typical restaurant in the US spends \$2.90 per sq ft on electricity and \$0.85 per sq ft on natural gas annually
- Average monthly energy bill for WI restaurant
 - ❖ \$1,243 for small restaurants (less than 25 employees)
 - ❖ \$2,815 for medium-sized restaurants (between 25 and 250 employees)

Energy End Uses in WI Restaurants



■ Cooking, heating, water heating, and refrigeration account for 83% of energy use in a typical WI restaurant

Capital Investment Decision Making

- Half of both small and medium-sized restaurants have an annual (or more frequent) capital spending budgeting process
- Corporate officers, owners, and facilities staff responsible for identifying and selecting capital expenditure projects
 - ❖ Medium-sized restaurants also look to external staff for assistance in identifying projects

Capital Investment Decision Making (cont.)

- Minimum expenditure included: most under \$1K
- Variety of financial evaluation methods used
 - ❖ Simple payback used by 25%, average 5 years
 - ❖ Return on investment used by 29%, threshold ranging from 5-50%
 - ❖ Internal rate of return used by 22%, threshold ranging from 5-25%
- Cost-saving investments differ from investments to increase revenues for many restaurants (40%)

Energy Management: Structure & Goals

- More than half of all restaurants do not have a staff person, group, or department assigned to manage energy use
 - ❖ 61% small, 53% medium
- When assigned, this function is often carried out (among other duties) by either the restaurant owner or manager
- Specific duties to which staff are assigned
 - ❖ Tracking whole building energy use/costs – 42% small, 55% medium
 - ❖ Monitoring building/system energy use – 33% small, 50% medium
 - ❖ Ongoing identification of facility improvements – 52% small, 57% medium
 - ❖ Qualifying projects based on financials – 39% small, 46% medium
 - ❖ Developing policies promoting energy efficiency – 33% small, 41% medium
- Overall, 39% of all restaurants report having energy reduction goals, some very explicit
 - ❖ 31% small, 47% medium

Recent Construction/Renovation Projects

- Many restaurants have recently undergone construction or renovation projects involving expenditures over \$5,000
 - ❖ 31% of small restaurants, 55% of medium-sized restaurants
- Most have undertaken 5 or fewer projects in the past 3 years
- Most often, reasons for undertaking project include
 - ❖ Reconfigure space (50%)
 - ❖ Increased staff/customer comfort (43%)
 - ❖ Replace failing equipment (36%)
- Only 25% undertook projects to reduce energy costs

Recent Construction/Renovation Projects (cont.)

- Types of systems/equipment affected by project
 - ❖ Space cooling, ventilation (58%)
 - ❖ Space heating (57%)
 - ❖ Cooking (54%)
 - ❖ Refrigeration (48%)
- Outside consultants, equipment suppliers and contractors are both involved with and have influence over decisions regarding design approaches and equipment selected for these projects
 - ❖ Over 40% of all restaurants cite these external sources as having the most influence

Energy Efficiency: Lighting

- Baseline conditions and practices
 - ❖ 32% replace failed lighting with more efficient lamp/ballast
 - 30% small, 34% medium
 - ❖ 40% of all fluorescent tube lighting is T8 with electronic ballasts
 - 38% small, 43% medium
 - ❖ 6% of all lighting is CFLs, although about 50% of all restaurants have at least one CFL
 - 46% small, 53% medium
 - ❖ 36% of all exit signs are LED
 - 30% small, 42% medium

Energy Efficiency: Lighting (cont.)

- Recent projects and current practices
 - ❖ Of 12 restaurants recently undertaking projects involving lighting system changes
 - About half involved CFLs, LED exit signs, and/or occupancy sensors or lighting controls
 - Only 4 involved T8 systems
 - Few involved other lighting efficiency measures (e.g., super T8s, task-oriented lighting levels, HID fixtures)
 - ❖ Only 34% of all restaurants have policies (formal or informal) that promote the consideration of energy efficient lighting

Energy Efficiency: HVAC

■ Baseline practices

- ❖ Two thirds of the HVAC equipment in all restaurants is maintained by service contracts
- ❖ Most HVAC maintenance contracts for medium-sized restaurants (71%) cover energy efficiency versus only 36% for small restaurants
- ❖ About 30% of all restaurants have policies (formal or informal) that promote the consideration of energy efficient HVAC equipment
- ❖ Most small restaurants (60%) replace failed cooling equipment with “whatever contractor recommends” (versus 31% of medium)
- ❖ About 21% report replacing failed cooling equipment with “high efficiency equipment that exceeds government standards”

Energy Efficiency: HVAC (cont.)

■ Recent projects

- ❖ Of the 10 restaurants recently undertaking projects involving HVAC system changes
 - Most involved “testing or commissioning of the system after installation to ensure efficient operation,” some type of control (e.g., programmable thermostats, EMS) and/or variable speed drives
 - Many involved high efficiency cooling equipment or furnaces (about half of the projects)
 - Few installed other types of energy efficiency measures (i.e., boiler reset/cut-out, steam trap replacement, enthalpy controllers for “free cooling”)

Energy Efficiency: Cooking

■ Baseline practices

- ❖ About 41% of all restaurants have maintenance contracts that cover cooking equipment
 - 36% small, 46% medium
- ❖ Of those with contracts, 46% address energy efficiency
 - 25% small, 56% medium
- ❖ About 30% of all restaurants have policies (formal or informal) that promote energy efficient cooking equipment

■ Recent projects

- ❖ Of the 13 restaurants recently undertaking projects involving cooking equipment
 - 9 projects involved medium-sized restaurants, 4 involved small restaurants
 - Most involved energy efficient ovens and fryers

Energy Efficiency: Refrigeration

■ Baseline practices

- ❖ Over half of all restaurants have maintenance contracts that cover refrigeration equipment
 - 47% small, 61% medium
- ❖ Of those with contracts, about half address energy efficiency
 - 29% small, 67% medium
- ❖ About 30% of all restaurants have policies (formal or informal) that promote energy-efficient refrigeration

■ Recent projects

- ❖ Of the 13 restaurants recently undertaking projects involving refrigeration system changes
 - 9 projects involved medium-sized restaurants, 4 involved small restaurants
 - Many involved doors and/or night covers on freezer and refrigerator cases
 - A few others involved efficient evaporative fan motors, variable capacity compressors, and/or floating head pressure controls for central systems

Energy Efficiency: Water Heating

■ Baseline practices

- ❖ About 46% of all restaurants have maintenance contracts that cover water heating equipment
 - 36% small, 55% medium
- ❖ Of those with contracts, about 1/3 address energy efficiency
 - 25% small, 43% medium
- ❖ About 27% of all restaurants have policies (formal or informal) that promote energy-efficient water heating equipment

■ Recent projects

- ❖ Of the 4 restaurants recently undertaking projects involving refrigeration system changes
 - 3 projects were completed for small restaurants, only 1 completed for a medium-sized restaurant
 - These projects included equipment with high Energy Factors and heat recovery equipment

Energy Efficiency: Influence of Focus

- Very few of the projects undertaken recently involved Focus incentives or services
- Barriers to participation
 - ❖ Primarily, awareness
 - 39% of small restaurants and 56% of medium-sized customers were aware of Focus before survey

Barriers to Energy Efficiency

- Budget constraints most commonly felt among medium-sized restaurants
- Many restaurants are concerned about overstated bill savings
- Doubts about the investment cost-effectiveness and equipment reliability are not significant barriers

**Percent of Respondents Who Agree
or Completely Agree with Barriers Statements**

	All	Small	Medium
Savings not worth the added investment	24%	31%	17%
Efficient equipment is less reliable	12%	19%	6%
Budget constraints prevent investment in efficiency	41%	36%	44%
Concerned about overestimated bill savings	39%	38%	41%

Program Implications

- Frequent capital investment decision-making cycles and smaller-scale projects (under \$1,000)
 - ❖ *Project timing flexible, prescriptive rebates most appropriate*
- Investment projects most always undertaken for reasons other than energy savings
 - ❖ *Explicitly link to other values – increased staff/customer comfort, reconfiguration of floor space, cost-effectiveness when replacing failed equipment*
- Internal organization not well suited to effectively monitor energy use and design specific policies or strategies for reducing energy costs
 - ❖ *Work with medium-sized chains and industry organization to develop prototype designs and specification guidelines*

Program Implications (cont.)

- Major projects undertaken less frequently (only half of medium-sized restaurants undertake projects over \$5,000 in a 3-year period)
 - ❖ *These projects typically involve most of the major energy-using equipment found in restaurants (e.g., HVAC, refrigeration, cooking) and represent significant missed opportunities for energy savings*
- External players – e.g., equipment suppliers, installation contractors, and consulting engineers – often influence purchase decisions regarding energy-efficient equipment
 - ❖ *Reach out through contractor networks to increase general awareness and promotion, and to most cost-effectively increase penetration when projects are undertaken*

Program Implications (cont.)

- Few restaurants – small or medium-sized – have current policies that promote energy efficiency in replaced equipment
 - ❖ *Work with medium-sized chains and industry organizations to develop action-oriented policies*
 - ❖ *Support contractor networks to actively influence replacement decisions*
- Many restaurants have maintenance contracts for existing equipment but not all explicitly address energy efficiency
 - ❖ *Develop guidelines for maintenance contracts to increase energy efficiency in existing equipment*

Program Implications (cont.)

- Awareness of CFLs is high, but penetration (as a proportion of total applicable lighting) is low
 - ❖ *Consider direct install approach to deliver measures and acquire savings cost-effectively*
- Room for improvement in LED exit signs and efficient T8 systems as well
 - ❖ *Promote quick payback benefits and immediate impact on bottom-line, and link to action-oriented policies developed for medium-sized restaurants*
 - ❖ *Consider a direct install program for LED exit signs.*
- Penetration of energy-efficient measures (other than lighting) has been limited to replacement measures (e.g., high SEER or EF equipment)
 - ❖ *Consider developing demonstration projects to showcase more comprehensive, cutting edge projects*

Potential Market Indicators: Restaurants

Metric	Baseline Measure		
	Small	Medium	All Rests.
Awareness of Focus (B1)	39%	56%	49%
Energy Management Practices			
Assigned staff to energy management function (B2)	39%	47%	42%
Have stated energy savings goals (B2E)	31%	47%	38%
Track energy use at the facility level (B2H)	42%	55%	48%
Qualify potential investments by costs and savings (B2H)	39%	46%	42%
Replacement Practices			
Upgrade lighting on replacement (A19)	30%	34%	33%
Upgrade motors on replacement (Dm4C)	25%	6%	17%
Investments in Energy Using Equipment			
Projects >\$10,000 in past 3 years (B3) ¹	31%	55%	44%
EE investment to at least one system ²	86%	86%	86%
EE investment to more than one system ²	71%	50%	59%
EE investment to at least one non-lighting system ²	86%	64%	73%
Received Focus services for recent project ²	29%	0%	9%

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3i)
- all energy efficient investments may not be eligible for Focus on Energy services

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.



Grocery Stores



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 54

	# of Establishments	Employment	Completed Surveys
Small	3,446	18,452	28
Medium	462	34,875	37
Large	13	9,179	2
Total	3,921	62,506	67

Structure of the WI Grocery Sector

- Over 4,000 establishments ranging in size from small convenience stores to large multi-service chains
 - ❖ Roughly 65% are single-site convenience stores
- Company and site consolidations continue due to intense competition
- The segment employs over 75,000 workers
 - ❖ The relatively few large stores employ ~75% of the workers

Business Objectives & Challenges

- Operate on very low profit margins
- Key business concerns: rough order of priority
 - ❖ Intense competition from large multi-service chains (e.g., Wal-Mart)
 - ❖ High energy costs, which are ~30% of operating costs, second only to labor costs
 - ❖ Labor concerns
 - Cost
 - Quality
 - Supply

Trends in Facility Investments

- Growth of “superstores”
 - ❖ Major low-cost competitor of traditional grocery stores
 - ❖ Wal-Mart expected to increase grocery sales from 19% to 35% by 2010
- Segmentation as a result of “superstore” phenomenon
 - ❖ Bigger stores
 - ❖ Or small specialty stores in urban areas
 - ❖ Traditional store (40,000–60,000 sq ft) competing on customer service
- Not much new store construction, but a lot of renovation
 - ❖ Market churn in WI as a result of consolidation
 - ❖ Stores expanding offerings—bigger bakery and deli sections, adding diet and organic sections

Capital Investment Decision Making

- Half develop capital budget on an annual cycle, over 40% do it more often
- 88% use centralized decision making
- Internal facilities staff and CEO are most involved in identifying projects
- Minimum expenditure included
 - ❖ All under \$5K, 80% under \$1K
- Most apply simple payback return on investment (39%) or (24%) to investments
 - ❖ Payback criteria varies: 10% <1 year, 30% 3–5 years
 - ❖ Return on investment requirements average 10%

Details of Recent Construction Projects

Characteristics of Construction Projects within Past Three Years

	Small	Med/Large	All Grocery Stores
Construction Volume & Objectives			
Portion doing projects in past 3 years	33%	48%	42%
Average number of projects (for those with projects)	4.5	2.4	3.0
Average number of projects (all respondents)	2.0	1.1	1.2
Had projects with EE as primary objective	56%	33%	42%
Number of projects with EE as primary objective (mean)	3.8	1.3	2.5
Influencers			
Internal staff most important in specification	33%	47%	41%
Consulting engineers/contractors most important in spec.	22%	35%	30%
Worked with consulting engineer to identify EE opps	75%	63%	64%

Energy Management: Structure & Resources

- Only 39% of large stores have designated energy management responsibility to a person or group; this is usually an owner or other high-level manager with other priorities located offsite.
- Only 26% report periodically using outside help to identify and implement projects.
- When seeking assistance, equipment installation contractors or consulting engineers are most common source. They don't report using trade associations or manufacturers.

Organization of Energy Management Function

	Small	Med/Large	All Grocery Stores
One person assigned	30%	32%	31%
A group assigned	7%	3%	5%
A department	4%	3%	3%
No assignment	59%	62%	61%
n =	27	37	64

Energy Management: Goals & Functions

- **Energy saving goals.** 31% report having energy reduction goals, which is generally a broad directive: reduce as much as possible.
- **Other goals.** 71% agree that energy efficiency offers significant benefits other than energy savings.
- **Energy-use monitoring.** 35% report tracking energy use at the facility level; 28% at the system level.
- **Scanning for investments.** 42% regularly assess opportunities for investments in energy efficiency.
- **Sources of assistance.** 26% regularly used outside assistance from specialty consultants to identify opportunities. Medium and large stores are more likely than small stores to use outside consultants.

Energy Efficiency: Baseline Lighting

Key Indicators of Baseline Lighting Efficiency

	Small	Med/Large	All Grocery Stores
Majority of Fluorescent Ballasts = T8	35%	54%	44%
Use CFLs	44%	36%	38%
Most Common Exit Signs			
Incandescent	48%	39%	43%
Fluorescent	16%	32%	23%
LED (Light Emitting Diodes)	36%	32%	34%
Upgrade Ballasts on Replacement	32%	21%	26%

Energy Efficiency: Baseline Refrigeration

- 67% have service contract for refrigeration. 63% address energy efficiency.

Key Indicators of Baseline Refrigeration Efficiency

Baseline Refrigeration	Small	Med/Large	All Grocery Stores
Centralized refrigeration system	69%	89%	81%
Stand-alone medium temperature cases	64%	89%	76%
Stand-alone low temperature cases	54%	74%	66%

Recent Small Actions to Improve Energy Efficiency

Sample Facilities Undertaking No- or Low-Cost Energy Efficiency Actions in the Three Years Prior to Survey

Low- or no-cost energy efficiency actions taken	Small	Med/Large	All Grocery Stores
Compressor tune-up	46%	63%	56%
Replaced door gaskets	31%	45%	42%
Installed strip curtains on a walk-in cooler	19%	37%	30%
Replaced or installed automatic closers	15%	26%	23%
Energy audit	15%	24%	20%

Recent Construction & Renovation: Systems Addressed

Sample Facilities Undertaking Renovation Projects in the Three Years Prior to Survey

	Small	Med/Large	All Grocery Stores
Percent Undertaking Renovation Projects	33%	49%	42%
Systems Address (as % of respondents with projects)			
Refrigeration	80%	61%	65%
Lighting	63%	44%	50%
Space cooling or ventilation	84%	28%	45%
Water heating	75%	17%	38%
Cooking	40%	6%	14%
Space heating	40%	0%	13%

Energy Efficiency: Refrigeration in Construction & Renovation Projects

Sample Facilities with Selected Refrigeration Efficiency Measures

Refrigeration measures included in recent construction and renovation projects	Small	Med/Large	All Groceries
Case doors	100%	75%	83%
High efficiency low temperature cases	50%	50%	50%
High efficiency med temperature cases	25%	50%	50%
Cycling of anti-sweat heaters	50%	38%	42%
Floating head pressure control	50%	33%	39%
Efficient evaporator fan motors	50%	33%	39%
Replaced open cases with closed cases	0%	57%	36%
Variable capacity compressors	25%	22%	23%
Low-heat/no-heat case doors	25%	17%	20%
Energy management system	0%	25%	17%
Night covers for cases	25%	0%	8%

Energy Efficiency: HVAC in Construction & Renovation Projects

Sample Facilities with Selected HVAC Efficiency Measures

HVAC Efficiency Measure Included in Recent Construction or Renovation Project	Small	Med/Large	All Groceries
Commissioning	80%	75%	78%
Energy management systems	80%	50%	67%
Set back thermostats	80%	50%	67%
High efficiency furnaces	60%	0%	50%
Cooling equipment with EER of 13 or higher	60%	0%	33%
Variable speed fans	60%	0%	33%
Steam trap replacement	20%	0%	12%
Computer modeling to design or size the system	20%	0%	11%
Enthalpy controls for "free cooling"	20%	0%	11%

Energy Efficiency: Lighting & Other Systems in Construction Projects

Projects in Sample Facilities with Selected Efficiency Measures

Lighting and other EE measures included in recent construction and renovation projects	Small	Med/Large	All Groceries
<i>Lighting Measures</i>			
T-8 fluorescent lamps	20%	63%	54%
LED exit lights	80%	13%	39%
Compact fluorescent fixtures or bulbs	40%	13%	23%
Substitution of fluorescent for HID fixtures	20%	25%	23%
<i>Other Measures</i>			
Water Heating: Heat recovery equipment	33%	50%	38%

Energy Efficiency in Construction Projects: Influencers

- Energy usage is high relative to other commercial sectors
 - ❖ Grocers use twice the average electricity as office buildings per square foot
 - ❖ Average EUI is over 50 kWh/sq ft
 - ❖ Refrigeration is half or more of energy usage
- 53% of respondents likely to take additional energy efficiency actions in next year
- Limited use of incentives for projects (<5% of respondents)
 - ❖ Of those who didn't use Focus, 30% said weren't aware at the time

Energy Efficiency in Construction: Barriers

**Percent of Respondents who
Agree or Strongly Agree with Barriers Statements**

	Small	Med/Large	All Grocery Stores
Concerned about overstated bill savings	48%	46%	47%
Budget constraints prevent investment in efficiency	44%	37%	40%
There is nothing else to do at this facility	32%	20%	25%
Savings not worth the added investment	24%	14%	18%
Efficient equipment is less reliable	7%	8%	8%

Energy Efficiency in Equipment Replacement

- 65% have informal policy regarding purchase of energy-efficient equipment
 - ❖ 55% of small, 71% of medium and large
 - ❖ Refrigeration and lighting most likely to be addressed
 - ❖ Usually rely on vendor recommendation for cooling or motors

Program Implications

- Frequent capital investment decision making cycles and smaller-scale projects (under \$1,000)
- Relatively frequent projects for those making investments: average of 3.8 projects over 3 years
 - ❖ *Project timing flexible, prescriptive rebates most appropriate*
 - ❖ *Identify segments that build frequently and work with them – likely to be convenience store chains*

Program Implications (cont.)

- Internal organization not well suited to effectively monitor energy use and design specific policies or strategies for reducing energy costs
- Equipment suppliers, installation contractors, and consulting engineers most often influence purchase decisions regarding energy-efficient equipment
 - ❖ *Reach out through contractor networks to increase general awareness and promotion and to most cost-effectively increase penetration when projects are undertaken*
 - ❖ *Work with chains and industry organizations to strengthen customer capability to demand energy efficient products and designs from vendors: develop prototype designs, specification guidelines*

Program Implications (cont.)

- Few groceries—small or medium-sized—have current policies that promote energy efficiency in replaced equipment
 - ❖ *Work with chains and industry organizations to develop action-oriented policies*
- Many groceries have maintenance contracts for existing equipment, but not all explicitly address energy efficiency
 - ❖ *Develop guidelines for maintenance contracts to increase energy efficiency in existing equipment*
 - ❖ *Work with equipment vendors who provide maintenance contract services as a channel for marketing prescriptive rebates for common measures.*

Program Implications (cont.)

- Despite importance of energy as an operating cost, penetration of most common lighting energy-efficient measures is relatively low compared to the rest of the commercial market (as reported by distributors and contractors)
 - ❖ *For smaller stores, consider direct install approach to deliver measures and acquire savings cost-effectively*
 - ❖ *For larger stores, best approach seems to be via vendors as discussed above*
 - ❖ *Could consider DI for LED exit signs*

Potential Market Indicators: Grocery Stores

Metric	Baseline Measure		
	Small	Medium/ Large	All Grocery Stores
Awareness of Focus (B1)	46%	49%	47%
Energy Management Practices			
Assigned staff to energy management function (B2)	41%	38%	39%
Have stated energy savings goals (B2E)	35%	29%	31%
Track energy use at the facility level (B2H)	36%	34%	35%
Qualify potential investments by costs and savings	42%	50%	47%
Replacement Practices			
Upgrade lighting on replacement (A19)	32%	21%	26%
Upgrade motors on replacement (Dm4C)	15%	20%	18%
Investments in Energy Using Equipment			
Projects >\$10,000 in past 3 years (B3) ¹	33%	47%	42%
EE investment to at least one system ²	100%	92%	95%
EE investment to more than one system ²	88%	23%	50%
EE investment to at least one non-lighting system ²	88%	62%	73%
Received Focus services for recent project ²	13%	0%	9%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3i)
- all energy efficient investments may not be eligible for Focus on Energy services



Health Care



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 801-804, 806, 808, 809, 832, 833, 836, 839

	# of Establishments	Employment	Completed Surveys
Small	11,004	57,770	15
Medium	1,105	68,467	18
Large	130	116,854	19
Total	12,239	243,091	52

Structure of the WI Health Sector

- Total of 12,150 establishments ranging in size from doctors offices to hospitals.
- 83 large hospitals account for about 40% of energy consumption; likely a greater portion of potential savings.
- Nursing homes and smaller hospitals each account for 5% of employment/energy in the sector.
- Very little change in employment in hospitals since 1994. The number of residential care establishments and employees has grown more than 10% since 1997.

Business Objectives & Challenges

- Hospitals and residential care operate on very low margins: 0%–5% profit
- Key business concerns: rough order of priority
 - ❖ Market share is related to quality of staff and facilities
 - ❖ Reimbursement rates and revenue cycle management
 - ❖ Workforce retention and quality
 - ❖ Cost control: energy is 3%–8% of total costs

Trends in Facility Investments

■ Drivers of investment in facilities

- ❖ The aging population means more admissions, longer stays, and more need for non-hospital residential care
- ❖ More space per in-patient
- ❖ Industry restructuring in response to regulation
- ❖ Need to replace aging facilities

■ Inhibitors of investment in facilities

- ❖ Current oversupply of in-patient facilities
- ❖ Competing investment priorities (specialty equipment and IT)
- ❖ Tough capital market for some segments

Capital Investment Decision Making

- 80% develop capital budget on an annual cycle
- Facilities staff and CFO most important in identifying projects
- CEO most important in selecting projects for investment
- Minimum expenditure included: most under \$5K
- Simple payback is criterion most often applied—modal value = 5 years (44%)
- Return on investment also applied, but few respondents could name a threshold level
- Cost-saving investments receive tighter scrutiny than investments to increase revenues

Energy Management: Structure & Resources

- 83% of large establishments have a staffed energy management function; 44% have a group or department.
- 56% of medium-sized establishments have a staffed function.
- 79% of large establishments report using outside help to identify and implement projects; 44% for medium, 20% for small.
- ~50% of large establishments report using consulting engineers. Medium and small establishments rely more on installation contractors, vendors, and trade associations.

Organization of Energy Management Function

	Small	Medium	Large
One person assigned	27%	44%	39%
A group assigned	0%	6%	22%
A department	0%	6%	22%
No assignment	73%	44%	17%
n =	15	18	18

Details of Recent Construction Projects

Construction Activity and Influencers

	Small	Medium	Large
Construction Volume & Objectives			
Portion doing projects in past 3 years	33%	67%	100%
Average number of projects (for those with projects)	1.6	3.7	24.0
Average number of projects (all respondents)	0.5	2.4	24.0
Had projects with ee as primary objective	20%	42%	56%
Number of projects with ee as primary objective (mean)	0.0	3.2	5.8
Influencers			
Consulting Engineers most important in specification	20%	17%	44%
Installation contractors most important in specification	20%	17%	0%
Worked with a consulting engineer to identify ee opps	20%	59%	78%

Energy Management: Goals & Functions

- **Energy saving goals.** Larger facilities are more likely to have goals.
 - ❖ 47% of large establishments report having energy reduction goals, many very explicit
 - ❖ 44% of medium report having goals
 - ❖ 13% of small
- **Other goals.** Half strongly agree that energy efficiency offers significant benefits other than energy savings.
- **Energy use monitoring.** 56% report tracking energy use at the facility level; 51% at the system level.
- **Scanning for investments.** Over 50% regularly assess opportunities for investments in energy efficiency.

Energy Efficiency: Baseline Lighting

- For large customers, saturation of T8s, CFLs, and LED exit signs is already very high
- Some room for improvement in medium-sized and small facilities

Key Indicators of Baseline Lighting Efficiency

	Small	Medium	Large
Majority of Fluorescent Ballasts = T8	46%	54%	94%
Use CFLs	33%	56%	90%
Most Common Exit Signs			
Incandescent	39%	47%	11%
Fluorescent	39%	33%	21%
LED (Light Emitting Diodes)	23%	20%	68%
Upgrade Ballasts on Replacement	47%	56%	63%

Recent Construction & Renovation: Systems Addressed

Sample Facilities Undertaking Renovation Projects in the Three Years Prior to Survey

	Small	Medium	Large
Percent undertaking renovation projects	33%	67%	95%
Systems addressed (as % of respondents with projects)			
Space Heating	0%	60%	80%
Space Cooling or Ventilation	0%	70%	81%
Water Heating	33%	38%	28%
Cooking	0%	33%	18%
Refrigeration	0%	29%	50%
Chilled Water	0%	25%	50%
Lighting	40%	50%	78%

Energy Efficiency: HVAC in Construction & Renovation Projects

- Penetration of HVAC efficiency measures similar in medium and large facilities, with exception of VSD fans and EMS.
- More than half of respondents report one or more measures used.

HVAC Efficiency Measure included in Recent Construction or Renovation Project	Medium	Large
Computer modeling to design or size the system	43%	46%
Commissioning	71%	85%
Cooling equipment with EER of 13 or higher (over 60% DK)	29%	15%
Enthalpy controllers for 'free cooling'	0%	54%
Variable speed fans	43%	85%
High efficiency boilers	43%	58%
High efficiency furnaces	57%	17%
Boiler reset and cutout	57%	62%
Steam trap replacement	43%	54%
Energy management systems	29%	77%
Set back thermostats	71%	69%

Energy Efficiency: Lighting & Other Systems in Construction Projects

Projects in Sample Facilities with Selected Efficiency Measures

Lighting and other energy efficiency measures included in recent construction and renovation projects	Small	Medium	Large
Lighting Measures			
T-8 fluorescent lamps	50%	67%	100%
Super T-8 Fluorescent Lamps	0%	0.0	7%
Compact Fluorescent Fixtures or Bulbs			
CFL Fixtures	0%	67%	79%
LED Exit Lights	0%	33%	79%
Occupancy controls in offices	0%	33%	50%
Task-oriented light levels	0%	33%	50%
Substitution of fluorescent for HID fixtures	0%	17%	29%
Other Measures			
Refrigeration: Variable capacity compressors	0%	0%	78%
Refrigeration: Efficient evaporator fan motors	0%	0%	57%

Energy Efficiency in Construction Projects: Influencers

- **Major influencers:** Small and medium facilities more likely to rely on installation contractors.
 - ❖ Internal facilities staff supported by consulting engineers for large health care facilities
 - ❖ Installation contractors for small and medium facilities
- **Use of outside resources:** Higher reliance on outside resources among larger customers.
- **Participation in Focus:** Virtually no reported use of Focus programs among sample health care organizations.

Energy Efficiency in Construction: Barriers

- Doubts about the value of savings versus the required investment and equipment reliability are not important barriers.
- Budget constraints are more keenly felt among larger organizations.
- About half of all respondents are concerned about overstatement of potential bill savings.

Respondents Who Agree or Strongly Agree with Barriers Statements

	Small	Medium	Large
Savings not worth the added investment	27%	28%	5%
Efficient equipment is less reliable	14%	6%	0%
Budget constraints prevent investment in efficiency	36%	41%	55%
Concerned about overstated bill savings	47%	56%	38%

Energy Efficiency in Equipment Replacement

- **Equipment replacement policies:** While roughly 50% of the respondents report having equipment replacement policies, virtually all the policies are informal. There is no difference by size of facility.
- **Lighting replacement:** Only large establishments report upgrading fluorescent ballasts upon failure.
- **HVAC replacement:** 50% of small and medium facilities and 75% of large ones report upgrading HVAC equipment on failure.
- **Motors replacement:** 50% of medium and large facilities report upgrading motors on failure.

Program Implications: Large Institutions

■ Key Findings

- ❖ Large facilities have extensive organizational infrastructure in place
- ❖ Build all the time
- ❖ Have harvested the low-hanging fruit
- ❖ Have done it without Focus

■ Implications

- ❖ Adopt account management approach with industry leaders
- ❖ Support comprehensive, large, cutting-edge projects that may have demonstration value
- ❖ Explicitly link to other values such as air quality and lighting, which can be linked to patient health

Program Implications: Mid-Sized Customers

■ Key Findings

- ❖ Mid-sized hospitals and residential care facilities (about 70 establishments) present good savings opportunities
- ❖ Most have energy management staff in place
- ❖ Penetration of common lighting and HVAC measures high, but not universal
- ❖ Do major construction every 3–4 years

■ Implications

- ❖ Some form of account management may be effective
- ❖ Also reach out through industry organization
- ❖ Promote quick pay-back lighting measures for quick wins

Potential Market Indicators: Health Care

Metric	Baseline Measure			
	Small	Medium	Large	All Health Care
Awareness of Focus (B1)	47%	56%	95%	69%
Energy Management Practices				
Assigned staff to energy management function (B2)	27%	56%	83%	57%
Have stated energy savings goals (B2E)	20%	44%	47%	37%
Track energy use at the facility level (B2H)	47%	47%	95%	65%
Qualify potential investments by costs and savings	26%	50%	84%	56%
Replacement Practices				
Upgrade lighting on replacement (A19)	47%	56%	63%	55%
Upgrade motors on replacement (Dm4C)	18%	50%	63%	46%
Investments in Energy Using Equipment				
Projects >\$10,000 in past 3 years (B3) ¹	33%	67%	95%	67%
EE investment to at least one system ²	50%	88%	94%	89%
EE investment to more than one system ²	0%	63%	88%	74%
EE investment to at least one non-lighting system ²	0%	88%	88%	81%
Received Focus services for recent project ²	0%	0%	19%	15%

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3i)
- all energy efficient investments may not be eligible for Focus on Energy services

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.



Food Processing



Structure of WI Food Processing Industry

- Meat processing
 - ❖ 57% of employees work for large companies (1000+ employees)
- Dairy processing
 - ❖ 84% of employees work for mid-sized or large companies (50+ employees)

Business Trends: Meat Processing

- Meat processing industry is expected to grow
 - ❖ Meat consumption tracks growth in population
 - ❖ “Low carb” diet craze has increased demand for meat
 - ❖ Transfer of meat production from high-wage in-store butchers to low-wage slaughterhouse workers
 - Due to increased automation and demand for “ready-to-eat” packaged meat products
 - ❖ Some shift in demand for certain meats (e.g., shift from beef to chicken and pork due to diet fads and Mad Cow disease concerns)

Business Trends: Dairy Processing

- Demand for dairy products has continued to rise despite diet/health concerns
 - ❖ Demand for cheese is up 3% in 2005 compared to 2004
- Growth in niche cheese markets
 - ❖ WI production of Hispanic cheeses has recently grown ~40% — fastest growing cheese category
 - ❖ U.S. Hispanic population expected to triple over next 50 years
- Health of WI dairy farms is big factor
 - ❖ 90% of WI milk production goes to cheese versus 41% in other dairy states
 - ❖ Some cheese plants have shifted to CA due to declining milk production in WI

Trends in Facility Investments

- 86% of dairy processors and 73% of meat processors have done large construction/ renovation project in last 3 years
- Over half of these had energy cost savings as major objective

Capital Investment Decision Making

■ Capital budgeting process

- ❖ Meat – Only 36% have it. \$13,000 is smallest project considered in process
- ❖ Dairy – 86% have it. Half of these do it on an annual cycle. Another third do it more than once per year.

■ Project identification and selection

- ❖ Meat – Facilities staff, plant manager, CEO, CFO all important in project identification. CEO and facility staff key for project selection.
- ❖ Dairy – Facilities staff, department heads, and plant managers most important for project identification. CEO key for project selection.

■ Financial criteria

- ❖ Meat – Simple payback is most common. 2-year minimum payback is shortest of all industrial sectors
- ❖ Dairy – Simple payback and return on investment most common. Average 4.3 year minimum payback is longest of all industrial sectors

Energy Management: Structure & Resources

- About half of the meat and dairy establishments do not have anyone assigned to manage energy use and costs
- 86% of meat processors use consulting engineers for energy advice versus only 14% for dairy processors
- But dairy processors much more likely to consult with govt./utility EE programs

Organization of Energy Management Function

	Meat	Dairy
One person assigned	36%	31%
A group assigned	18%	6%
A department	0%	6%
No assignment	45%	57%
n =	11	35

Details of Recent Construction Projects

- A lot of new construction. About half of these projects have energy cost reduction as important goal
- Meat and dairy processors are using consulting engineers a lot, but do not consider them important voices in final project selection.
- For meat processors the facility staff is most important decision maker in project selection
- For dairy processors, there is no one important decision maker for project selection

	Meat	Dairy
Construction Volume & Objectives		
Portion doing projects in past 3 years	73%	86%
Average number of projects (for those with projects)	3.2	3.3
Had projects with EE as primary objective	50%	57%
Influencers		
Consulting Engineers most important in specification	0%	3%
Installation contractors most important in specification	22%	20%
Worked with a consulting engineer to identify EE opps	75%	70%

Energy Management: Goals & Functions

- Meat processors lag dairy processors in energy monitoring activities and identification of energy efficiency opportunities

	Meat	Dairy
Have energy saving goal?	36%	44%
Strongly agree that EE offers significant benefits other than energy savings?	81%	83%
Track energy use at facility level?	55%	69%
Track energy use at system level?	36%	51%
Regularly assess opportunities for EE investments?	45%	71%

Energy Efficiency: Baseline Lighting

- Dairy processors lag behind meat processors in T8 and CFL use
- Meat processors lead all industrial sectors in % reporting regular T8 upgrade upon replacement. But small sample size (n=9)

Key Indicators of Baseline Lighting Efficiency

	Meat	Dairy
Fluorescent tubes = T8	71%	54%
Use CFLs?	56%	38%
Most Common Exit Signs		
Incandescent	11%	27%
Fluorescent	44%	21%
LED (Light Emitting Diodes)	44%	52%
Upgrade Ballasts on Replacement	56%	34%

Recent Construction and Renovation: Systems Addressed

Percent of Sample Facilities Undertaking Renovation Projects in the Three Years Prior to Survey

	Meat	Dairy
Percent Undertaking Renovation Projects	73%	86%
Systems Addressed (as % of respondents with projects)		
Compressed Air	33%	47%
Pumping Systems	17%	62%
Process Heat Equipment	17%	36%
Refrigeration Equipment	50%	63%
Air Conditioning Equipment	29%	33%
Custom Equipment	75%	83%
Lighting	63%	47%

Energy Efficiency: HVAC in Construction & Renovation Projects

- High EER cooling equipment, computer modeling for cooling systems, enthalpy controllers, and boiler resets and cutouts have not been covered much in recent projects
- Meat processing HVAC efficiency measures not represented due to small sample size (n=2)

**Percent of Projects in Sample Facilities
with Selected HVAC Efficiency Measures**

HVAC Efficiency Measure included in Recent Construction or Renovation Project	Dairy
Computer modeling to design or size the system	33%
Commissioning	78%
Cooling equipment with EER of 13 or higher (over 60% DK)	13%
Enthalpy controllers for 'free cooling'	25%
Variable speed fans	67%
High efficiency burners for boilers	55%
Boiler reset and cutout	33%
Steam trap replacement	91%
Energy management systems	44%
Set back thermostats	44%

Energy Efficiency: Lighting & Other Systems in Construction Projects

Percent of Projects in Sample Facilities with Selected Efficiency Measures

Lighting and other energy efficiency measures included in recent construction and renovation projects	Meat*	Dairy
<i>Lighting Measures</i>		
T-8 fluorescent lamps	60%	92%
Super T-8 Fluorescent Lamps	0%	17%
LED Exit Lights	20%	77%
Improved lighting controls	20%	57%
Occupancy controls in offices	40%	36%
Daylighting	20%	14%
Task-oriented light levels	40%	43%
Substitution of fluorescent for HID fixtures	20%	50%
<i>Other Measures</i>		
Refrigeration: Variable capacity compressors	75%	53%
Refrigeration: Efficient evaporator fan motors	67%	67%

*Small sample (n = 4-5)

Energy Efficiency Project Influencers

- New construction/renovation project design/selection
 - ❖ Meat – Facility staff is most influential
 - ❖ Dairy – No one important influencer
- Routine purchase of energy-using equipment
 - ❖ Meat – Equipment manufacturers most influential
 - ❖ Dairy – No one important influencer
- No Focus influence on meat processors, tiny Focus influence (8%) on dairy processors

Energy Efficiency in Construction: Barriers

- Meat processors are very concerned about overstated bill savings. Other barriers are less significant.
- 45% of meat processors strongly agree that they have taken all cost-effective energy efficiency actions. Only 23% of dairy processors believe this.
- Dairy processors identify budget constraints and overstated bill savings as biggest barriers.

Percent of Respondents Who Strongly Agree with Barriers Statements

	Meat	Dairy
Savings not worth the added investment	36%	18%
Budget constraints prevent investment in efficiency	27%	46%
Concerned about overstated bill savings	70%	46%
Efficient equipment is less reliable	0%	9%

Energy Efficiency in Equipment Replacement

- Equipment replacement policies for both meat and dairy processors are all informal

	Meat	Dairy
Have equipment replacement policy	73%	74%
Routinely upgrade fluorescent ballast on failure	56%	34%
Tested for compressed air leaks in last 3 years	*	50%
Routinely replace motors with high EE motors	64%	68%

*Inadequate sample

Key Findings: Dairy Processing

- 86% have done large construction/renovation project in last 3 years. Over half of these had energy cost savings as major objective.
- Half of dairy processors identify budget constraints and concerns of overstated bill savings as barriers to implementing energy efficiency projects.
- Dairy processors permit the longest average maximum payback period (4.3 years) of all industrial sectors
- Very complex projects
 - ❖ Over 70% said recent projects affected more than 3 different energy-using systems. For most other industrial sectors, only 1/3 report this.
- Dairy processors lag behind meat processors in T8 and CFL use.
- Only 23% believe that they have already done all cost-effective energy efficiency.
- Facilities staff, department heads, and plant managers most important for project identification. CEO key for project selection.
- Awareness of Focus is high (73%), but Focus influence on projects is low (8%)
FP17

Key Findings: Meat Processing¹

- Meat processing industry is expected to grow due to population growth and “low carb” diet appeal.
- 73% have done major construction/renovation project in last 3 years, but only 36% of respondents have a capital budgeting process.
- 86% of meat processors use consulting engineers for energy advice.
- Meat processors lag dairy processors in energy monitoring activities and identification of energy efficiency opportunities.
- Meat processors lead all industrial sectors in % reporting regular T8 upgrade upon replacement.

¹ Only 11 meat processing facilities responded to the survey, so the responses may not be representative of the industry as a whole.

Program Implications: Meat & Dairy Processing

- There are many opportunities to improve energy efficiency in the food processing industry due to the frequency of capital investments. Respondents indicated that they have not taken all cost-effective actions to reduce energy costs.
- **Provide cases studies with energy savings figures.** Case studies with documented energy savings may overcome the concern of overstated energy savings by convincing decision makers that energy efficiency improvements are worthwhile. Though respondents cite budget constraints as another barrier, the level of capital investment in the industry suggests that if they are convinced that the savings are real they will make the investment.
- **Promote Practical Energy Management training.** Facilities operators need more training in routine energy management and assessment practices. This training should also provide tools or skills to convince management of the benefits of investing in energy efficiency. In meat processing the facilities staff appear to be important in project selection.

Potential Market Indicators: Food Processing

Metric	Meat	Dairy
Awareness of Focus (B1)	64%	74%
Energy Management Practices		
Assigned staff to energy management function (B2)	55%	43%
Have stated energy savings goals (B2E)	36%	44%
Track energy use at the facility level (B2H)	56%	69%
Qualify potential investments by costs and savings (B2H)	73%	69%
Replacement Practices		
Upgrade fluorescent ballasts on replacement (A19)	56%	34%
Investments in Energy Using Equipment		
Projects >\$10,000 in past 3 years (B3) ¹	73%	86%
EE investment to at least one system ²	100%	100%
EE investment to more than one system ²	57%	86%
EE investment to at least one non-lighting system ²	71%	100%
Received Focus services for recent project ²	29%	11%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3i)
- all energy efficient investments may not be eligible for Focus on Energy services



Plastics



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 3089

	# of Establishments	Employment	Completed Surveys
Small	224	3,050	13
Medium	100	9,926	26
Large	13	4,740	2
Total	337	17,716	41

Structure of the WI Plastics Industry

- SIC 3089 – Plastic Products, NEC
 - ❖ A total of 337 firms in Wisconsin distributed as follows

Employment Category	Total Number of Employees	Percent of Total Employment	Total Number of Establishments	Percent of Total Establishments
1 to 49	3,050	17%	224	66%
50 to 249	9,926	56%	100	30%
250+	4,740	27%	13	4%

- ❖ Sector is characterized by small operations—86% of total establishments employ less than 250 people
- ❖ Sector accounts for 20% of total employment in WI—second largest (behind Pulp and Paper)

Structure of the WI Plastics Industry (cont.)

- WI ranks tenth in the country in plastics employment and 12th in plastic shipments
- Over 1/3 of all US plastics manufacturing activity takes place within a 500-mile radius of WI.
- Nationally, the plastics industry compound annual growth rate (CAGR) has fluctuated
 - ❖ 1990-1990 4.9 percent
 - ❖ 1995-2000 2.2 percent
 - ❖ 2000-2002 -5.4 percent
 - ❖ Since 2002 there has been an overall, but slow, growth rate in the industry

Structure of the WI Plastics Industry (cont.)

- Over $\frac{3}{4}$ of plastics manufacturers (78%) own the space occupied by their business
 - ❖ Lower percentage than other industries in WI
- Business structure
 - ❖ 49% are single-location businesses
 - ❖ 22% are branch or franchise locations based in WI
 - ❖ 17% are branch or franchise locations based outside of WI
 - ❖ 12% are headquarters for firm with multiple locations

Energy Costs & End Uses

- Average monthly energy bills for surveyed firms
 - ❖ Electricity = \$18,000 (among lowest in survey)
 - ❖ Natural Gas = \$4,700 (lowest in survey)
- Nearly all firms have compressed air equipment
 - ❖ Average number of systems: 3
 - ❖ Majority powers mechanical applications throughout plant as well as for specific process applications such as mixing or aerating
- Other common end-uses
 - ❖ Air conditioning systems (90%)
 - ❖ Fan or blower systems (85%)
 - ❖ Custom process systems (76%)
 - ❖ Pumping systems (55%)
 - ❖ Process heat systems (54%)
 - ❖ Refrigeration systems (54%)

Capital Investment Decision Making

- Decision-making occurs one or more times per year in most facilities surveyed.
 - ❖ Process more common in plastics industry compared to overall industry
- Plant manager, CEO, and internal facilities staff “have most important say in selecting projects for implementation.”
- A variety of others—including department heads, Boards of Directors, and vendors/engineers—play a role in selecting projects.
- Typical project expenditure level considered in process—nearly \$40,000 (industry average = \$17,000).
- Simple payback and return on investment predominant financial criterion, average thresholds.
 - ❖ 4 years for simple payback
 - ❖ 12% for return on investment

Energy Management: Structure

- More than half (53%) do not have a staff person, group, or department assigned to manage energy use
 - ❖ 69% small (n=13), 48% medium (n=26), 0% large (n=2)
 - ❖ Fairly consistent with industry average
- Energy management function in plastics companies is more likely to report to general or plant manager as opposed to CEO or other executive (except for smallest companies)
- Specific duties to which staff are assigned
 - ❖ Tracking whole building energy use/costs – 54%
 - ❖ Monitoring building/system energy use – 39%
 - ❖ Ongoing identification of facility improvements – 56%
 - ❖ Qualifying projects based on financials – 59%
 - ❖ Developing policies promoting energy efficiency – 45%
 - ❖ Assignments increase as business size increases
 - ❖ Consistent with industry averages, except lower for tracking and monitoring energy use and higher for developing policies

Energy Management: Goals & Resources

- Overall, 46% report having energy reduction goals, some very explicit
 - ❖ 31% small, 54% medium, 50% large
 - ❖ Fairly consistent with industry average
- Overall, 44% use consultants and contractors to identify and implement energy savings projects
 - ❖ 0% small, 62% medium, 100% large
 - ❖ Slightly lower than industry average
- Medium-sized establishments use wider variety of resources (e.g., manufacturers, dealers, installers, utility programs), whereas large establishments are more likely to rely on consulting engineers.

Recent Construction & Renovation Projects

- Many firms (60%) have recently undergone construction or renovation projects involving expenditures over \$10k
 - ❖ 23% small, 80% medium, 50% large
 - ❖ Slightly lower than industry average
- On average, firms have undertaken 12 projects in the past three years.
 - ❖ 3 small, 11 medium, 50 large
 - ❖ Slightly fewer than industry average

Recent Construction & Renovation Projects (cont.)

- Reasons for undertaking projects directly or indirectly compliment energy savings objectives
 - ❖ Reconfiguring existing space (71%) – slightly higher than industry average
 - ❖ Energy cost reduction (46%) – slightly lower
 - ❖ Change in processes/products (46%) – much lower
 - ❖ Change in output volume (46%) – much lower
 - ❖ Replace failing systems (33%) – much lower
 - ❖ Operating cost reduction (25%) – much lower

Recent Construction & Renovation Projects (cont.)

- Types of systems/equipment affected by project
 - ❖ Custom equipment (68%) – slightly lower than industry average
 - ❖ Lighting (54%) – about same
 - ❖ Air conditioning (43%) – higher
 - ❖ Process heat systems (40%) – slightly higher
 - ❖ Refrigeration (38%) – much lower
 - ❖ Fan or blower systems (30%) – much lower
- Over 2/3 use consulting engineers/contractors to identify opportunities
 - ❖ Slightly higher than industry average
- Most firms use internal staff (plant managers, facilities staff) and equipment suppliers and installers to *identify projects*.
- CEO and facilities staff have *most influence* on design selection and equipment purchase decisions.

Service Contracts

- Most equipment is not covered by existing service contracts, except for air conditioning and refrigeration systems.
- Most existing service contracts address energy efficiency.

	Have Existing Service Contract?	Is Energy Efficiency Covered?
Air Conditioning Systems	79%	67%
Refrigeration Systems	79%	47%
Compressed Air	45%	61%
Pumping Systems	16%	80%
Fan or Blower Systems	15%	73%
Process Heat Systems	6%	80%
Custom/Process Systems	4%	40%
Plant Steam Systems	0%	0%

Energy Efficiency: Lighting

- Baseline conditions and practices
 - ❖ 35% replace failed lighting with more efficient lamp/ballast
 - Slightly lower than industry average
 - ❖ 36% have replaced HID indoor lighting (such as high bay metal halide fixtures) with T-8 lighting
 - ❖ 56% of all fluorescent tube lighting is T-8 with electronic ballasts
 - Consistent with industry average
 - ❖ 3% of all lighting is CFLs, although about 38% of all firms have at least one CFL
 - Somewhat consistent with industry average
 - ❖ 22% of all exit signs are LED
 - Considerably lower than industry average

Energy Efficiency: Lighting (cont.)

- Recent projects and current practices
 - ❖ Of 13 projects recently undertaken and involving lighting system changes
 - About half involved T-8 systems, fluorescent substitute for HID, and/or task-oriented lighting levels
 - Only a few involved other common lighting efficiency measures (e.g., LED exit signs, lighting controls, occupancy sensors, daylighting)
 - ❖ Only 19% of all firms have policies (mostly informal) that promote the consideration of energy-efficient lighting

Energy Efficiency: Air Conditioning

- Of 9 recent air conditioning projects
 - ❖ Most involved setback thermostats (7 projects)
 - ❖ Others involved
 - “Testing or commissioning of the system after installation to ensure efficient operation” (4 projects)
 - High SEER equipment (3 projects)
 - Computer modeling to design/size the system (3 projects)
 - EMS (3 projects)
- Only 16% of all firms have policies (mostly informal) that promote the consideration of energy efficient HVAC equipment

Energy Efficiency: Process Heat

- Of 6 recent process heat projects
 - ❖ 3 projects involved installing
 - Variable speed controls on draft fans
 - Advanced burners and controls
 - Insulation for furnace walls, piping, and ductwork
 - ❖ Another project involved installing systems to pre-heat combustion air
 - ❖ No projects involved installing heat recovery equipment or improved fuel mix control measures
- About 22% of all firms have policies (mostly informal) that promote the consideration of energy-efficient process heat measures

Energy Efficiency: Refrigeration

- Of 5 recent refrigeration projects
 - ❖ 3 involved load sequencing of multiple compressors
 - ❖ 2 involved installing variable capacity compressors for central systems
 - ❖ 2 involved installing efficient evaporator fan motors
 - ❖ No projects involved installing floating head pressure control for central systems
- About 22% of all firms have policies (mostly informal) that promote the consideration of energy-efficient refrigeration measures

Energy Efficiency: Fan/Blower Systems

- Of 7 recent fan/blower systems projects
 - ❖ 4 installed variable speed drives
 - ❖ 1 installed retrofit inlet vanes
 - ❖ 1 replaced components with large pressure drops
- Only 19% of all firms have policies (mostly informal) that promote the consideration of energy-efficient fan/blower systems

Energy Efficiency: Compressed Air

- Of 6 compressed air projects
 - ❖ All used parallel compressors to meet variations in load
 - ❖ 4 installed higher efficiency compressors and/or eliminated unnecessary compressed air uses
 - ❖ 3 improved auxiliary equipment such as air dryers and coolers
 - ❖ 3 improved piping and distribution systems
 - ❖ 2 improved compressor controls and/or reduced leakage
- About half of all firms (47%) have policies (mostly informal) that promote the consideration of energy-efficient fan/blower systems

Energy Efficiency: Influence of Focus

- Awareness of Focus very high
 - ❖ 80% for plastics industry versus 76% for overall industry average
- Focus participation has been very limited (6 projects)
 - ❖ Lighting incentives and technical assistance (3 and 2 projects, respectively)
 - ❖ Fan and blower system incentives and technical assistance (1 project)
 - ❖ Air conditioning technical assistance (1 project)
- Barriers to participation
 - ❖ Primarily awareness (at the time of project)
 - ❖ Paperwork/rebate levels not worth it

Barriers to Energy Efficiency

- Doubts about the investment cost-effectiveness and equipment reliability are not significant barriers.
- Budget constraints and concerns about overstated bill savings are more commonly felt barriers.
- Barriers facing plastics industry do not differ significantly from the overall average.

Respondents Who Agree or Completely Agree with Barriers Statements

	Plastics Industry
Organization already taken all cost-effective actions	28%
Energy efficient equipment has practical (non-savings) benefits	78%
Efficient equipment is less reliable	11%
Savings not worth the added investment	18%
Budget constraints prevent investment in efficiency	46%
Concerned about overstated bill savings	46%

Program Implications

- Internal staff well organized and assigned to address many energy management functions, especially in largest businesses
- External players – e.g., consulting engineers, equipment suppliers, and installation contractors – often involved in identifying projects, but CEO and facilities staff have most influence on decision-making
 - ❖ Consider developing targeted account manager programs and/or training and educational programs targeting internal decision-makers
- Many decisions are made by and/or for business locations outside of WI
 - ❖ Work with larger industry organizations to develop prototype designs and specification guidelines

Program Implications (cont.)

- Frequent capital investment decision making cycles involving very large-scale projects (nearly \$40k)
 - ❖ Project timing may be flexible, but size of projects considered requires custom incentive structure and design/technical assistance services
- Investment projects are almost always undertaken for reasons either directly or indirectly related to energy savings
 - ❖ Explicit link to energy cost reduction and other values – reconfiguration of space, changes to processes, products and/or output volume, replacing failed equipment
- Many projects being undertaken – 60% have implemented on average 12 projects >\$10k in the past three years)
 - ❖ These projects typically involve most of the major end-uses among the plastics industry (e.g., custom/process equipment, air conditioning, process heat, refrigeration, fan/blower systems, compressed air systems)

Program Implications (cont.)

- Few firms of any size have current, formal policies that promote energy efficiency in replaced equipment
 - ❖ Work with medium-sized and larger firms and industry organizations to develop action-oriented policies
 - ❖ Support trade ally networks to actively influence replacement decisions
- Most equipment not covered by existing service contracts, except air conditioning and refrigeration
 - ❖ Develop internal guidelines for maintenance practices and work with medium-sized or larger firms and industry organizations to increase energy efficiency in existing equipment operation

Program Implications (cont.)

- Awareness of CFLs is relatively low, and penetration (as a proportion of total applicable lighting) is very low
- Room for improvement in LED exit signs and efficient T-8 systems as well
 - ❖ Promote quick payback benefits and immediate impact on bottom-line, link to action-oriented policies and maintenance practices for medium-sized and larger firms
- Penetration of energy-efficient measures (other than lighting) has been limited
 - ❖ Consider developing demonstration projects to showcase more comprehensive, cutting-edge projects
 - ❖ Create case studies for Best Practices

Potential Market Indicators: Plastics

Metric	Baseline Measure			
	Small	Medium	Large	All Plastics
Awareness of Focus (B1)	62%	88%	100%	80%
Energy Management Practices				
Assigned staff to energy management function (B2)	31%	52%	100%	47%
Have stated energy savings goals (B2E)	31%	54%	50%	46%
Track energy use at the facility level (B2H)	38%	58%	100%	54%
Qualify potential investments by costs and savings (B2H)	23%	73%	100%	59%
Replacement Practices				
Upgrade lighting on replacement (A19)	31%	40%	0%	35%
Investments in Energy Using Equipment				
Projects >\$10,000 in past 3 years (B3) ¹	23%	80%	50%	60%
EE investment to at least one system ²	67%	82%	100%	81%
EE investment to more than one system ²	33%	59%	100%	57%
EE investment to at least one non-lighting system ²	67%	65%	100%	67%
Received Focus services for recent project ²	0%	29%	100%	29%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3l)
- all energy efficient investments may not be eligible for Focus on Energy services



Pulp and Paper



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – 2611, 2621, 2631

	# of Establishments	Employment	Completed Surveys
Small	106	3,811	7
Medium	20	9,820	3
Large	3	5,400	2
Total	129	19,031	12

Structure of the WI Pulp & Paper Sector

- Total of 129 establishments
- WI produces more paper than any other state
 - ❖ 5.3 million tons paper annually
 - ❖ 1.1 million tons paperboard annually
 - ❖ \$12.4 billion in products shipped annually
- Largest consumer of energy in the state
 - ❖ 115 trillion Btu's annually
- Pulp, paper, and allied companies employed over 50,000 people in WI

Business Objectives & Challenges

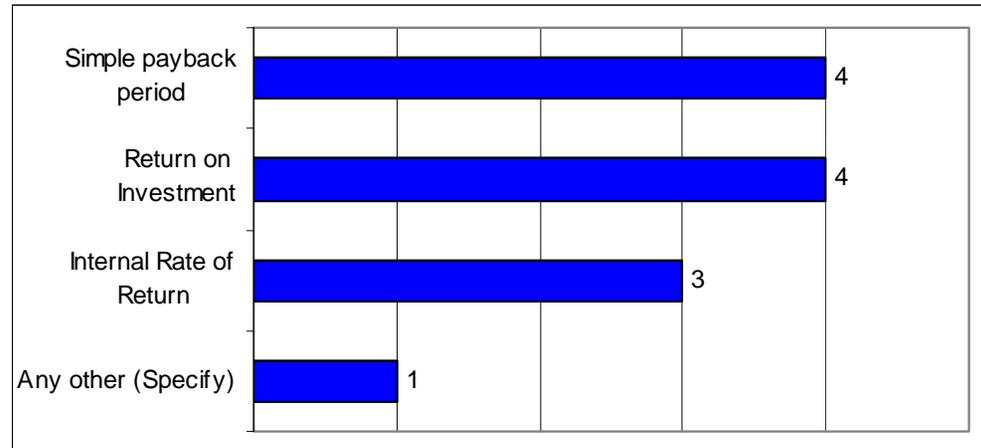
- Pulp and Paper industry is very energy intensive
 - ❖ Uses 3 times as much energy as the average WI company
- Key business concerns
 - ❖ Competition in national and international markets is intense
 - ❖ Soaring energy costs
 - ❖ Environmental issues
 - ❖ Industry consolidation
 - ❖ Aging equipment

Trends in Facility Investments

- Drivers of investment in facilities
 - ❖ Regulatory issues/environmental protection
 - Air and water discharge requirements
 - ❖ Improve quality and increase productivity
 - ❖ Process is hard on equipment such as pumps and fans. Requires frequent maintenance and replacement
- Inhibitors of investment in facilities
 - ❖ Overcapacity and poor return on investment
 - ❖ Recent consolidation of facilities
 - ❖ Extensive regulatory review required of any project

Capital Investment Decision Making

- Nearly all companies (11 of 12) have a formal budgeting process that takes place annually
- 8 of 11 report that the capital budget process is for the entire company, not just a signal facility
- Investments over \$9,300 typically require capital budget.
- Typically, investments for cost reduction are not evaluated the same as investments to increase revenue
- Investment criteria a mixed bag
- Average simple payback 2 years, return on investment, internal rate of return 40–50%



Energy Management: Structure & Resources

- Most (92%) paper mills have a staffed energy management function; larger establishments more likely to have individual assigned
- Investment decisions usually made by staff engineers, department heads, or plant manager
- 83% report using outside help to identify and implement projects
- 8 of 10 report using consulting engineers for support and 5 of 10 report using utility or government programs for support

Energy Management: Goals & Functions

- **Energy saving goals.** 75% report having energy reduction goals.
- **Energy use monitoring.** 92% report tracking energy costs over time.
- **Scanning for investments.** Most facilities have staff regularly assessing opportunities for energy efficiency investments.

Energy Efficiency: Baseline Lighting

- All respondents report having T8 fluorescent lamps.
- HIDs account for a large portion of the lighting.
- Only 22% report using CFLs and only 29% have LED exit signs. However, these fixture may not be very applicable.
- 67% report upgrading lighting when replacing.

Recent Construction & Renovation: Systems Addressed

- Compressed air improvements may provide untapped potential

Percent of Sample Facilities Undertaking Renovation Projects in the Three Years Prior to Survey

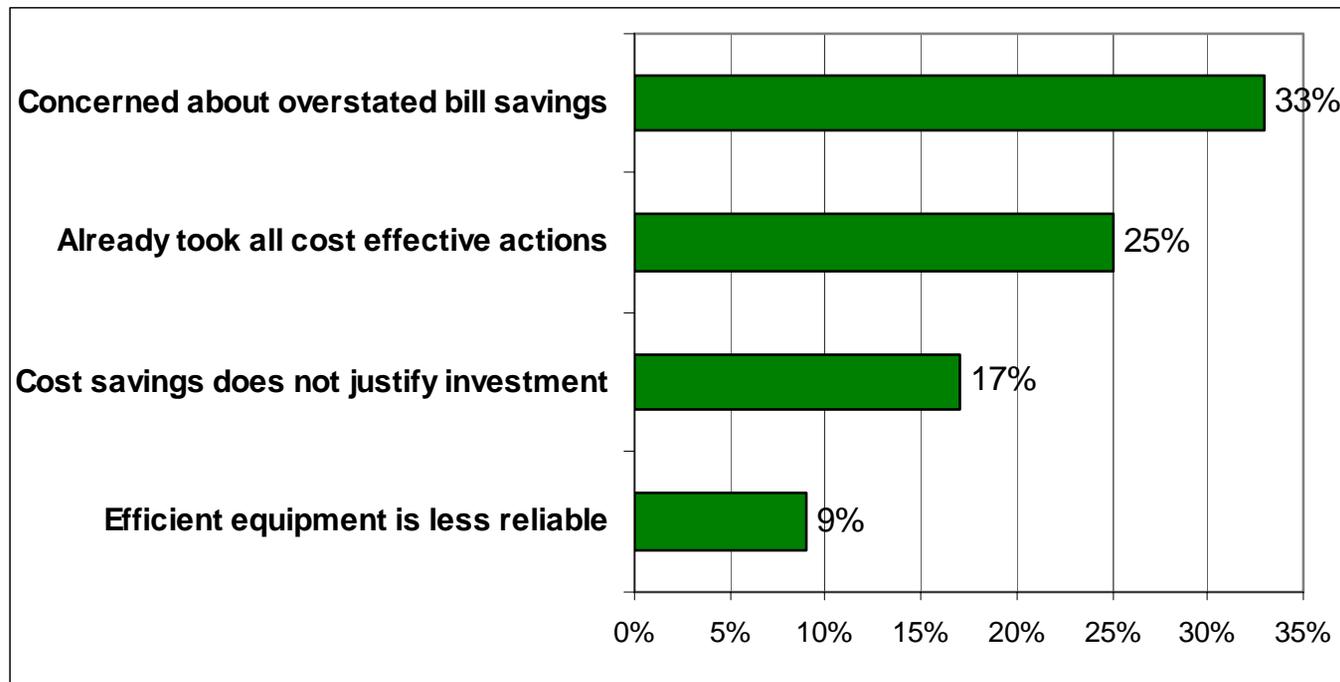
Custom manufacturing or industrial process systems	71%
Pumping systems	70%
Fan or blower systems	70%
Lighting	50%
Plant steam systems	50%
Process Heat Systems	30%
Air Conditioning System	30%
Refrigeration Systems	25%
Compressed Air	10%
Other (Specify)	100%

Energy Efficiency in Equipment Purchases: Influencers

- Internal engineers have the most influence on energy efficiency projects
- Most companies have an informal policy regarding the purchase of energy-efficient equipment (7 of 12)
- 4 of 12 companies have a formal policy
- Very little use of Focus programs in construction projects
 - ❖ 20% used Focus for lighting upgrades
- All respondents report knowledge of Focus

Energy Efficiency in Projects: Barriers

Percent of Respondents Who Agree or Strongly Agree with Barriers Statements



• 12 Respondents

Program Implications

■ Key Findings

- ❖ Most changes are driven by environmental regulations or consolidations.
- ❖ Environmental regulatory dis-incentives exist for some energy efficiency projects.
- ❖ Energy cost reduction and reliability are 1 of 3 top priorities of the industry (others are adoption of a fuel and electricity sales tax exemption and rapid implementation of regulatory reform).

■ Implications

- ❖ Assist companies overcome regulatory barriers to energy efficiency projects
- ❖ Develop partnerships to replace fossil fuel use with biomass, cleaner coal, or refuse
- ❖ Focus energy efficiency efforts on lower capital cost measures unless they improve quality or increase production
- ❖ Industry consolidation = energy efficiency should focus on process optimization

Potential Market Indicators: Pulp & Paper

Metric	Baseline Measure Pulp and Paper
Awareness of Focus (B1)	100%
Energy Management Practices	
Assigned staff to energy management function (B2)	92%
Have stated energy savings goals (B2E)	75%
Track energy use at the facility level (B2H)	92%
Qualify potential investments by costs and savings	75%
Replacement Practices	
Upgrade lighting on replacement (A19)	67%
Investments in Energy Using Equipment	
Projects >\$10,000 in past 3 years (B3) ¹	92%
EE investment to at least one system ²	80%
EE investment to more than one system ²	50%
EE investment to at least one non-lighting system ²	70%
Received Focus services for recent project ²	20%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3l)
- all energy efficient investments may not be eligible for Focus on Energy services



Metal Casting

Ferrous and Non-Ferrous Metals



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- SIC codes – Ferrous 332, Nonferrous 336

	# of Establishments	Employment	Completed Surveys
Ferrous Small	6	605	6
Ferrous Medium	19	1,971	8
Ferrous Large	9	4,574	1
Nonferrous Small	40	1,257	6
Nonferrous Medium	24	5,329	6
Nonferrous Large	2	10,000	0
Total	100	23,736	27

Structure of the WI Metal Casting Industry

- Very energy intensive
- Accounts for 6% of industrial consumption in WI
- Most own building
- Ferrous metals
 - ❖ 66 firms, total employment 16,586
 - ❖ Most fewer than 100 employees
 - ❖ Largest 2 firms account for 60% of employment in sector
 - ❖ No clear indication of change in employment in WI
- Non-ferrous metals
 - ❖ 76 firms, total employment 7,150
 - ❖ Tend to be smaller than ferrous

Business Objectives & Challenges

- Key business concerns
 - ❖ Foreign competition — low cost foreign producers
 - ❖ Scrap metal prices
 - ❖ Relatively high operating costs
 - Environmental compliance
 - Labor and associated costs
 - Energy
 - ❖ Workforce retention and quality
 - ❖ Access to capital (given low profit margins)

Trends in Facility Investments

- Inhibitors of investment in facilities
 - ❖ Money is tight
 - ❖ Industry forecasts varied—tied to
 - US economy
 - Worldwide price of materials
 - Trading policies
 - International financial markets (China in particular)
 - ❖ Material and labor costs high

Capital Investment Decision Making

- Decision making occurs one or more times per year in most facilities surveyed.
- CEO, Boards of Directors, and regulatory authorities “have most important say in selecting projects for implementation.”
- Other internal staff – department heads and department heads play a role in selecting projects.
- No single financial criterion dominates.

Energy Management: Goals & Functions

- **Energy saving goals.** 1/3 of those interviewed had energy saving goals.
- **Person or department assigned to manage energy costs.** 15 of 27 said NO.
- **Person responsible for (# out of 27) . . .**
 - ❖ Tracking energy costs over time (13)
 - ❖ Identifying improvements to reduce energy use (12)
 - ❖ Monitoring key building or production systems (11)
 - ❖ Qualifying energy efficiency improvements (11)
 - ❖ Developing purchase policies (5)

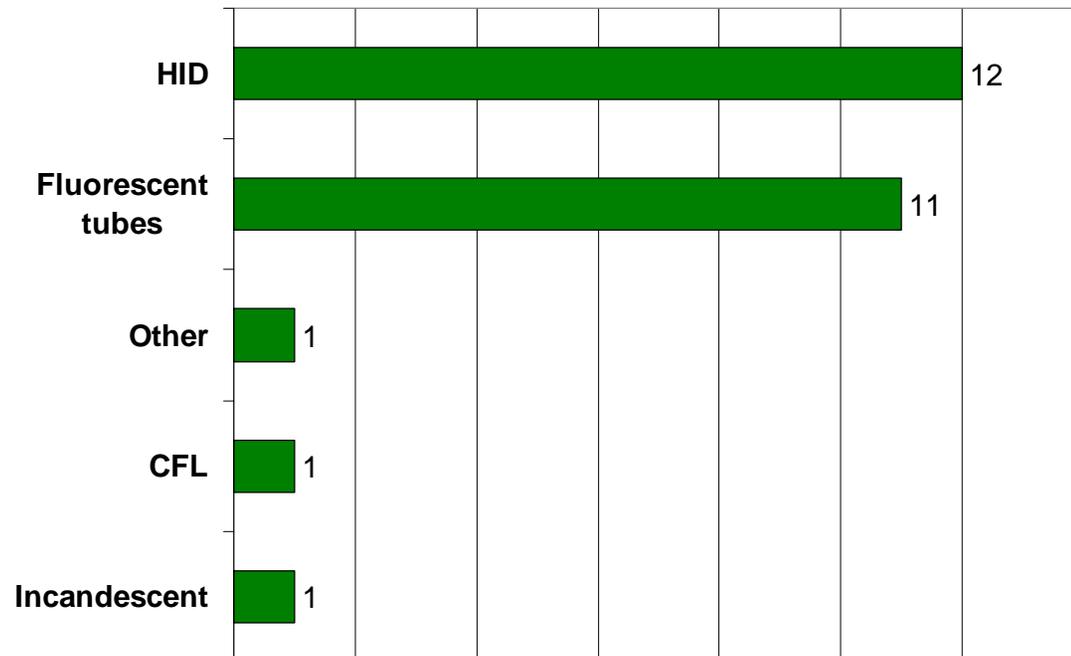
Energy Management: Goals & Functions

- Outside help
 - ❖ Half use outside assistance to help identify energy savings
- Sources of assistance
 - ❖ Government or utility energy efficiency programs (7)
 - ❖ Equipment dealers (4) or installers (4)
 - ❖ Consulting engineers (2)
 - ❖ Equipment manufacturers (1)

Energy Efficiency: Baseline Lighting

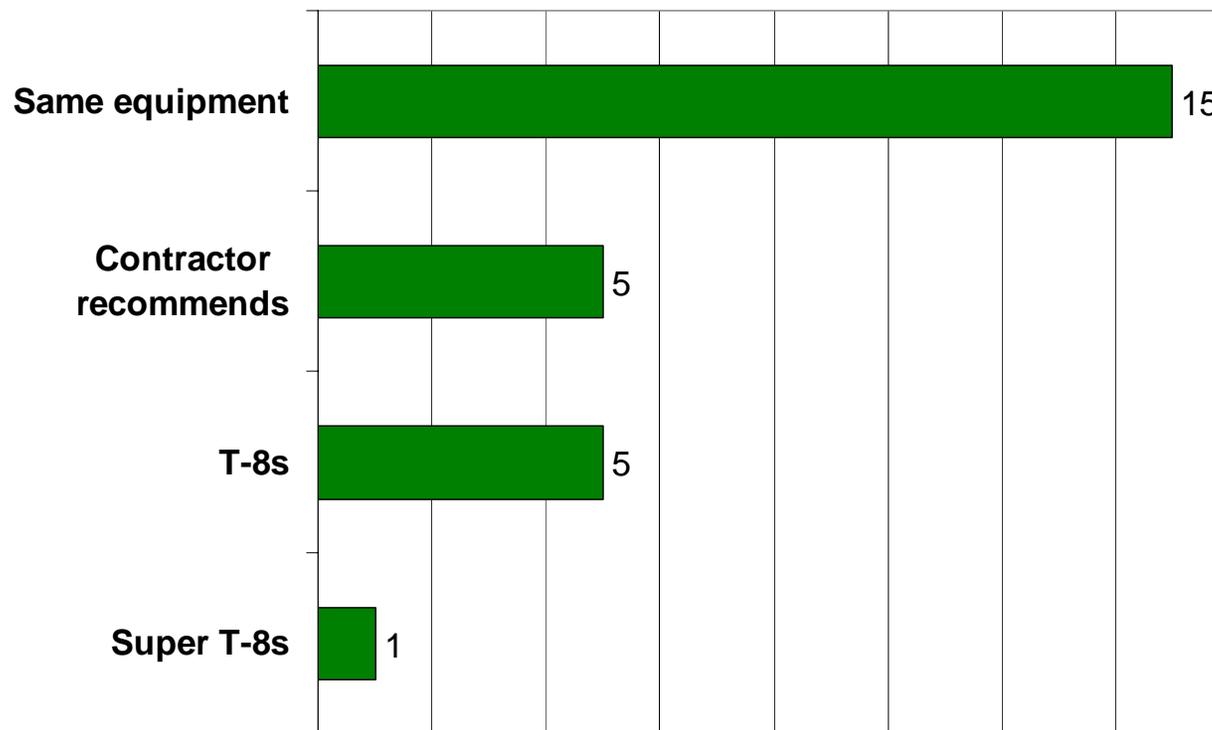
- Most fluorescent tubes are T-12s
- Low penetration of LED exit lights

Majority of Existing Lighting (n=26)



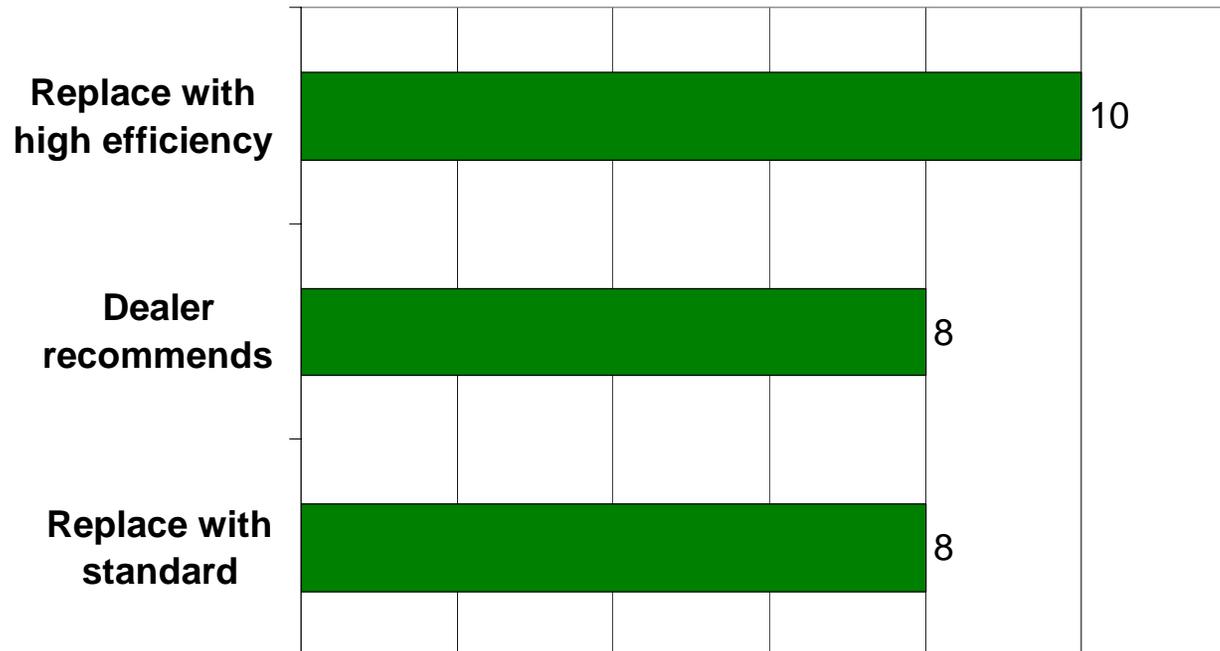
Energy Efficiency: Baseline Practices

Fluorescent Lighting Replacement Practice



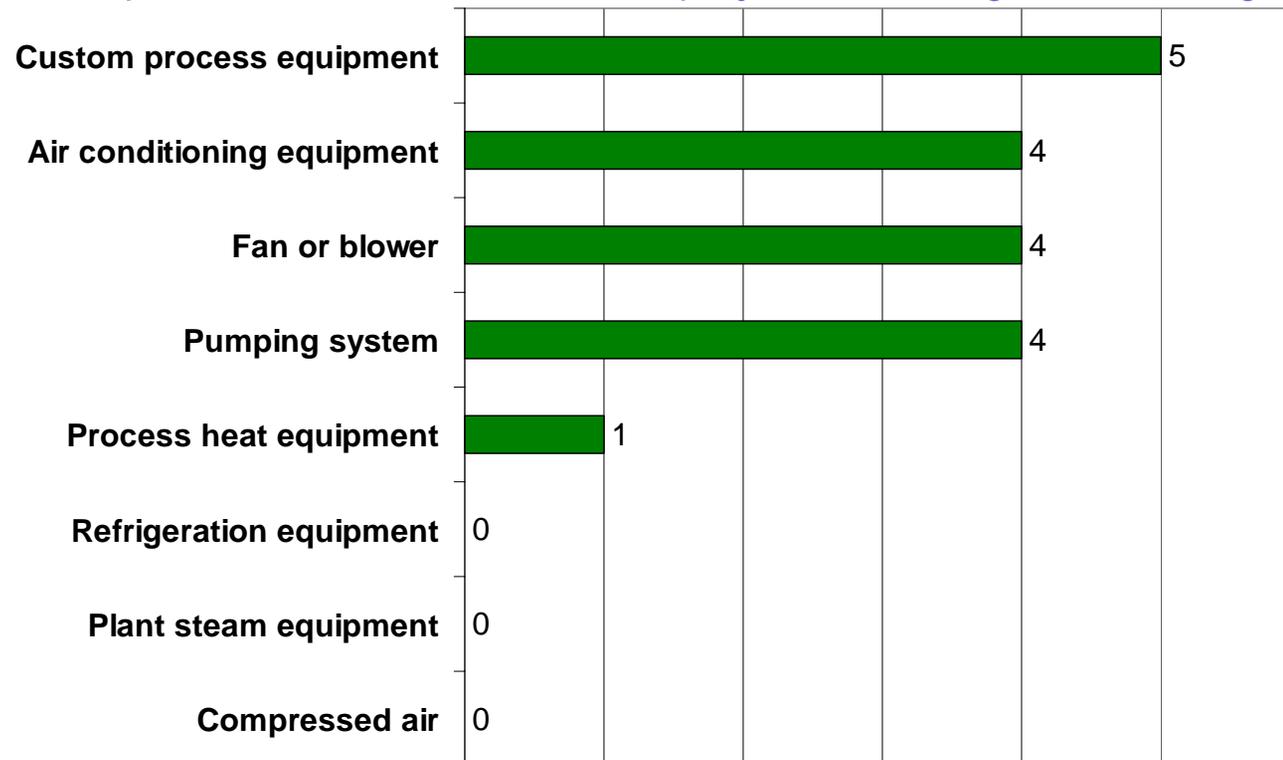
Energy Efficiency: Baseline Practices

Motors Replacement Practices



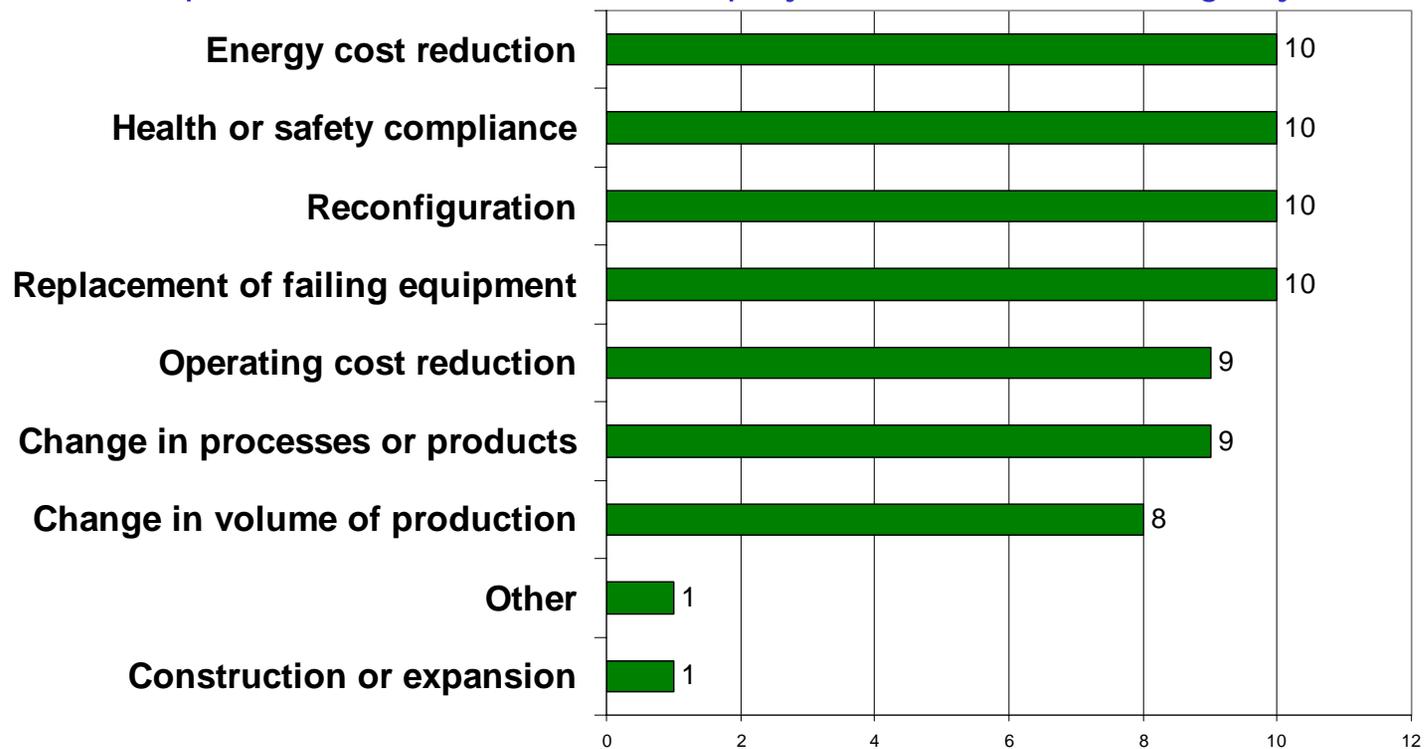
Recent Construction & Renovation: Systems Addressed

12 of 27 respondents invested in \$10k + projects affecting the following systems:



Recent Construction & Renovation: Objectives

12 of 27 respondents invested in \$10k+ projects with the following objectives:

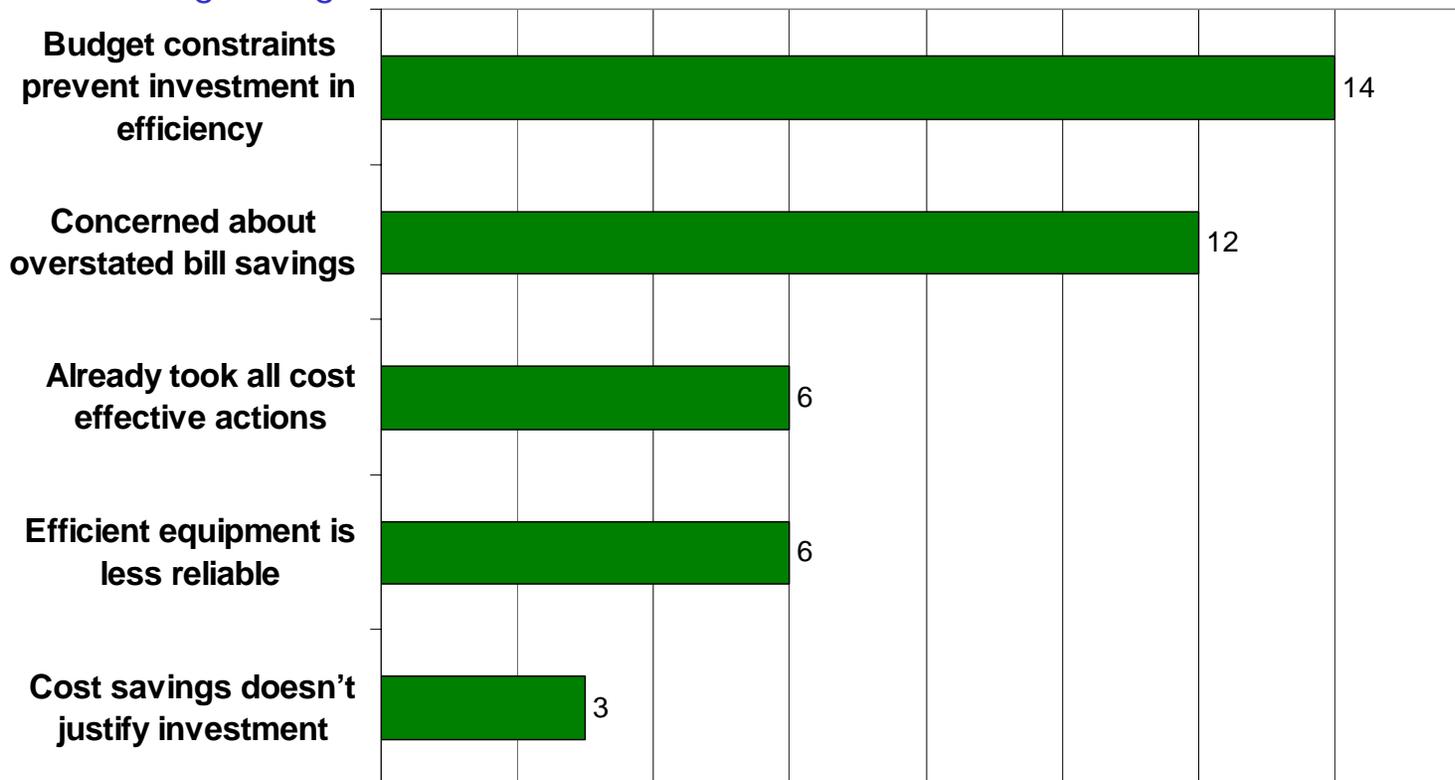


Energy Efficiency in Construction Projects: Influencers

- **Outside help.** Half use outside help to identify energy savings
- **Sources of assistance**
 - ❖ Government or utility energy efficiency programs (7)
 - ❖ Equipment dealers (4) or installers (4)
 - ❖ Consulting engineers (2)
 - ❖ Equipment manufacturers (1)
- **Awareness of Focus.** 18 of 27 aware
- **Use of Focus.** Very limited among respondents

Energy Efficiency Investment Barriers

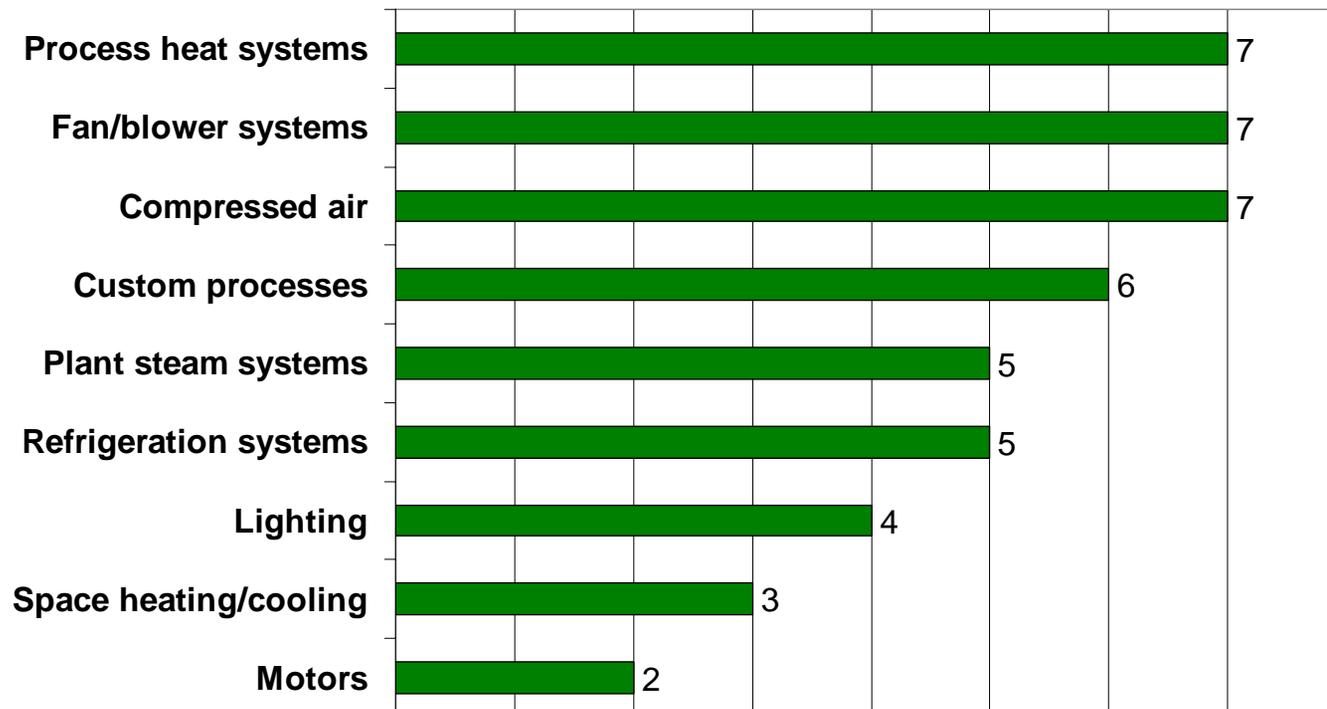
Number agreeing with statement:



Energy Efficiency in Equipment Replacement

- 20 respondents report having a "Replacement Policy" – all informal

Policies cover the following areas:



Key Findings & Program Implications

- Energy one of *many* concerns in industry
Opportunity to meet or complement other business objectives with energy efficiency. Identify opportunities to piggyback Focus onto environmental or economic development issues
In addition to cost savings, highlight other benefits of energy efficiency—more stable input costs, environmental benefits, reductions in labor (for some process improvements)
- Control of energy use not consistent
- Promote Practical Energy Management training among metal casters.
Most do not have energy savings goals or people assigned to manage energy costs.
- Frequent capital investment decision cycles
Increase awareness of Focus so that firms access the program when changes are being made
Opportunities for increases in lighting, compressed air, and motor efficiency (but small relative savings)
Opportunities for greater efficiency in processes—plant specific.

Potential Market Indicators: Metal Casting

Market Indicators	Baseline Indicators (percent of respondents)	
	Iron	NF Met
Awareness of Focus	58%	73%
Energy Management Practices		
Assigned staff to energy management function	75%	20%
Have stated energy savings goals	42%	27%
Track energy use at the facility level	67%	33%
Qualify potential investments by costs and savings	58%	27%
Replacement & Maintenance Practices		
Upgrade lighting on replacement	17%	40%
Compressed air leak detection once in 2 years	n/a	67%
Investments in Energy Using Equipment		
Projects >\$10,000 in past 3 years (B3) ¹	58%	47%
EE investment to at least one system ²	83%	86%
EE investment to more than one system ²	33%	29%
EE investment to at least one non-lighting system ²	33%	71%
Received Focus services for recent project ²	0%	43%

¹ Percentage of all businesses

² Percentage of businesses with investments in energy using equipment. self reports.

Notes on Investment Market Indicators

- based on self reports of specific actions taken (see questions b3e-b3l)
- all energy efficient investments may not be eligible for Focus on Energy services



Agricultural Sector



Methodology & Sampling

- Secondary Research
- CATI survey – February 2005
- CATI survey with dairy farmers in 3 of the 5 largest dairy producing counties—Marathon, Dane, and Grant
- SIC codes – 0241

	Employment	# of Dairy Farms	Completed Surveys
Small 1-2 emp.	1184	784	19
Medium 3-9	948	238	51
Large 10+ emp	250	19	40
Total	2382	1041	74

Structure of the WI Dairy Sector

- Dominated by small to mid-sized dairy farms
 - ❖ 50% of WI dairy farm employees are on small farms (1–2 employees)
 - ❖ 40% on mid-sized farms (3–9 employees)
 - ❖ Only 10% of WI farm employees are on large farms (10+ employees)
- Herd sizes
 - ❖ Small farms — average 88 cows
 - ❖ Medium farms — average 188 cows
 - ❖ Large farms — average 1,045 cows

Business Objectives & Challenges

- Record milk prices in 2004
 - ❖ Product of high demand and tight supply due to industry consolidation
- Average herd size is increasing
 - ❖ From 1980 to 2004 average herd size has increased from 40 to 75 COWS
 - ❖ Number of herds with <100 cows expected to decline by 28–48% by 2009
 - ❖ Number of herds with >200 cows expected to increase 27–65% by 2009
- Exits from dairy industry is slowing slightly
 - ❖ WI lost 100 milking operations each month from 1993–2001
 - ❖ In 2004 it lost ~50 milking operations each month

Trends in Facility Investments

- Only 5% of small dairy farms and 17% of mid-sized dairy farms plan to expand operations in next 2 years
 - ❖ Concerns that current record milk prices won't continue is restraining expansion
 - ❖ Depressed milk prices during 2000-2003 also hurt farm cash flow
- However, the use of milking parlors is expected to increase—especially among mid-sized dairy farms

Capital Investment Decision Making

- Only 21% have regularly scheduled capital budgeting process
- 42% do not use any financial criteria to evaluate projects
 - ❖ 29% use return on investment—40% is minimum acceptable return on investment
 - ❖ 25% use simple payback—longest acceptable payback is ~5 years
- Most (75%) use same criteria for cost-reduction projects as they do for projects designed to increase revenue/production

Energy Management: Goals & Functions

- Few small farms are tracking energy usage
- Medium farms are better, but more than half do not track energy

	Small	Medium
Track energy use/ costs of whole facility?	16%	43%
Monitor energy use for key building or production systems?	11%	35%
I.d. facility improvements to reduce energy use/ costs?	32%	59%
Qualify potential EE improvements in terms of costs and ROI?	41%	63%
Energy cost reduction goals for farm?	26%	41%

Energy Efficiency: Baseline Lighting

- High prevalence of incandescent lighting in barns
- High prevalence of mercury vapor lighting in exterior
- Not much use of lighting controls

Key Indicators of Baseline Lighting Efficiency

	Small	Medium
Interior Lighting		
Have incandescent lighting in barn	51%	45%
Have fluorescent lighting in barn	41%	49%
Use long day lighting schedules in barns?	32%	47%
Have indoor lighting controls	8%	22%
# of hours/day keep barn lighted	17	15
Exterior Lighting		
Have mercury vapor exterior lighting	53%	42%
Have sodium vapor exterior lighting	24%	23%
Have incandescent exterior lighting	35%	28%

Energy Efficiency: Baseline Ventilation

- HVLS fans are most common ventilation system
- But only 1/3 of small-medium farmers have them

Ventilation System	Small	Medium
Tunnel	6%	6%
Box	0%	2%
HVLS fans	33%	37%
Curtain ventilation	6%	8%
Natural ventilation	22%	25%
Low-speed fan	28%	27%
Other	17%	27%

Energy Efficiency: Baseline Milking Equipment

- 84% of small farms and 59% of mid-sized farms have not installed nor expanded their milking system in over 10 years
- Most dairy farms (74%) using round-the-barn pipelines
- Low market penetration of VSDs on vacuum pumps
- Small farms lag behind in all energy efficiency measures

	Small	Medium
Use in-line coolers to pre-cool milk?	33%	54%
Use VSDs on vacuum pumps?	18%	32%
Use heat recovery systems on milk cooling compressors?	47%	61%

Energy Efficiency: Barriers

- Farmers are much less likely than those in the commercial sector to believe that they have done all cost-effective energy efficiency measures
- Budget constraints and concerns about overstated bill savings are biggest barriers

Respondents Who Agree or Strongly Agree with Barriers Statements

	Small	Medium
Have done all cost-effective energy efficiency	22%	18%
Savings not worth the added investment	32%	29%
Efficient equipment is less reliable	22%	22%
Budget constraints prevent investment in efficiency	61%	55%
Concerned about overstated bill savings	42%	43%

Energy Efficiency in Equipment Replacement

- When fluorescent ballasts fail, 50–59% of small/medium farmers replace with same equipment
- When motors fail, 61% of farmers replace it with what the dealer recommends

Equipment Suppliers

- General agricultural supply companies are major suppliers for a wide variety of energy-using equipment
- Specialty equipment dealers are big suppliers of milking equipment
- Electrical supply companies are biggest suppliers of lighting equipment

Equipment Type	General Ag. Supply Co.	Electrical Supply Co.	Specialty equipment dealer	Manufacturer rep	Other
Lighting equipment	33%	37%	14%	1%	15%
Space heating/cooling equipment	50%	10%	29%	2%	9%
Water heating equipment	36%	24%	13%	2%	25%
Milking equipment	46%	4%	47%	1%	1%
Electric motors	40%	27%	15%	6%	12%
Ventilation fans	57%	14%	13%	2%	14%

Focus on Energy

- Most dairy farmers (64%) are aware of Focus on Energy
- Roughly 1/3 of those aware “have taken part in programs or used services offered by Focus on Energy”
- Most participants have used financial incentives. Small farmers are less likely to get financial incentives but are the only ones reporting that they took part in training.
- The 3 most common measures addressed in Focus projects are
 - ❖ Variable speed drives – 44%
 - ❖ Efficient motors – 37%
 - ❖ Lighting – 22%

Key Findings: Dairy Farms

- Few have formal capital budgeting process
- Don't track energy use—especially small farmers
- 84% of small farms and 59% of mid-sized farms have not installed nor expanded their milking system in over 10 years
- Purchase much of their equipment, including HVAC, water heating, and lighting from general agricultural supply dealers
- Rely on dealers for motor replacement decisions
- Value energy efficiency, but budget constraints and perception that energy prices are not high enough restrain action
- Large energy efficiency potential
 - ❖ Heat recovery systems on milk cooling compressors and in-line coolers to pre-cool milk are the only energy-efficient measures with significant market penetration
 - ❖ A lot of incandescent lighting, mercury vapor lighting still in place

Program Implications: Dairy Farms

- Work with agriculture supply companies directly to promote energy efficiency
 - ❖ These companies must have knowledge and supply of energy-efficient equipment to reach a large portion of the dairy farm sector
 - ❖ Farmers often defer to suppliers/dealers on equipment decisions
- Greatest opportunities may be in upgrades to existing equipment upon failure or planned replacement. Limited opportunity to piggy-back onto other dairy farm projects. Ongoing decrease in number of milking operations and limited plans to expand milking operations indicate little potential for major capital investments.
- Educate farmers about relative energy costs with benchmarking information
 - ❖ Few farmers track energy consumption
 - ❖ Many do not use financial criteria to evaluate projects
 - ❖ Believe energy prices are not high enough to justify action
- Untapped potential for interior lighting upgrades and VSDs on vacuum pumps
- Measures that increase cow comfort, for example HVLS fans, may have instant appeal

Potential Market Indicators: Agriculture

Metric	Market Segment			
	Small	Medium	Large	All
Awareness of Focus (E1)	63%	64%	100%	64%
Energy Management Practices				
Have stated energy savings goals (B3)	26%	41%	25%	30%
Track energy use at the facility level (B1A-1)	16%	43%	50%	23%
Qualify potential investments by costs and savings (B4A_4)	41%	63%	75%	47%
Replacement Practices				
Upgrade fluorescent ballasts on replacement (F15)	6%	6%	25%	6%
Upgrade motors on replacement (F16)	11%	18%	33%	13%
Percent Dairy Farms Using Focus on Energy (E1A)	27%	47%	33%	32%