Carbon, Energy & Climate Conference

W.K. Kellogg Biological

On-Farm Energy Audits: Efficiency and Savings

MI Farm Energy Audit Program

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MICHIGAN AGRICULTURAL ELECTRIC COUNCIL

BAE
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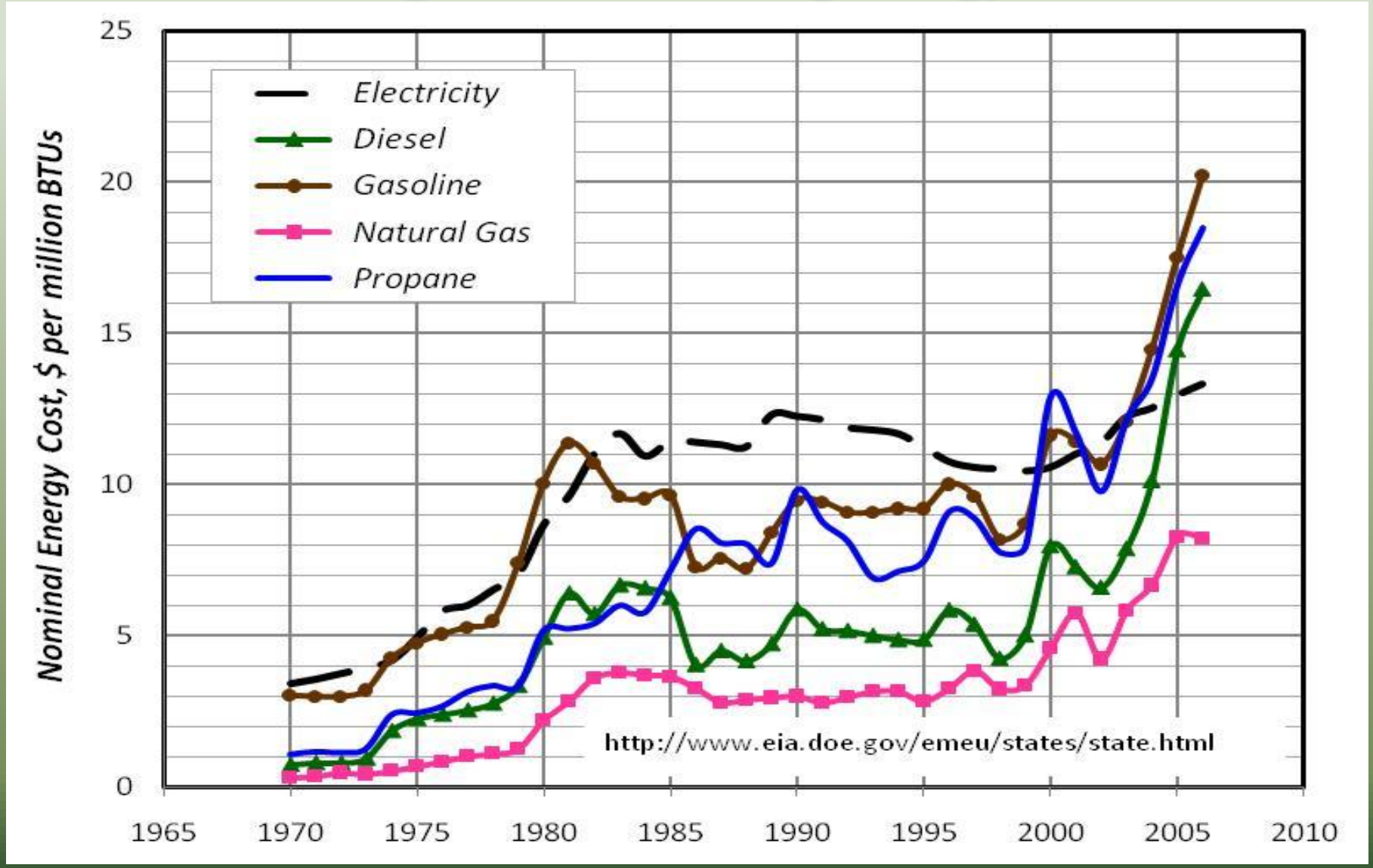
Michigan Surge of Energy Costs

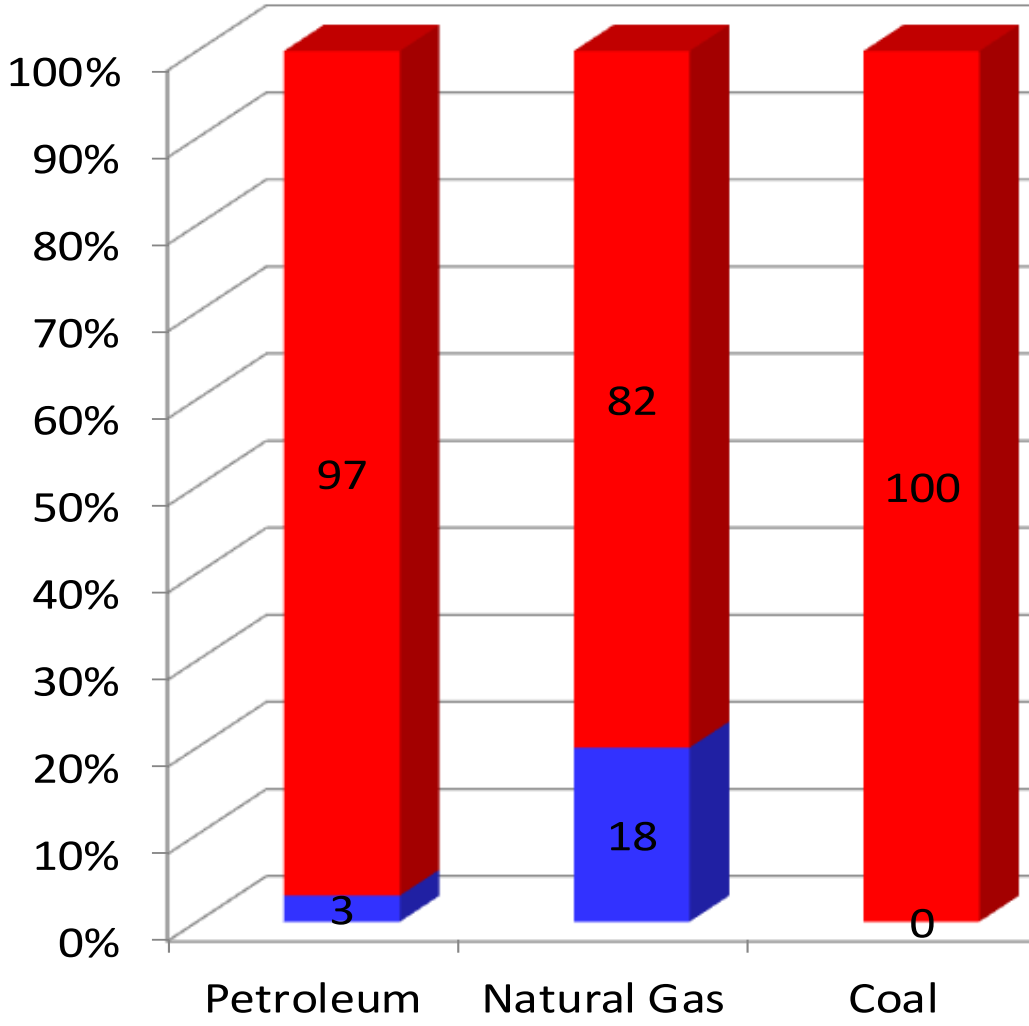
How it got stated – Rising Energy Costs



North Central Region SARE Grant, 2011

Michigan Energy Sources

We got hit hard – Net energy importer



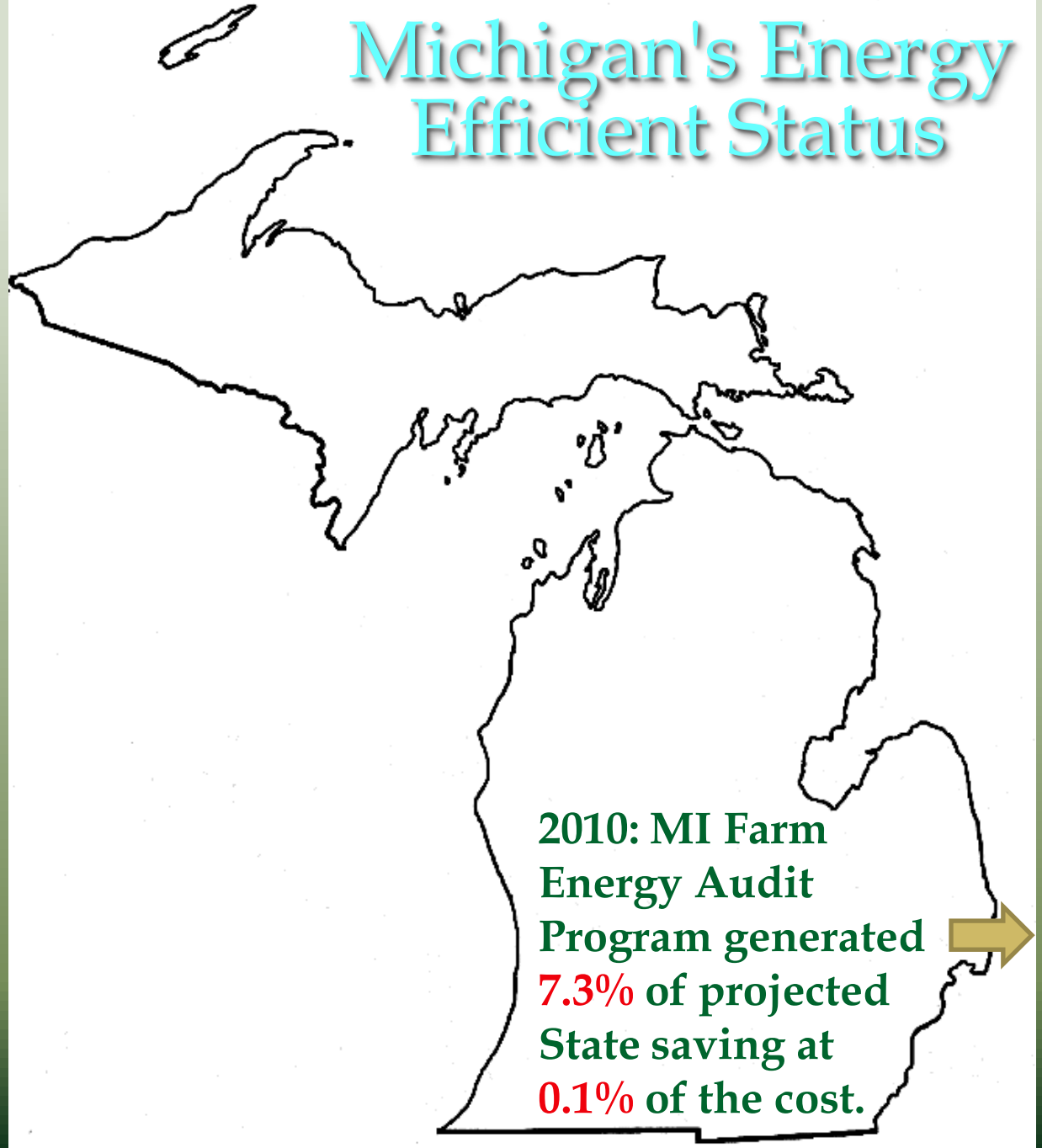
Currently, over $23 billion flows out of Michigan annually to pay for fuel, coal, and other sources of energy to power the state.

Imports
MI Source

MICHIGAN'S LEADING INDUSTRIES

- Manufacturing
- **Agriculture** ($74B)
- Tourism
- Services
- Forestry & Lumber

Michigan's Energy Efficient Status



2003-2006: Bottom 5 States in USDA-REAP energy efficiency projects.

2011: Top 5 States in USDA-REAP energy efficiency projects.

2010: Most improved energy efficient State. Up to #17, from #27 in 2009 (ACEEE – 10/20/11).

Spent $91.5 M in energy efficiency promotion programs with a projected savings of 410M KWh.

MI Farm Energy Audit Program

Dairy (MMPA, DFA)
Greenhouse (Univ. of Wisconsin)
Irrigation (Univ. of Nebraska)
Grain Drying (Purdue University)
Poultry
Hogs
Others
Rural Businesses
Renewable Energy Assessment

What is a Farm Energy Audit?

A Farm Energy Audit is an essential management tool in developing a comprehensive energy plan for your farm or rural business.

- It can pinpoint areas for reducing energy costs and energy use.
- It helps prioritize implementation projects based on energy efficiency improvements, payback period, capital outlay or implementation duration and complexity.
- A farm energy audit can also improve operational efficiency as well as identify potential areas for renewable energy application.
- Certified Farm Energy Audits are required for participation is State, Federal and Utility energy efficiency programs.

Not All Energy Audits Are The Same

Energy Audits

1. **Farm/Rural Business Energy Audit** **(PE, CEM, State Certified Auditor)**

   ANSI/ASABE S612 (July 2009) – level I & level II
   MI Farm Energy Audit Program
   http://maec.msu.edu/farmenergy

2. **Industrial/Commercial Energy Audit** **(PE, CEM)**
   Industry Standards – level I, II, III

3. **Home/Residential Energy Audit**

   BPI
   RESNET
   Homeworks w/ Energy Star

Expectations On Our Energy Audits

An energy audit is an important management tool. However, implementation of the recommended ECM's to save energy or increase productivity is the ultimate goal.

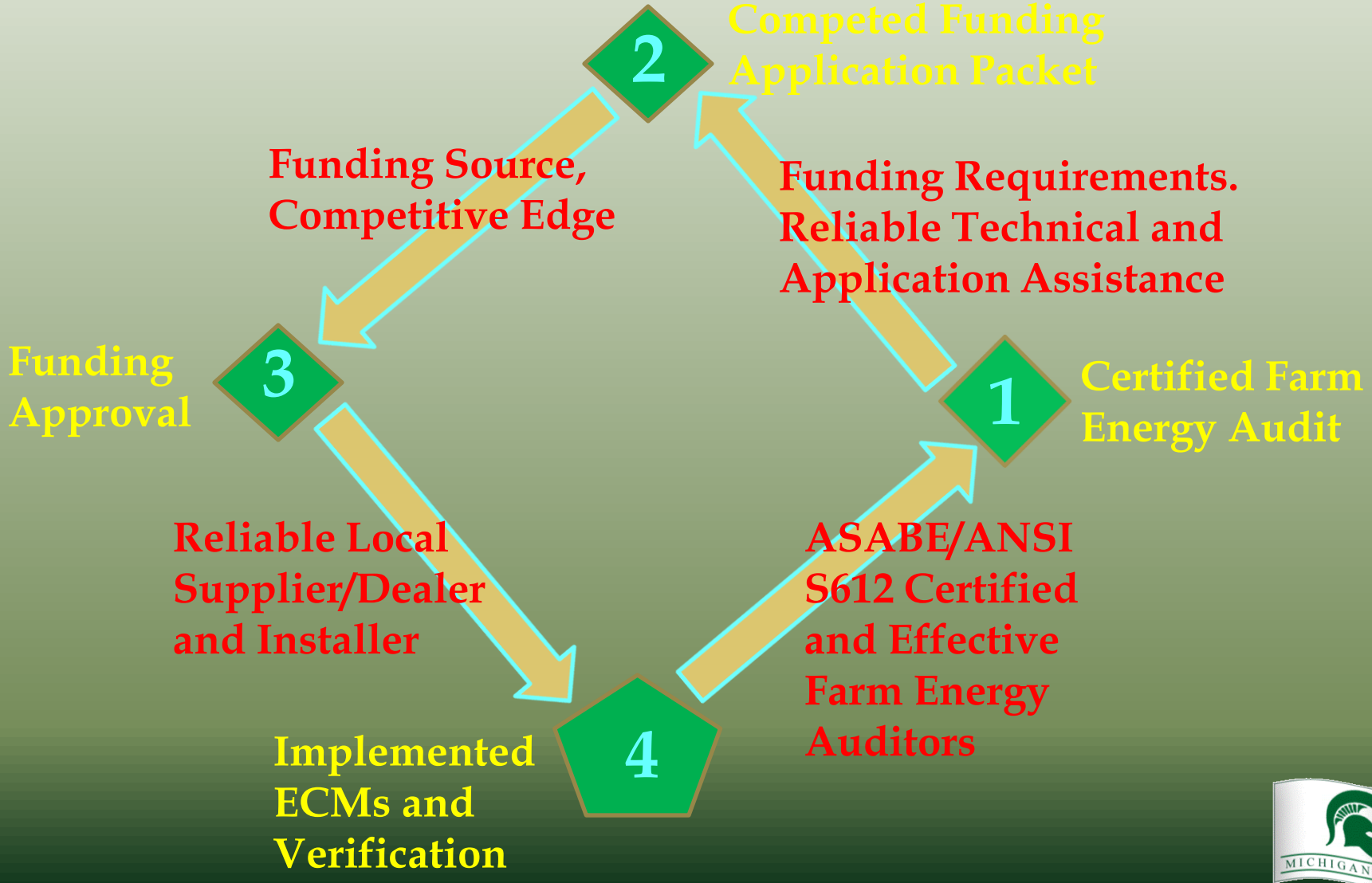
It integrates mgmt.'s preferences and uses a "whole enterprise" approach in developing ECM's or operational adjustments.

An energy audit must be conducted on-site by the certified auditor. Remote auditing via surveys/questionnaires or third party representatives (despite training) does not adequately capture the management and operational/situational uniqueness inherent in all enterprises.

We strive to develop energy audits that attain tier II level standards based on the ASABE and ANSI standards for farm energy audits.

Integration of Federal, State and Utility funding options. Auditor and farmer feedback.

Bottlenecks for Farm Energy Efficiency Implementation



Selling Points For A Tier II Farm or Rural Business Energy Audit

Selling Point #1:

Reduced Energy Costs/Increased Profits

2010 Energy Audits and Renewable Energy Assessment

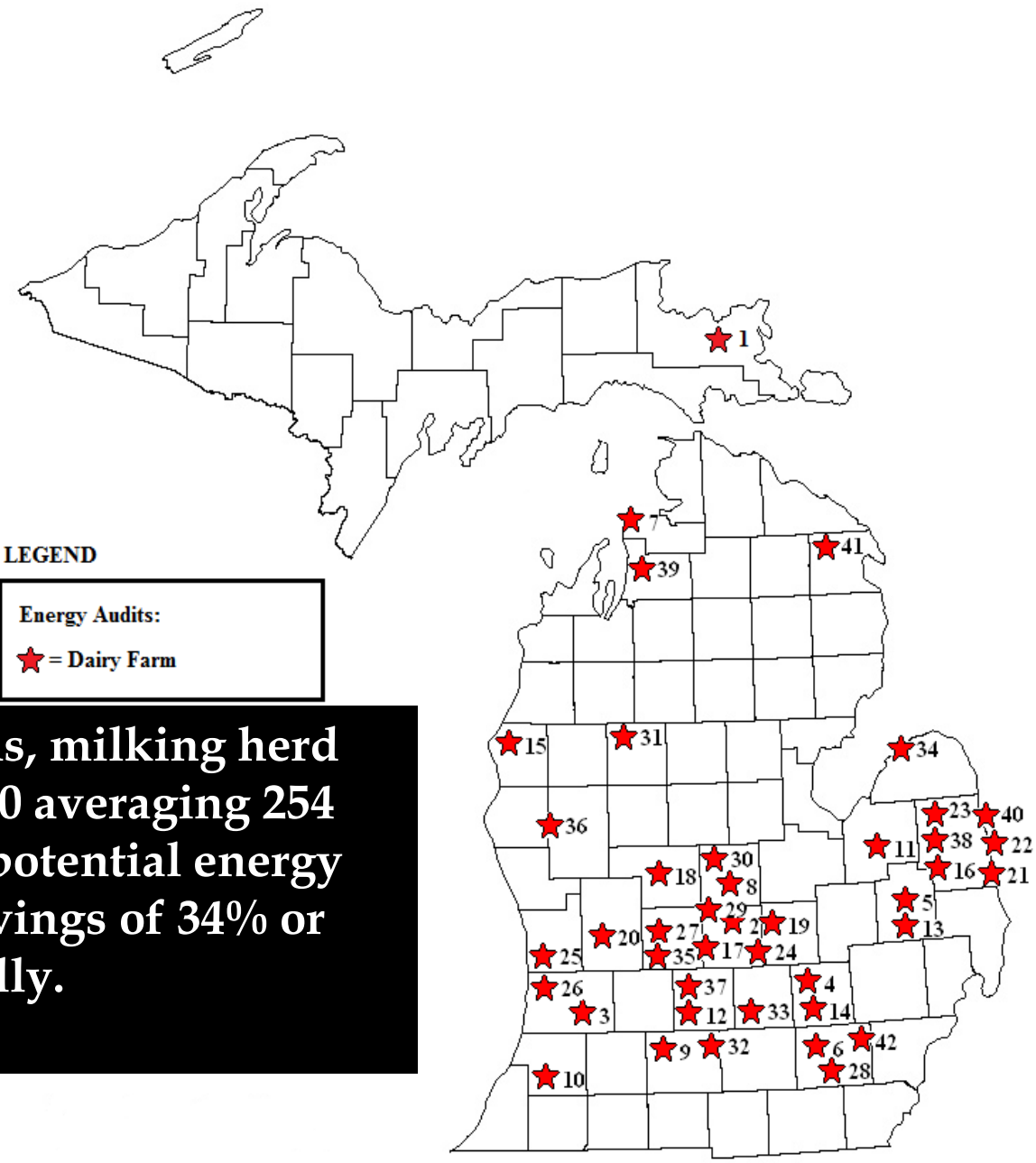
	2010	Totals (includes electric and fuel)		
No	Operation	Savings (kWh)	Dollar Equivalent	Average Savings
41	Dairy Farms	2,684,923	$293,046	$7,147
6	Greenhouse	5,406,067	$605,335	$100,889
7	Grain Drying	772,772	$111,352	$15,907
7	Miscellaneous	1,103,048	$64,461	$9,209
12	Rural Business	2,037,030	$205,573	$17,131
12	Renewable Energy	18,229,425	$478,525	
85	Total	30,233,266	**$1,758,293**	

2011 Energy Audits and Renewable Energy Assessment

	2011	Totals (includes electric and fuel)		
No	Operation	Savings (KWh)	Dollar Equivalent	
24	Dairy Farms	1,447,272	$167,425	$6,976
9	Greenhouse	8,652,103	$860,316	$95,591
6	Grain Drying	778,055	$88,650	$14,775
8	Miscellaneous	559,684	$56,897	$7,112
8	Rural Business	9,971,598	$945,323	$118,165
21	Renewable Energy	576,560	$292,026	
76	Total	21,985,272	**$2,410,637**	

Michigan Farm Energy Audit Results (Dairy)

Michigan Farm Energy Audit Program



53 dairy farms, milking herd size 35 to 3200 averaging 254 cows with a potential energy efficiency savings of 34% or $7,084 annually.

Energy Use in MI Dairy Farms

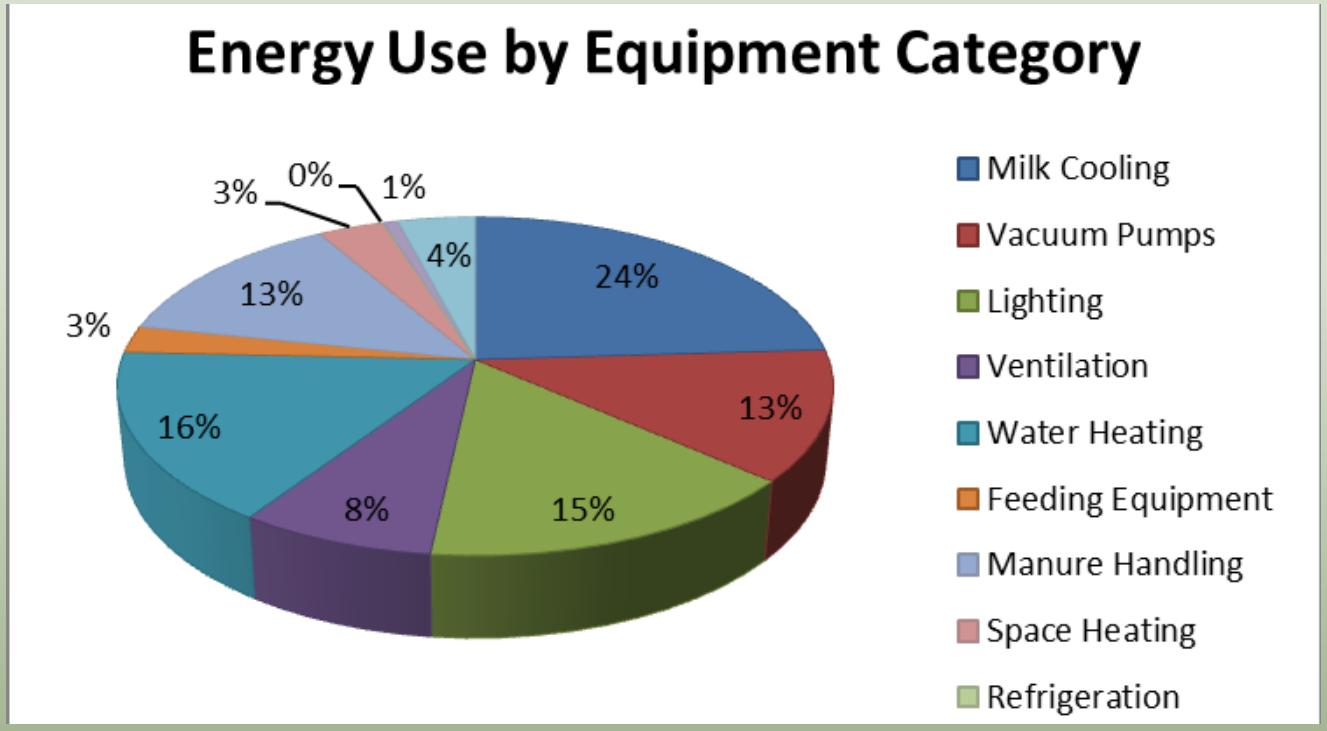
- **Milking herd size from 35 to 3200 averaging 254 cows with a potential energy efficiency savings of 34% or $7,084 annually.**

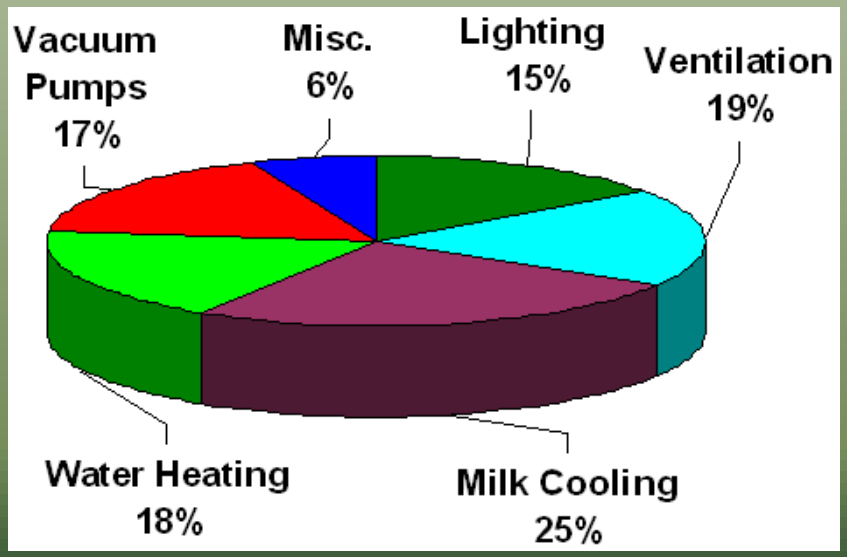
- **Average milk production per cow - 24,703 pounds/cow/yr. (18% greater than the 2010 USDA average)**

- **The top six categories represented 89% of all energy consumed on the audited farms. The were milk cooling, water heating, lighting, manure handling, vacuum pumps, and ventilation.**

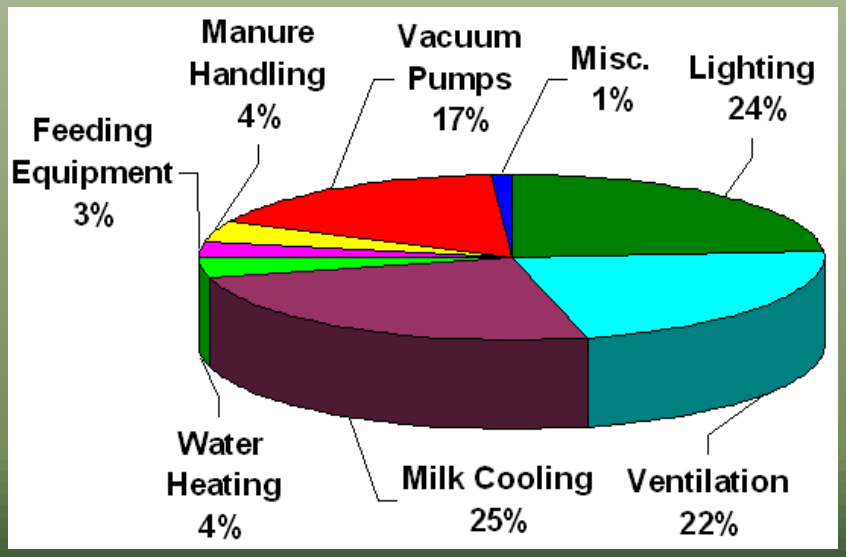
- **Over half of the farms audited had recommendations to conserve energy in lighting, milk cooling, water heating, and vacuum pumps.**

Michigan, 2011



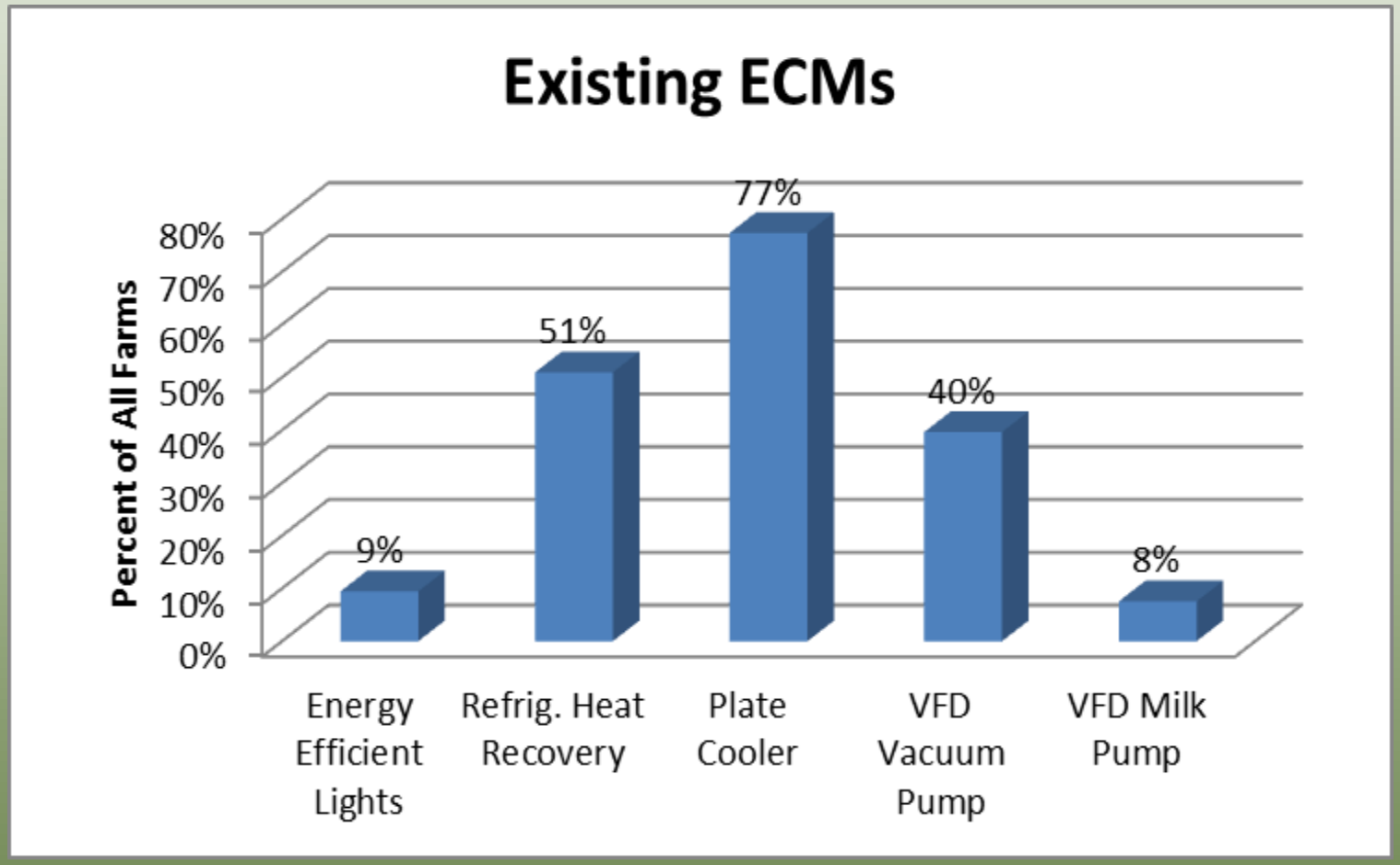


Wisconsin, 2003



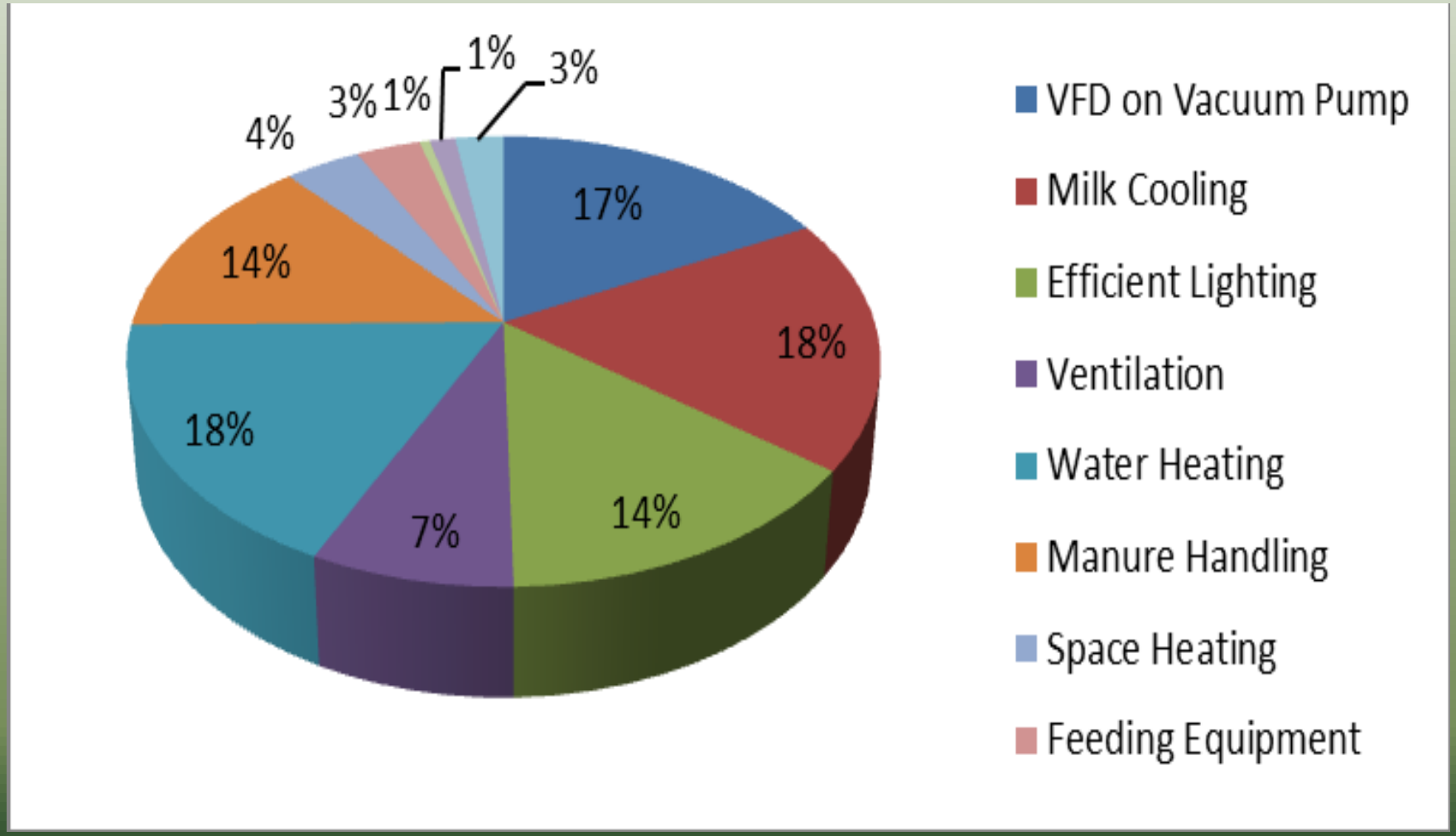
New York, 2003

Existing Energy Conservation Measures

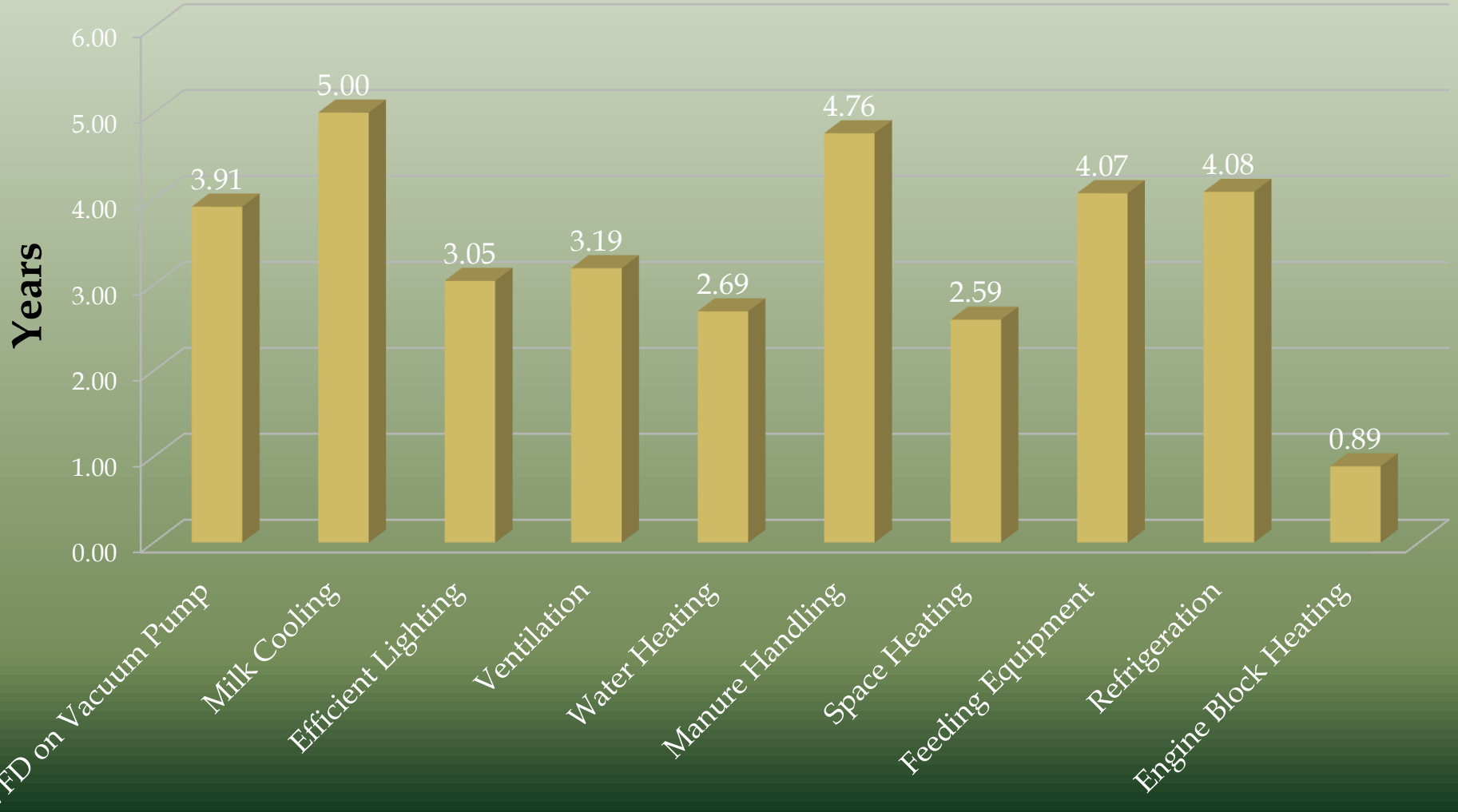


The most prevalent ECM in place for all the audited farms was milk plate pre-coolers (77%), followed by refrigeration heat recovery (51 %) and VFD on the vacuum pump (40%).

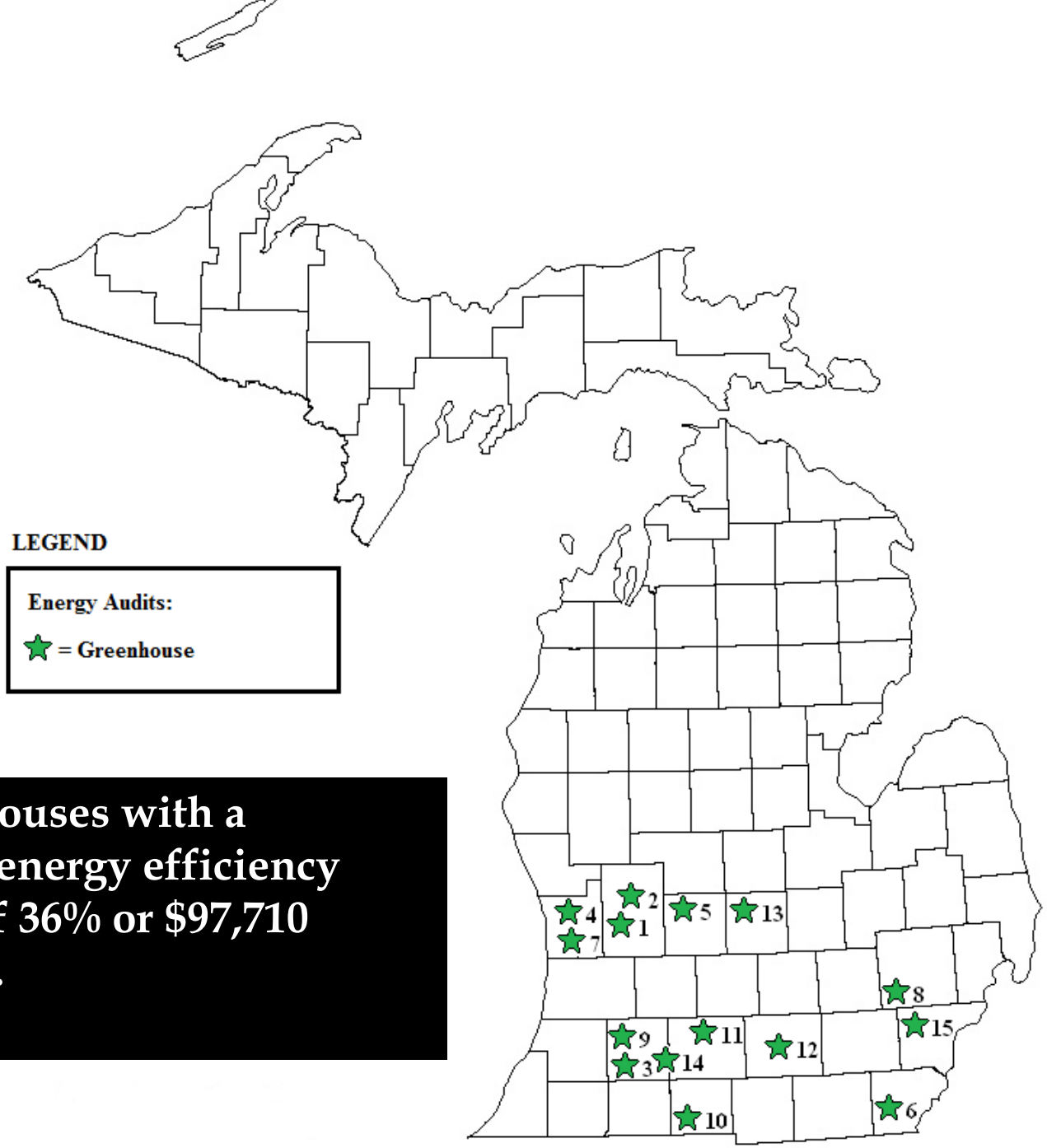
Energy Use by Category



Average Payback for Proposed ECMs (Dairy)



Michigan Farm Energy Audit Results (Greenhouse)



15 greenhouses with a potential energy efficiency savings of 36% or $97,710 annually.

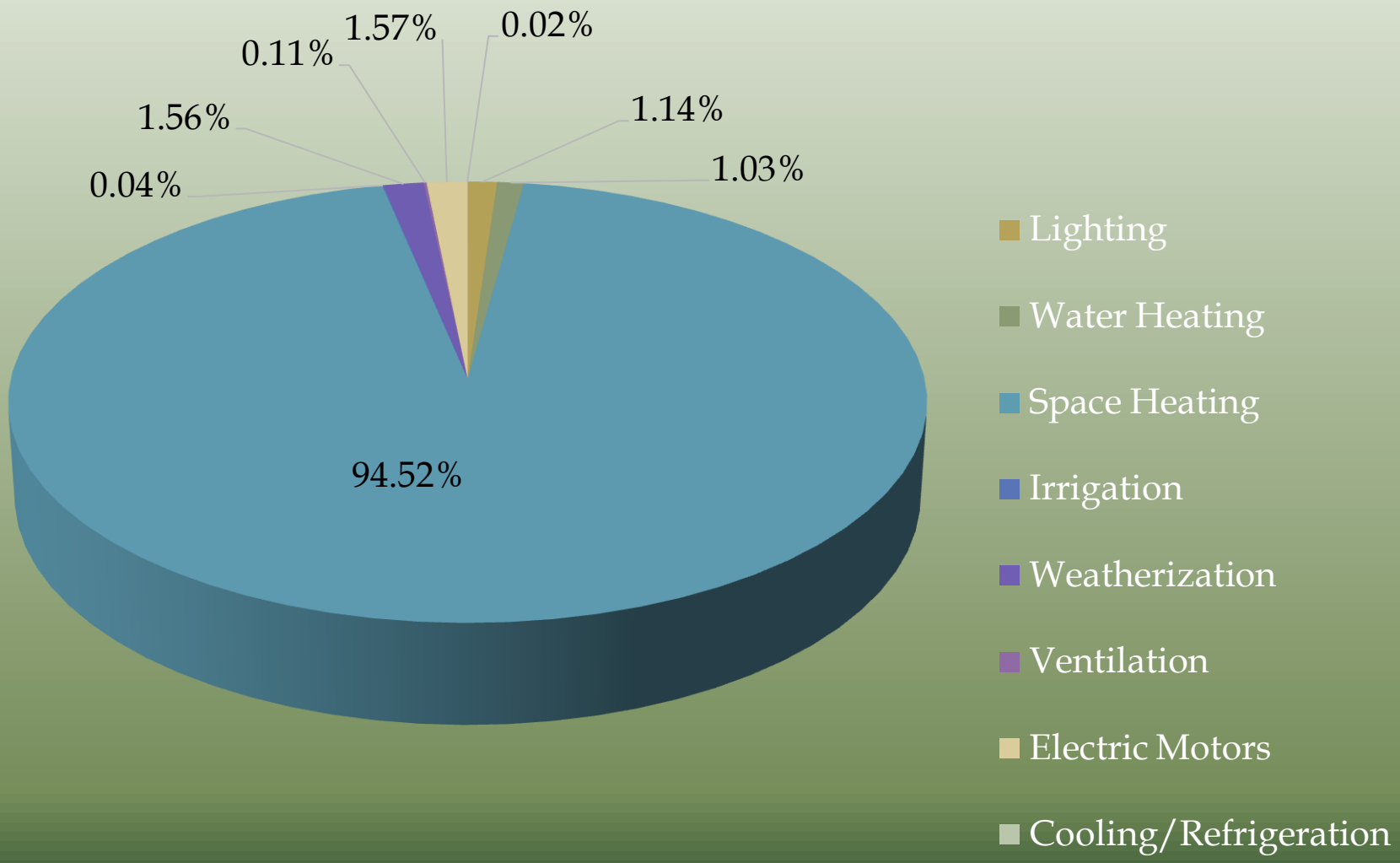
Energy Use in MI Greenhouses

- **Potential energy efficiency savings of 36% or $97,710 annually.**
- **The top six categories represented 99% of all energy consumed on the audited greenhouses. The were space heating, electrical motors, weatherization, lighting, and water heating.**
- **Over half of the farms audited had recommendations to conserve energy in space heating and energy curtains.**

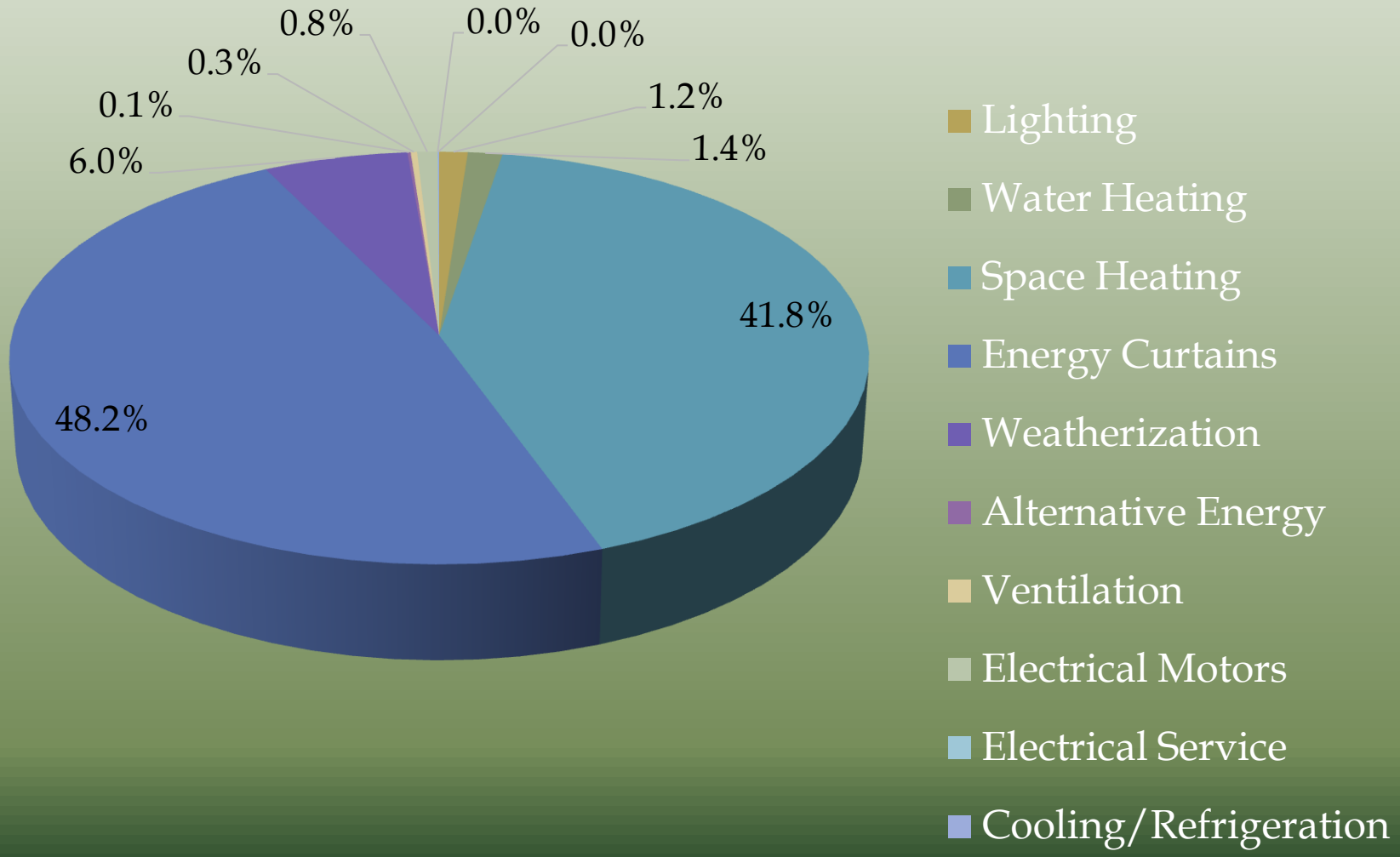
Energy Use on Michigan Greenhouses

Space Heating	(94 %)
Electrical Motors	(1.6 %)
Weatherization	(1.6 %)
Lighting	(1.2 %)
Water Heating	(1.0 %)
Ventilation	(0.4 %)
Irrigation	(0.2 %)

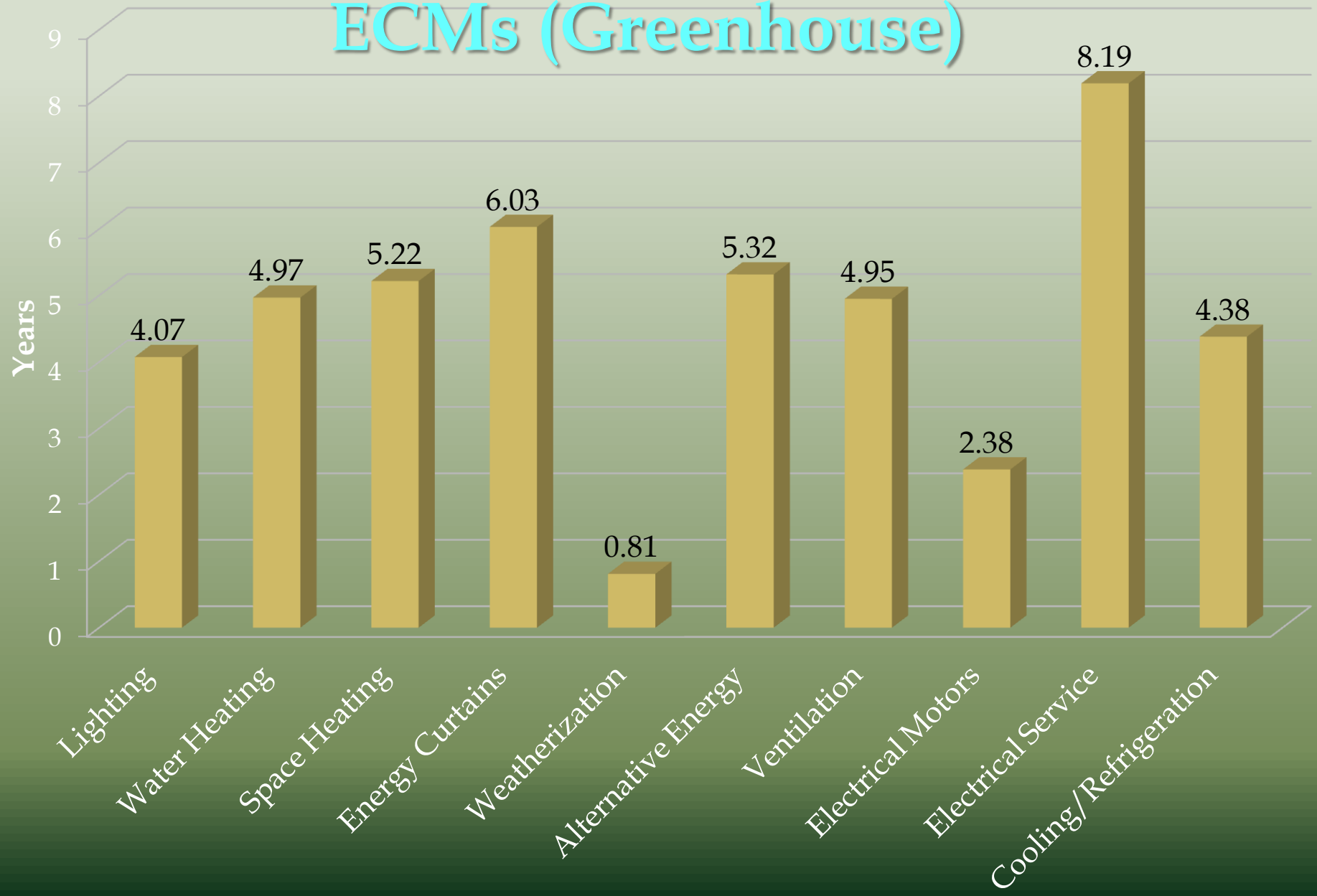
Energy Use by Category



Classifications of ECM Savings



Average Payback for Proposed ECMs (Greenhouse)

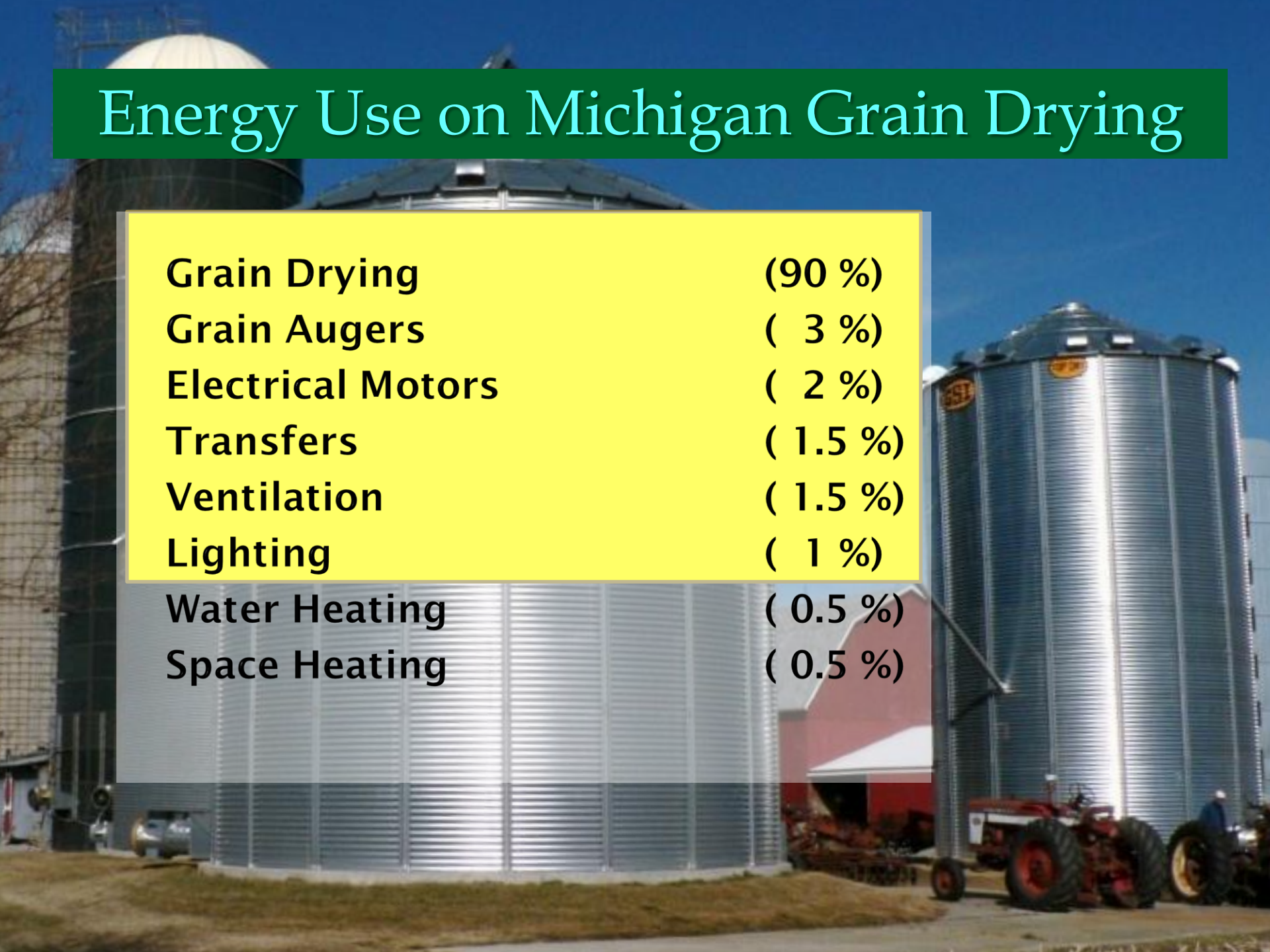


Michigan Farm Energy Audit Results (Grain Drying)

Energy Use in MI Grain Drying

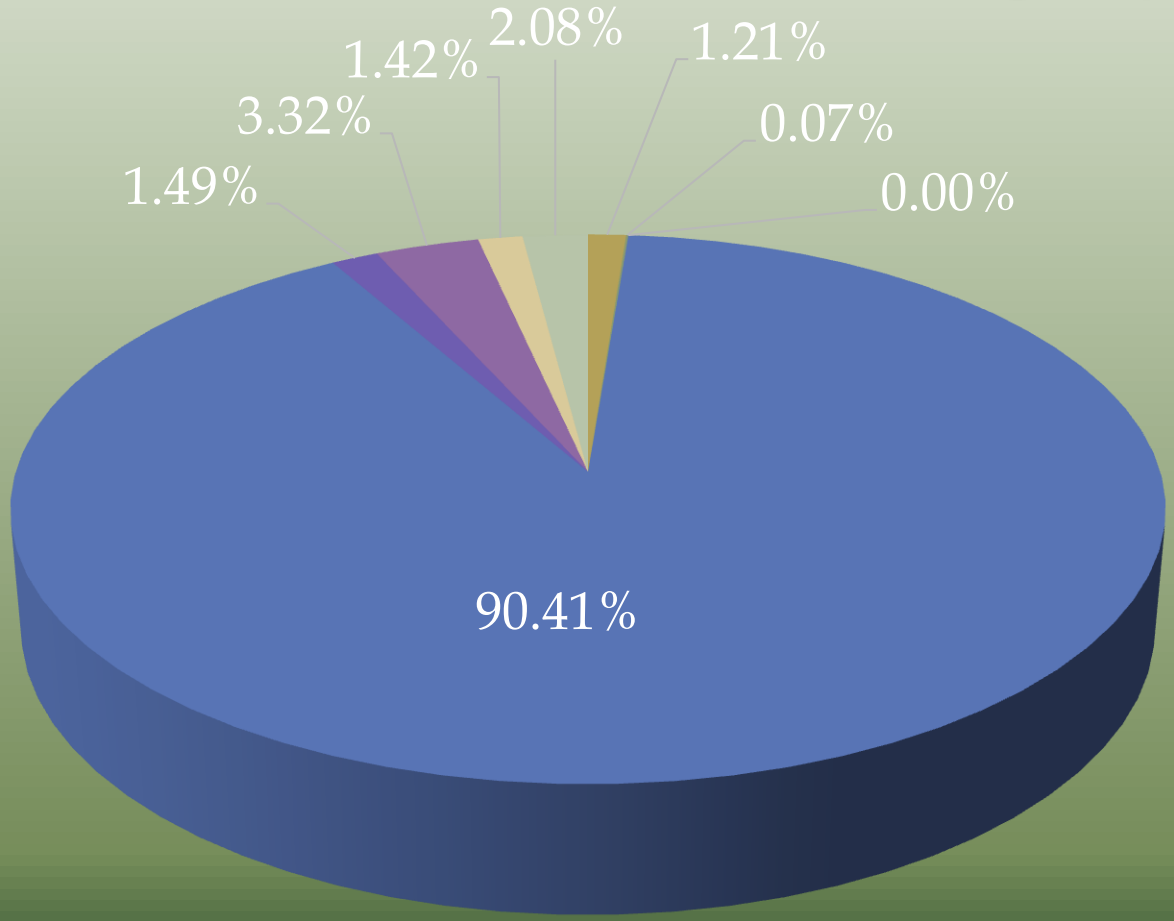
- **Potential energy efficiency savings of 26% or $12,951 annually.**
- **The top six categories represented 99% of all energy consumed on the audited greenhouses. The were grain drying, grain augers, electrical motors, transfers, ventilation, and lighting.**
- **Over half of the farms audited had recommendations to conserve energy in grain drying and lighting.**

Energy Use on Michigan Grain Drying

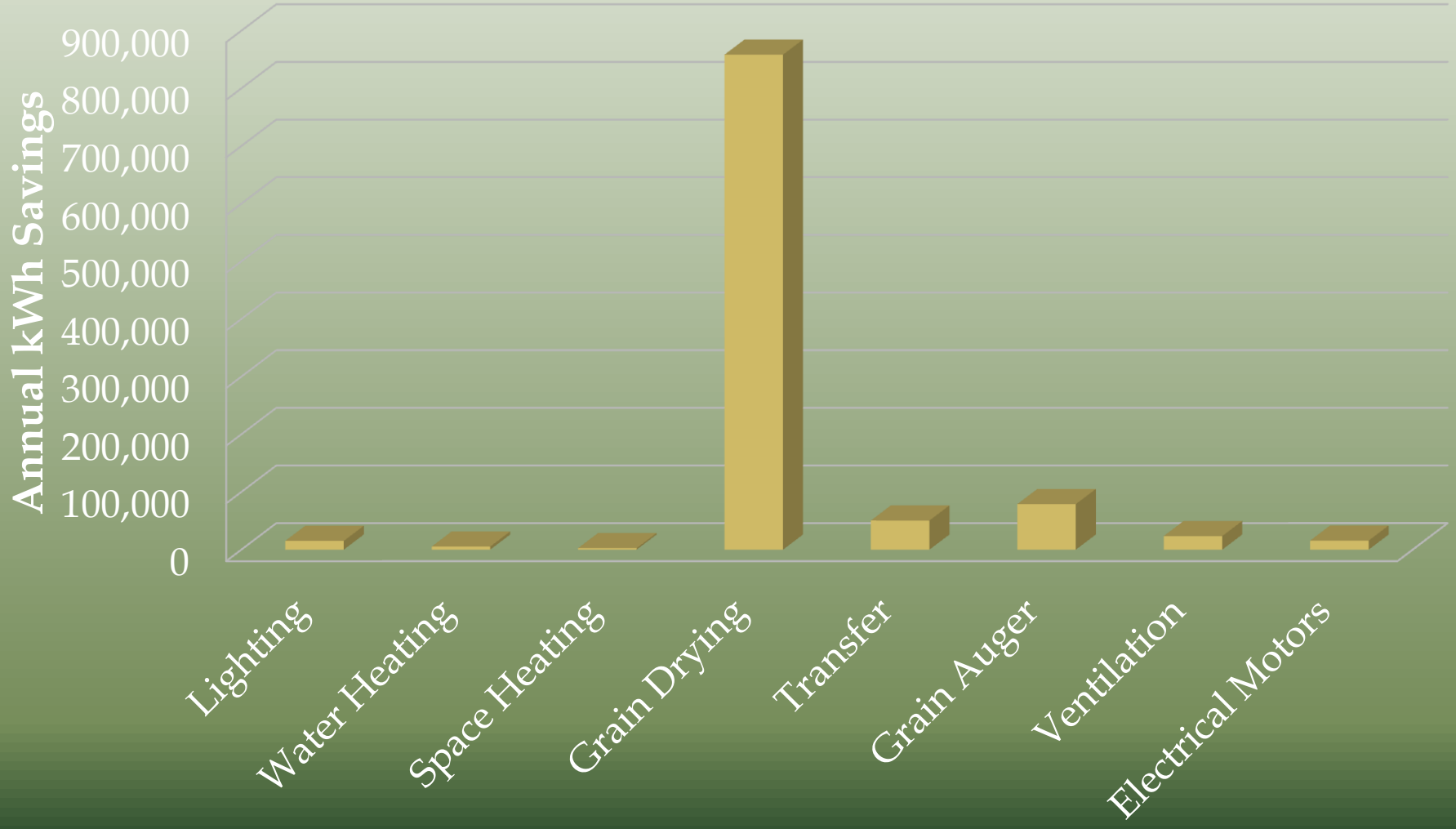


Grain Drying	(90 %)
Grain Augers	(3 %)
Electrical Motors	(2 %)
Transfers	(1.5 %)
Ventilation	(1.5 %)
Lighting	(1 %)
Water Heating	(0.5 %)
Space Heating	(0.5 %)

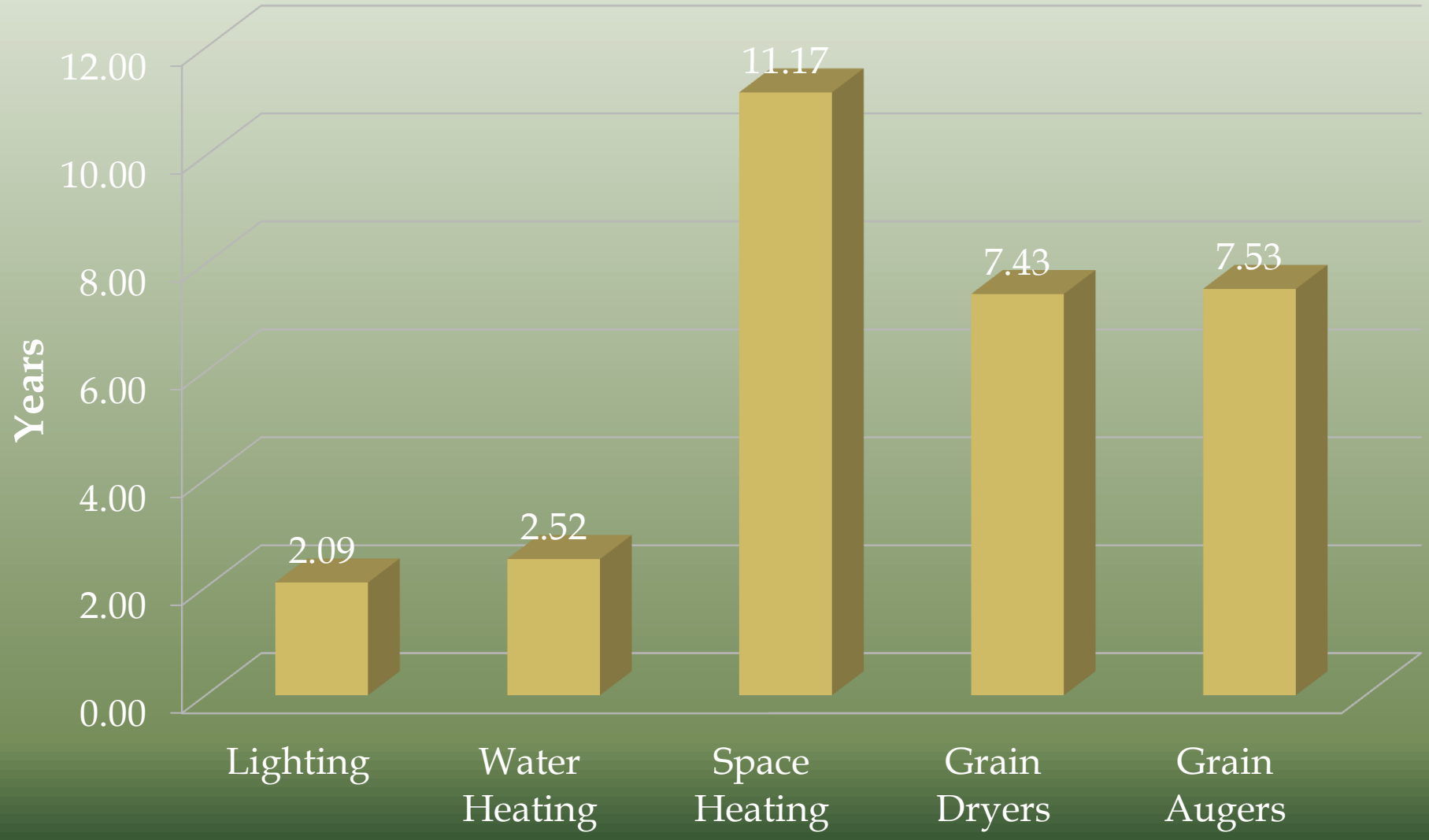
Energy Use by Equipment Category



Energy Savings for Recommended ECMs (Grain Drying)



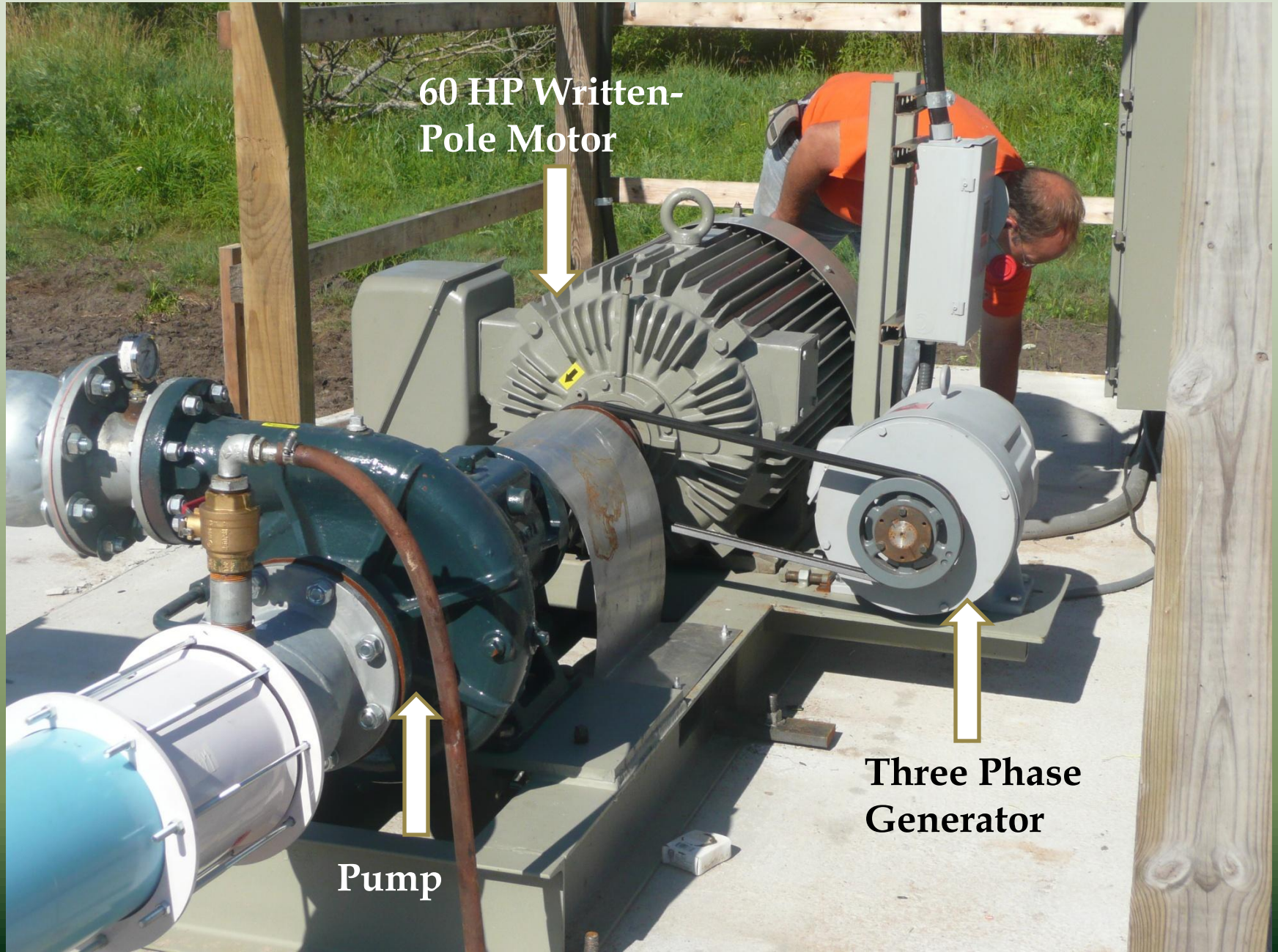
Average Payback for Proposed ECMs



Selling Point #2:

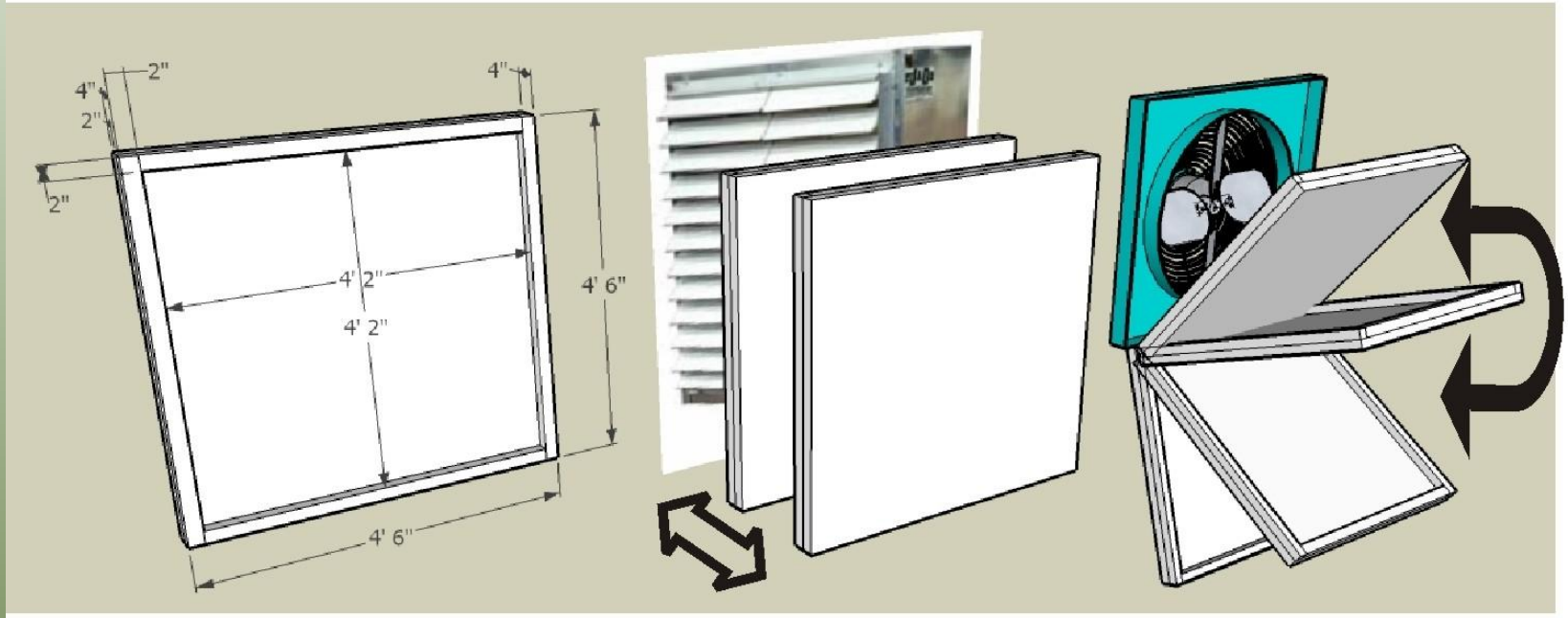
Operations Solutions by auditors who understand the farm operations.

Written- Pole Motors



Ventilation Vent Caps

Hardened-removal insulated fan-vent caps



Stock and
Custom sizes

Push on
To Latch

Flip up-down hinge
with Snap latch

Overheating motor on ventilation fan

The motor on the left ventilation fan was leaking oil and operating at 19.5°F greater than normal.

Selling Point #3:

Financially Options to Ease the Burden

$$$

Efficiency/Renewable Energy Funding

- USDA-REAP
- USDA-NRCS
- DOE/State Energy Agencies
- University Programs/Extension
- Utility Companies and Electric Coops
- State Agencies

Selling Point #4:

Reduce the Operation's Carbon Foot Print and Be Environmentally Responsive

Be Part of the 4TH Great Human Revolution

1. AGRICULTURAL
2. INDUSTRIAL
3. INFORMATION
4. ENERGY AUTONOMY

Be Green, Go Green

MICHIGAN STATE

MICHIGAN FARM ENERGY AUDIT PROGRAM

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