Michigan Energy Public Forum

April 12, 2013

Northern Michigan University

Don H. Bottum University Center

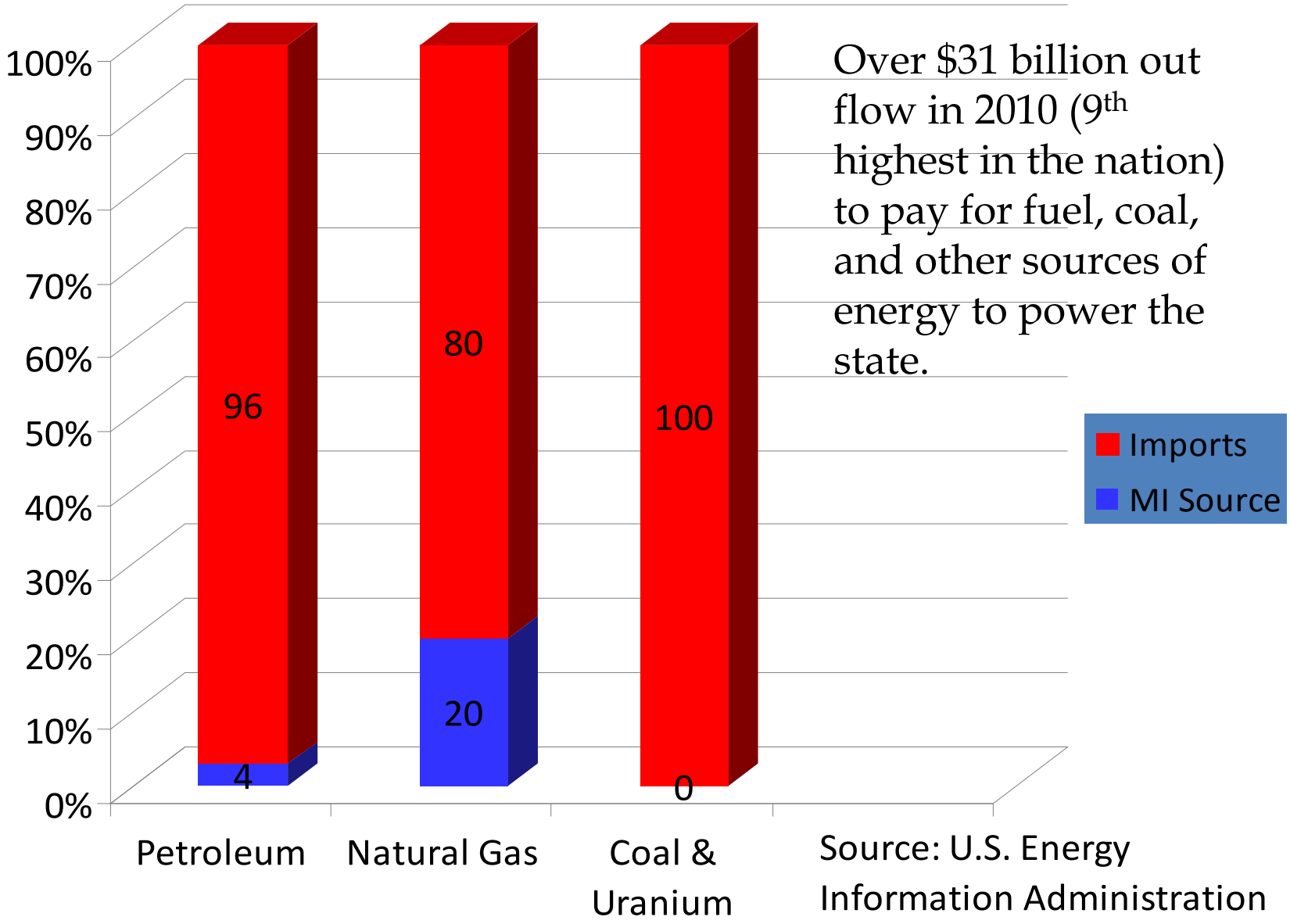
Michigan Agriculture

The Untapped Energy Efficiency Frontier

Aluel S. Go
Michigan Farm Energy Program
Michigan State University

Michigan Energy Sources

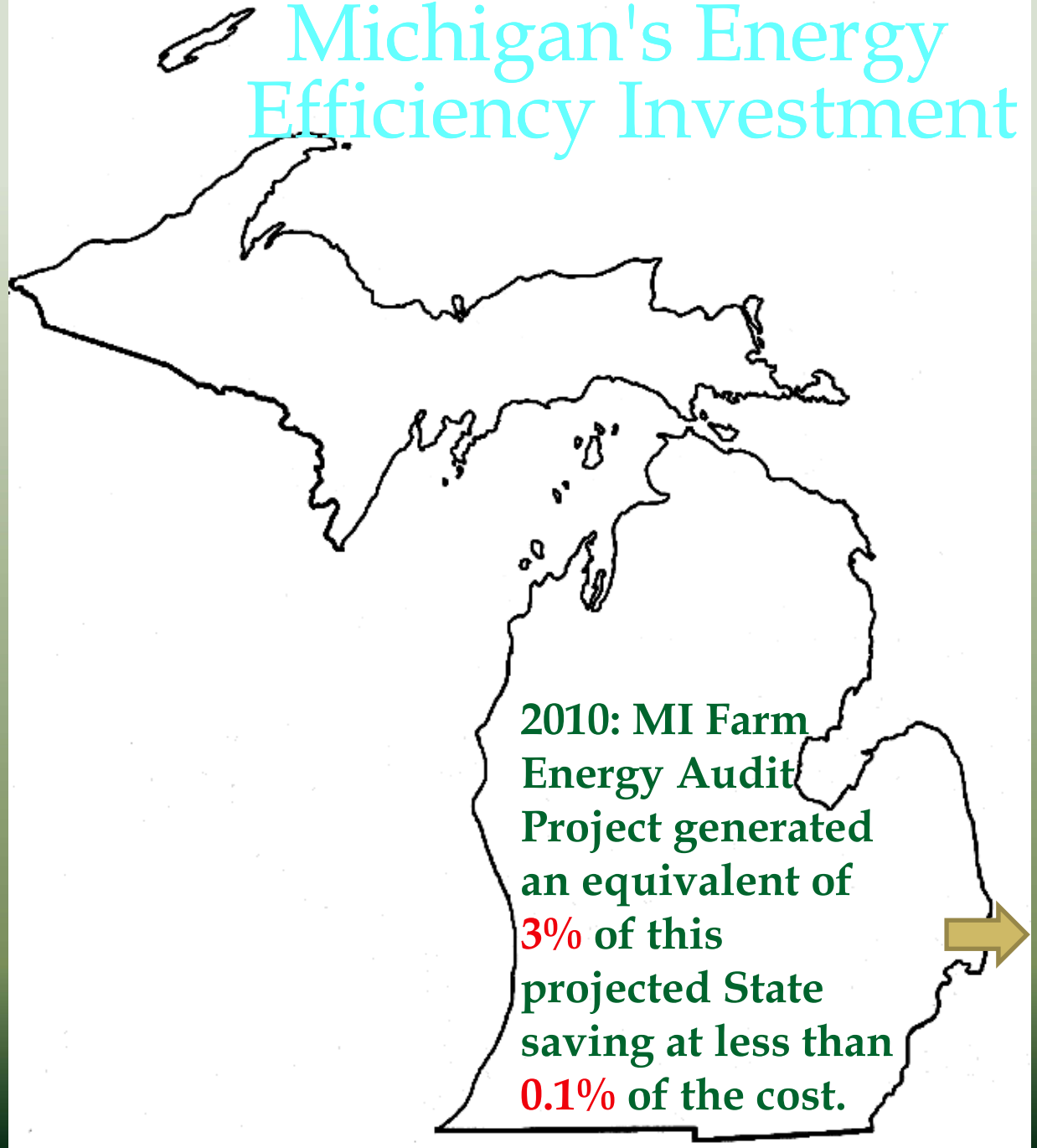
Major Net Energy Importer



Over $31 billion out flow in 2010 (9th highest in the nation) to pay for fuel, coal, and other sources of energy to power the state.

Source: U.S. Energy Information Administration

Michigan's Energy Efficiency Investment



2010: Most improved energy efficiency State. Up to a #17 ranking, from #27 in (American Council for an Energy Efficient Economy – 10/20/11).

Spent $137.2 M (electric & gas) in energy efficiency promotion programs with a projected total savings of 1,596,081 MWh .

MICHIGAN'S LEADING INDUSTRIES

- Manufacturing
- **Food &Agriculture** ($91.4B)
- Tourism
- Services
- Forestry & Lumber

Michigan Food & Agriculture

No Small Potatoes

$91.4 billion industry. 2nd most diverse agriculture state in the nation while ranking 19th in food manufacturing.

Employs 923,000 residents - accounts for about 22 percent of the state's employment.

Sustained growth at a rate of more than 5 times faster than the rate of the general economy over the last decade. Only industry in Michigan to grow during the recent recession.

Michigan farms accounts for $13 billion of the industry's overall total, making the Agriculture Sector necessary for Michigan's economic recovery and reinvention.

- 10 million acres of farmland in Michigan, and the state is home to nearly 54,900 farms averaging 182 acres each. At best only 0.5% of Michigan farms have had a certified energy efficiency audit of their operations.

- In 2010, Michigan exported over $1.75 billion of agricultural products to Canada, Mexico, Japan, Korea, China and Taiwan. Making our farms energy efficient, is essential in attaining a competitive edge in the U.S. and world markets.

Source: Michigan Department of Agriculture

Agriculture Sector

"Michigan's energy shock absorber"

Michigan's Energy Shock Absorber

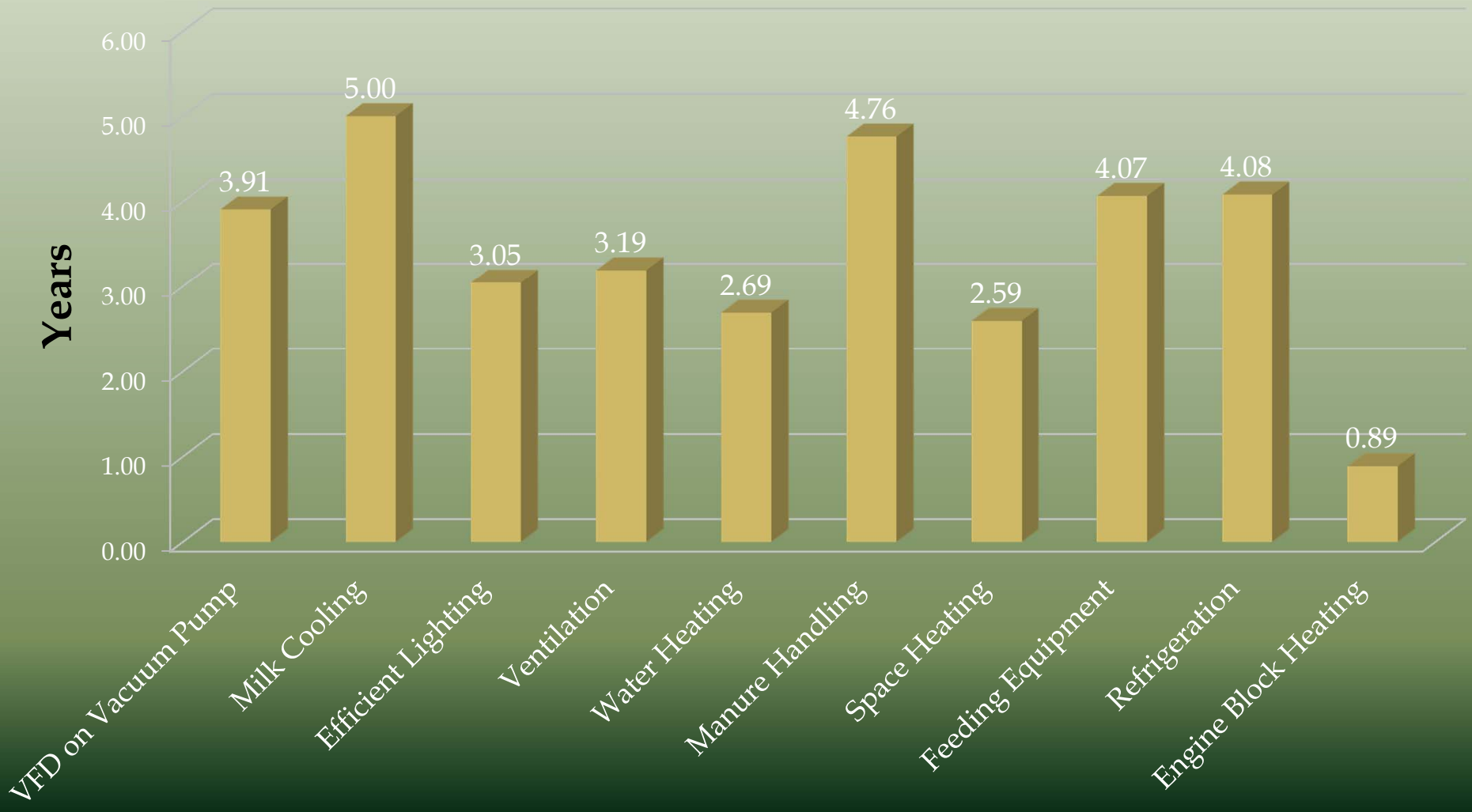
- Given the nature of production agriculture , any interruption of energy supply or spike in fossil fuel costs would have a substantial impact on commodity prices. A decrease in agricultural production as a result of a doubling in fossil fuel costs would result in a 13 percent increase in commodity prices. If fossil fuel costs increases four fold, commodity prices would increase by 60% (Dvoskin and Heady). This would result to a significant cost burden on the State's economy.

- Our results show MI farms can easily attain 30% total energy cost reduction with energy efficiency measures. This would provide the Agricultural Sector the ability to survive the of rising energy costs and absorb most of the pressure of rising commodity prices. Additional savings can be achieved with the alternative energy options. With just the energy efficiency savings alone the agricultural sector will be able to adsorb at a minimum, a doubling of energy costs without the usual impact of down sizing production thus leading to a significant avoidance of commodity price increases that have a negative impact on the Michigan's economy. This could potentially result in a buffer of $651 million (2012 farm sales at $13B) if energy costs double or about $3.2B if they increases four folds like it did in the early 1970's, in annual savings due to avoided commodity price increases. A similar impact could also be attained with higher feed, processing or operating costs.

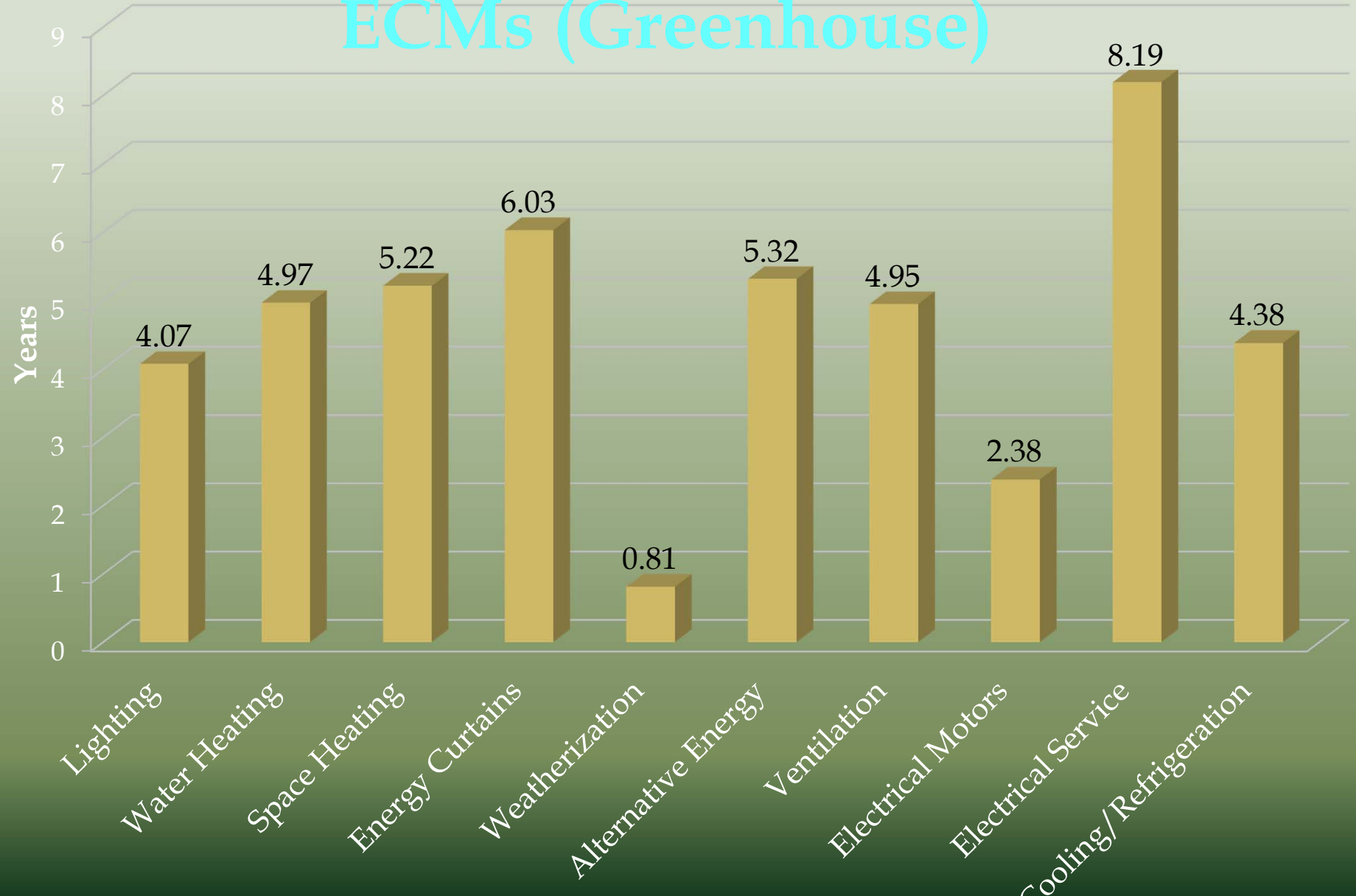
Potential Efficiency In Agriculture

MI #s	Homestead Operation	Ave. Combined Energy Use (kWh)	Ave. % Energy Cost Savings	Ave. Pay-back (Yrs)	Average Energy Saved ($)	Potential Annual Savings
2,170	Dairy	152,388	46%	3.1	$7,082	$15.4M
584	Greenhouse	2,486,561	39%	3.8	$36,194	$21.1M
17,140	Field Crops*	47,495	24%	2.2	$8,742	$149.8M
500	Grain Drying	641,492	37%	7.1	$17,200	$8.6M
4,413	Irrigation	220,711	75%	5.7	$7,546	$33.3M
2,930	Hogs	316,629	22%	3.8	$6,109	$17.9M
3,407	Fruit/Vegetables*	180,491	23%	7.2	7,857	$26.8M
131	Fruit Processing/ Winery	125,931	39%	4.7	4,478	0.6M
31,275	Totals	533,338	40%	4.3	$12,370	273M
	Rural Business	1,520,669	36%	2.1	$27,705	
	Renew Energy	1,010,249	64%	7.3	$23,400	

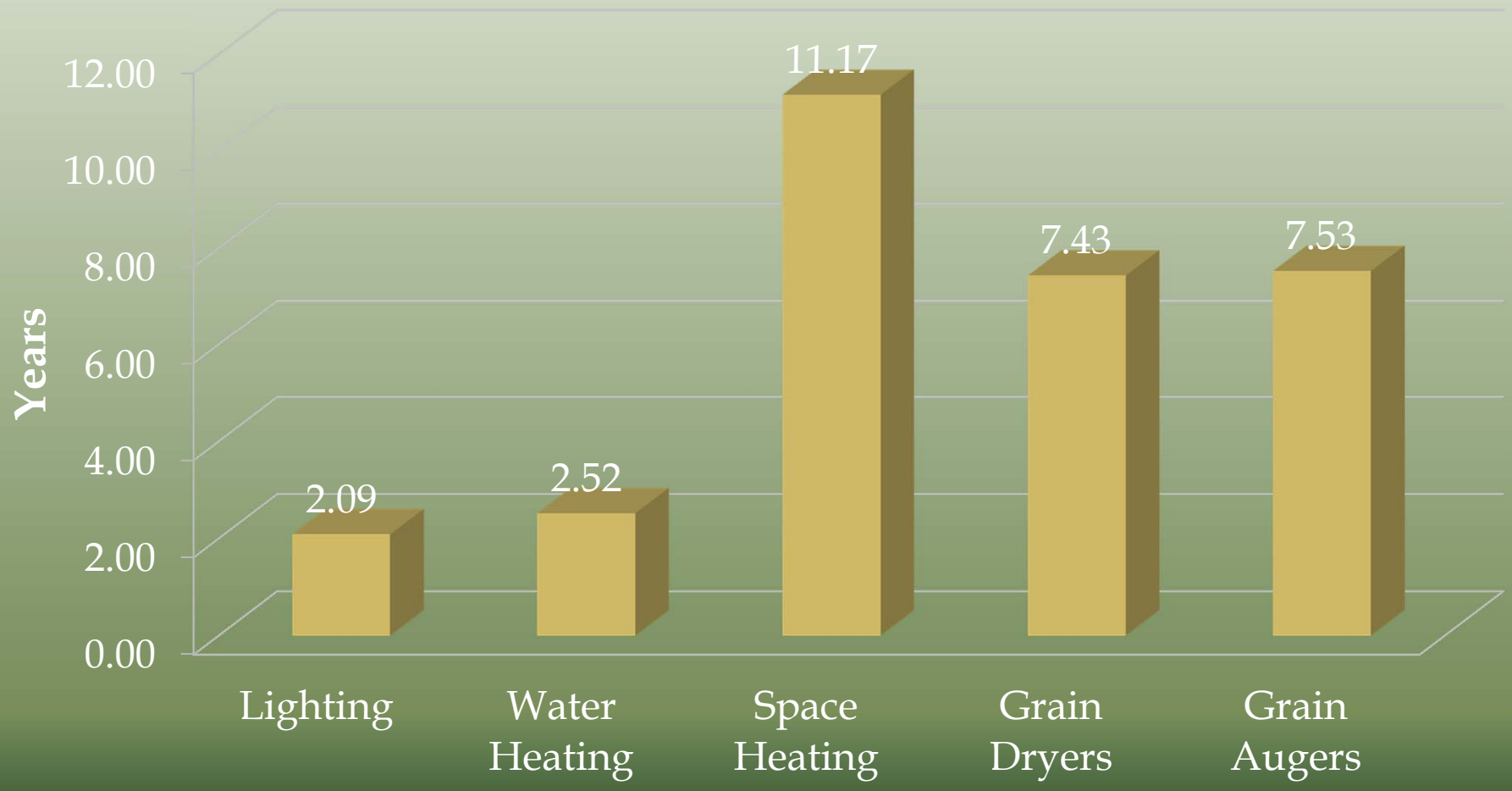
Average Payback for Proposed ECMs (Dairy)



Average Payback for Proposed ECMs (Greenhouse)



Average Payback for Proposed ECMs (Grain Drying)



Energy Efficiency Impact

Bottom Line

- Provides an economic buffer of $651 million (2012 farm sales at $13B) if energy costs double or about $3.2B if they increases four folds.
- Provides over $500M potential annual energy cost savings.
- Provides a bigger bang for the buck in energy efficiency.
- Provides resources for the to expand operations and increase production. Additional benefits in resource conservation and environmental protection.

  - only 6.7% of the 7.8M acres of crop land is irrigated. Irrigation in today's environment could bump per acre production by 50% or more.
  - farms and food/feed processors are often limited in their ability to expand to take advantage of economies of size and scale.

- Agricultural and Food System Operators are much more inclined to participate in improving energy efficiency, reducing the operation's carbon foot print and be environmentally responsive.

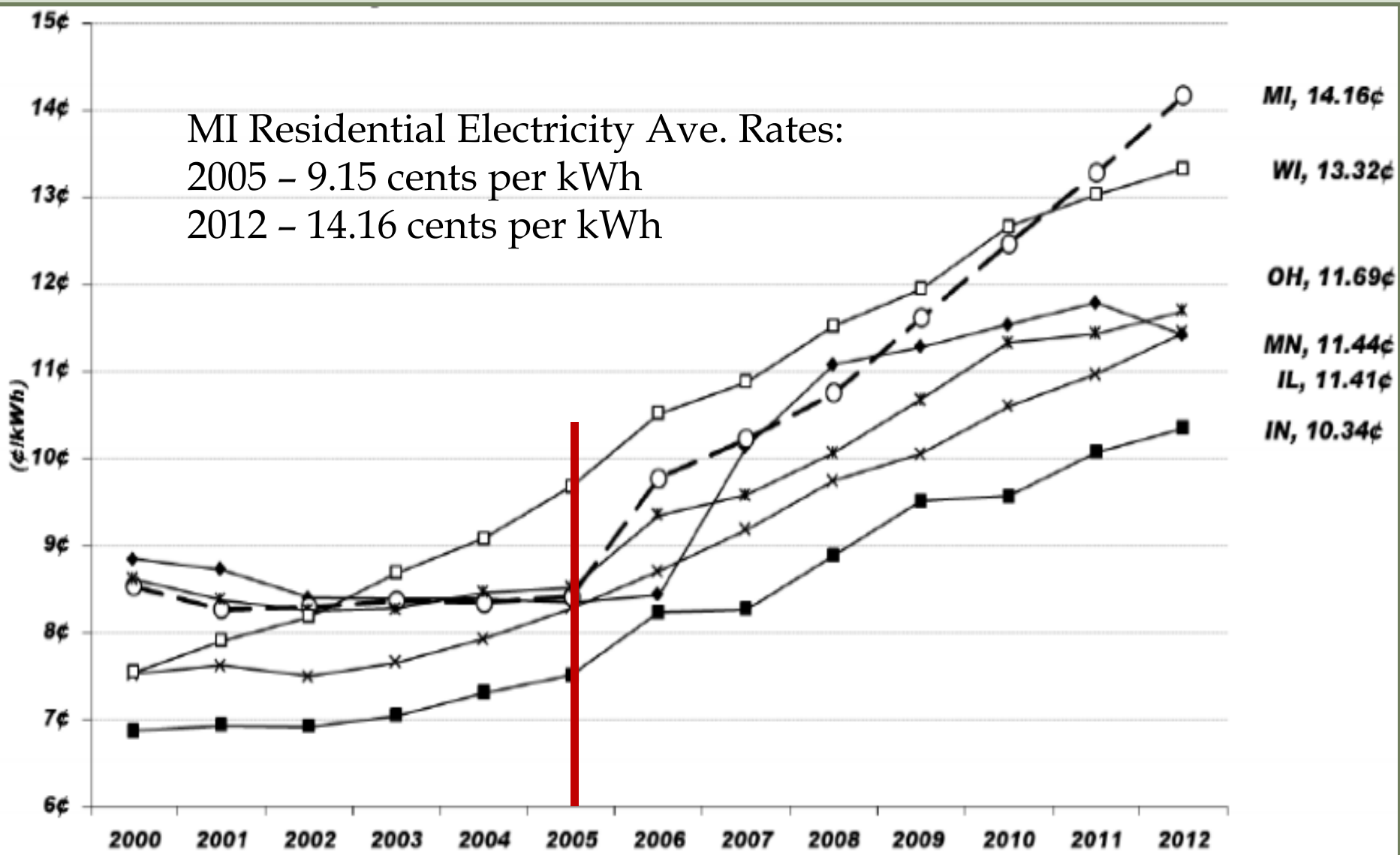
Energy Efficiency in Agriculture

Missing in Action

- MI farmers have been left out by most current and past energy efficiency programs usually due to these programs geared for residential, commercial and industrial clientele. The Ag. sector's energy efficiency issues are unique and have unfortunately not been incorporated in the design of these programs. The Michigan Energy Office efforts are the exception.
- MI Agricultural operations have been exempt from electrical and building codes all these years. Therefore, the energy efficiency, wiring efficiency and other aspects inherent in these codes are often not present in farm facilities, likely making agriculture the lowest of the "low hanging" fruit in energy efficiency.
- Recent energy optimization programs by utility entities have unintentionally limited the typical MI farm from fully participating in energy efficiency measures that would be most beneficial for their operations due to their "grandfathered" residential/farm classification.

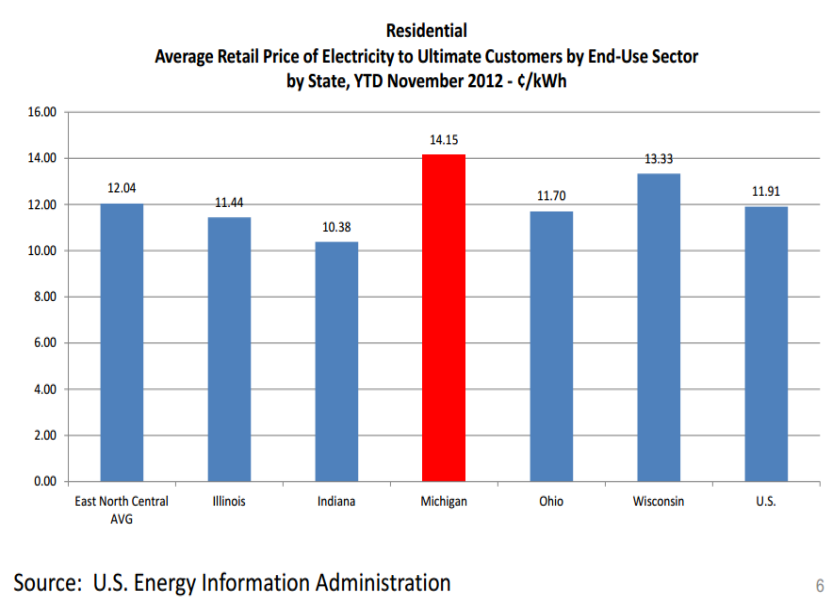
Issues Faced by Michigan's Ag. Sector

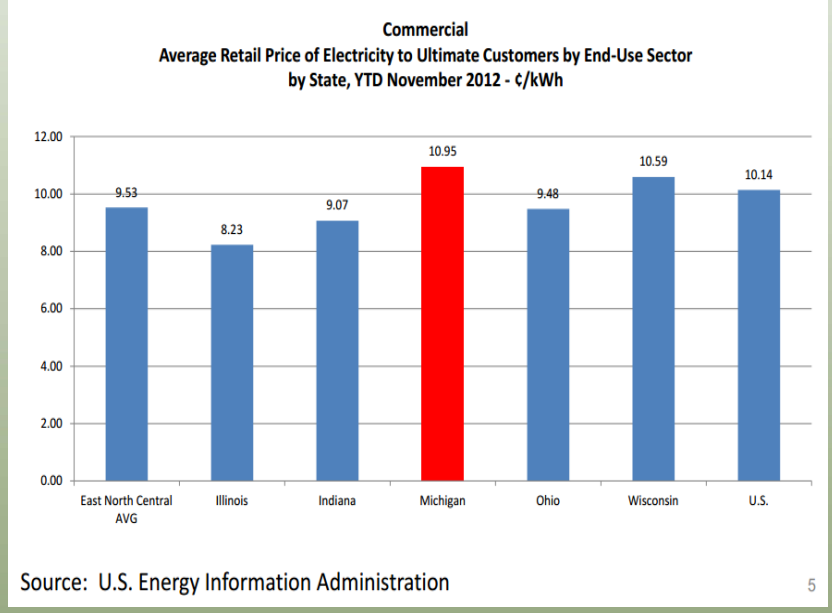
Average Residential Retail Rates, Midwest



Source, http://www.eia.doe.gov/cneaf/electricity/page/sales_revenue.xls, Current and Historical Monthly Retail Sales, Revenues, and Average Retail Price by State and By Sector (Form EIA-826). 2012*, 2012 data is only through August and will change.

Fuel Cost Comparison For Irrigation and Manure Operations





Electricity	***0.10***	**0.05**	**.09**	**0.18**	**0.24**
Natural Gas (925 BTU)	**6.97**	***3.50***	**6.27**	**12.55**	**16.73**
Natural Gas (1,000 BTU)	**7.54**	**3.78**	***7.00***	**13.57**	**18.09**
Diesel	**1.41**	**0.71**	**1.27**	***2.55***	**3.39**
Propane	**0.78**	**0.39**	**0.70**	**1.40**	***1.90***

Single Phase Electrical Service Access

Restrictions to Energy Efficiency

The predominant electrical service to the Food and Agricultural Industry is Single Phase Electrical service. An informal survey of Electric Utilities show about 98% of rural customers are on single phase service.

Positives of switching to Three Phase Electrical Service

A. Access to more efficient, less costly, cheaper to operate and more reliable three phase electrical motors.

B. Access to large three phase motors needed in irrigation, manure management, food/feed processing, fruit/vegetable storage and other operations to replace either diesel of LPG fuel source.

C. Expand operations requiring larger electrical motors.

Negatives of switching to Three Phase Electrical Service.

A. Electrical rewiring cost – Assistance programs.

B. Need to replace all electric motors. – Staggered implementation

Unintended Benefits of switching.

A. Improved electrical safety, wire efficiency and upgrade to code specs.

B. Reduced electrical issues.

Rural Electrical Service

Number 1 in the 20th Century

Invest in energy and information infrastructure to allow the Agricultural Sector and Rural Businesses to be competitive in the 21th century with access to energy efficient options, energy sources and information technology.

In 1927, first electric service to rural customers: Mason-Dansville power line is activated.

Natural Gas Service Access

Restrictions to Energy Efficiency

Data Source: U.S. Energy Information Administration

Energy Efficiency Value

The Wise Investment

- "By displacing traditional fossil fuel energy, the energy efficiency program alone could save Michigan $3 billion in electricity costs over the next 20 years. These results compare favorably to other statewide energy efficiency programs."

  Source: Michigan's 21st Century Electric Energy Plan, pp. 32-33

- Energy Efficiency Cost
  1. Energy efficiency average cost of $20/MWh (2 cents/kWh)
  2. New natural gas combined cycle generation cost at $66/MWh (6.6 cents/kWh)
  3. New coal generation cost at $111/MWh (11.1 cents/kWh)

- For every $1 spent on energy efficiency programs, customers will save $3 in avoided energy costs. Over the next three years, energy efficiency programs will save Michigan utility customers $1.2 Billion. It's true; the cheapest energy is the energy you don't use!

  Source: Michigan Public Service Commission

Be Part of the next Great Human Revolution

"ENERGY INDEPENDENCE"

Be Green, Go Green

Go Wildcats

MICHIGAN FARM ENERGY PROGRAM

http://maec.msu.edu/farmenergy

Contact Us:

Truman C. Surbrook
Biosystems & Agric'l Engineering
Michigan State University
East Lansing, MI 48824-1323
(517) 353-3232
surbrook@msu.edu

Aluel S. Go
Biosystems & Agric'l Engineering
Michigan State University
East Lansing, MI 48824-1323
(517) 353-0643
goaluel@msu.edu

http://maec.msu.edu/farmenergy