

Maryland Energy

ADMINISTRATION

Powering Maryland's Future

What are Maryland's State Agencies Doing to Help
Agriculture? An Overview of the Mathias Ag Programs
for the 2015 Rural Summit – “ASPIRE Rural
Maryland” 12/3/2015

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Agenda

- ▶ **Origination of MEA agriculture energy efficiency programs**
 - ▶ Maryland Statewide Farm Energy Audit Program
- ▶ **Kathleen A. P. Mathias Agriculture Energy Efficiency Programs**
 - ▶ Mathias Ag Programs 2012-13, 2014 – results & resources
 - ▶ Mathias Ag Program 2015 – results and resources coming soon
 - ▶ Mathias Ag Program 2016 – open for applications
- ▶ **Past Programs as Resources for Stakeholders**
 - ▶ Showcasing
 - ▶ Agriculture Energy Project Resources for assorted stakeholders
 - ▶ Savings in Aggregate
- ▶ **Program Observations**
- ▶ **Wrap up**



Origination of MEA agriculture energy efficiency programs – Why have programs?

- ▶ ≈350,000 people are employed in some aspect of agriculture, making it the largest commercial industry in Maryland.*
- ▶ Agriculture is the largest single land use in the State, with 2.0 million acres, or roughly 32 percent of total land area used for farming in 2014.*
- ▶ In 2012, the total cash farm income was approximately \$2.3 billion.
 - ▶ Total farm expenses exceeded \$1.9 billion, while per farm expenses averaged \$158,312. Net farm income was over \$477 million while income per farm averaged \$38,920.*
- ▶ **Energy Costs continue to Increase**
 - ▶ According to the U.S. Department of Agriculture (USDA) 2007 Census of Agriculture, Maryland's farms increased in number, fossil fuel consumption, and energy use between 2002 and 2007.
 - ▶ Maryland's approximately 12,000 farms spent about \$26 million on electricity in 2008 .
 - ▶ For a decadal perspective,
 - ▶ Maryland farms spent about \$33 million on petroleum products, gasoline, diesel fuel, natural gas, LP gas, kerosene, fuel oil, and other fuels in 1997;
 - ▶ in 2007, Maryland farms spent about \$67 million on “gasoline, fuels, and oils.”
 - ▶ In 1997 the average retail rate for electricity in Maryland was 7 cents per kilowatt hour (kWh); in 2007 it was 11.4 cents per kWh.
- ▶ **Maryland Energy Administration's Mission**
 - ▶ “to promote affordable, reliable, clean and resilient energy”

*<http://msa.maryland.gov/msa/mdmanual/01glance/html/agri.html>



Origination of MEA agriculture energy efficiency programs continued

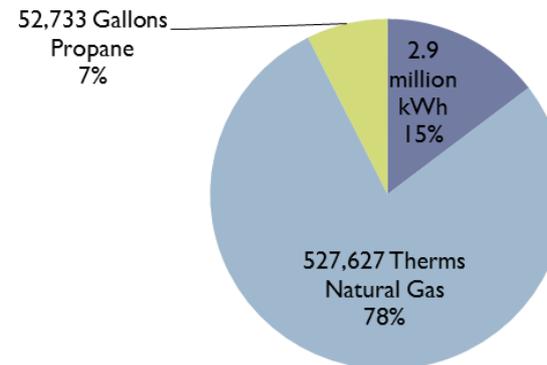
- ▶ Ag stakeholders came together in 2006 to establish a process by which the agriculture sector could reduce its energy consumption in Maryland.
- ▶ The program designed to establish a process by which the agriculture sector could reduce its energy consumption in Maryland was entitled the *Maryland Statewide Farm Energy Audit Program*.
- ▶ Audits were used to identify and quantify energy consumption and to make cost-effective efficiency recommendations



Maryland Statewide Farm Energy Audit Program

- ▶ Program was run in three phases
 - ▶ Phase I: 25 energy audits on the Eastern Shore
 - ▶ Annual energy savings of 471,700 kWh and 46,000 gallons of propane identified
 - ▶ Phase II: 51 energy audits in Western Maryland
 - ▶ Annual energy savings of 1.6 million kWh and 22,808 gallons of propane identified
 - ▶ Phase III: 42 additional energy audits, and the implementation of some of the measures recommended by the previous audits
- ▶ Program total: 118 audits and 129 implemented projects with an estimated annual savings of:
 - ▶ 2.9 million kWh
 - ▶ 52,733 gallons of propane
 - ▶ 527,627 Therms of natural gas

**Farm Energy Audit Program:
where did the savings come from?**



In 2010, the American Council for an Energy-Efficient Economy (ACEEE) awarded the Phase III program with Exceptional State-led Energy Efficiency Program.

Kathleen A. P. Mathias Agriculture Energy Efficiency Programs

- ▶ 2016 is the fourth year of the program
 - ▶ Mathias Ag Program 2012-13
 - ▶ Mathias Ag Program 2014
 - ▶ Mathias Ag Program 2015
 - ▶ **Mathias Ag Program 2016 now open for applications!**
 - ▶ **Applications must be submitted by Friday, January 20, 2016**

<http://energy.maryland.gov/business/Pages/incentives/FY2016mathiasag.aspx>

- ▶ The programs explore and share information gained at *the intersection of energy and agriculture*



2012-13 Kathleen A. P. Mathias Agriculture Energy Efficiency Program

- ▶ American Recovery and Reinvestment Act (ARRA) Program funding source - Better Buildings Neighborhood Program
 - ▶ \$2 Million award
 - ▶ Competitive program
 - ▶ Program sought to leverage utility programs wherever possible
 - ▶ Program was for 15% **energy** savings per building or in some cases per measure
 - ▶ 16 farms/businesses
 - ▶ Estimated electricity savings \approx 800,000 annual kWh

Locations



Estimated Costs, Savings, and Payback

Estimated Annual Energy Cost Savings	\$233,471
Estimated Installed Cost	\$1,966,735
Estimated Payback in Years	8.4

Building Info

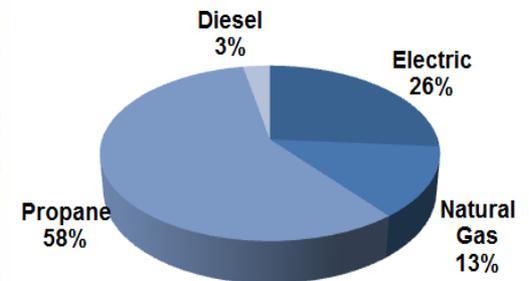
Average Savings per Building	23.6%
Square Footage	754,138
Number of Buildings Retrofitted	48

Greenhouse Gases (estimated values)

CO ₂ (Metric Tons)	969.85780*
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Mathias Ag Program Outcomes

Where did the energy savings come from?

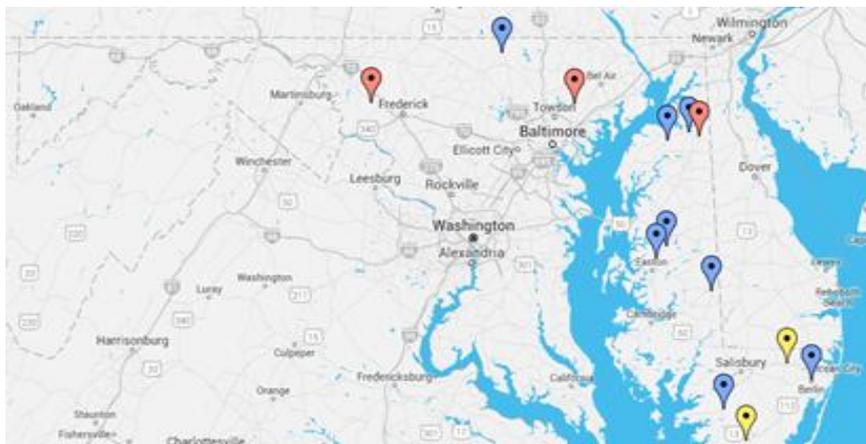


Total Energy Savings: 10,375 MMBtu

2014 Kathleen A. P. Mathias Agriculture Energy Efficiency Program

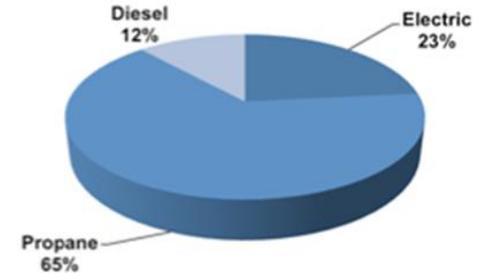
Strategic Energy Investment Fund (SEIF) Program funding source

- Competitive program
- Energy efficiency only projects
- Program sought to leverage utility programs wherever possible
- Program was for 20% **energy** saving per building or in some cases per measure
- 13 farms/businesses
- Estimated electricity savings \approx 800,000 annual kWh
- 7 year estimated simple payback



2014 Mathias Ag Program Outcomes

Where did the energy savings come from?



Total Energy Savings: 10,927.92 MMBtu

Fuel Type	MMBtu Savings	% Savings
Electric	2,555.94	23%
Propane	7,093.87	65%
Diesel	1,278.11	12%
Total Energy Savings	10,927.92	100%

Estimated Costs, Savings, and Payback

Estimated Annual Energy Cost Savings	\$239,146
Invoiced Installed Cost	\$1,672,084
Estimated Payback in Years	7.0

Building Info

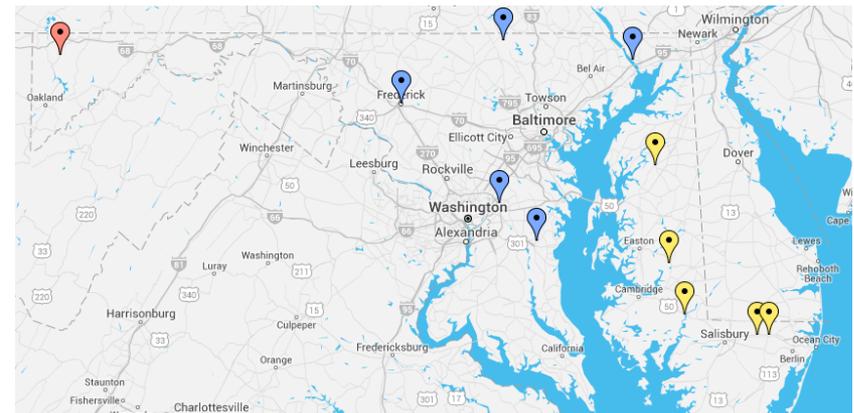
Average Savings Per Building	36.3%
Number of Buildings Retrofitted	43

Annual Greenhouse Gases Reductions

Greenhouse Gas	Metric Tons
Carbon Dioxide (CO ₂)	992.23807*
Nitrous Oxide (N ₂ O)	0.02288
Methane (CH ₄)	0.09204
Sulfur Oxide (SO _x)	4.09793
Nitrogen Oxide (NO _x)	1.21104

2015 Kathleen A. P. Mathias Agriculture Energy Efficiency Program

- ▶ Strategic Energy Investment Fund (SEIF) Program funding source
 - ▶ *Just concluding... results coming soon!*
 - ▶ Competitive program
 - ▶ Energy efficiency AND renewable energy projects
 - ▶ Program is seeking out cost-effective deeper-retrofit upgrades in the agriculture sector
 - ▶ To be eligible for renewable energy upgrades a project must incorporate significant energy savings
 - ▶ Renewable energy proposal must be best practices
 - ▶ Program seeks to leverage utility programs wherever possible
 - ▶ \$550,000 was available for FY15
 - \$300,000 for energy efficiency projects
 - \$250,000 for renewable energy projects
 - ▶ 13 awards – two have dropped out
 - ▶ Maximum award amount \$60,000



2016 Kathleen A. P. Mathias Agriculture Energy Efficiency Program

What is the program?	What are the project requirements?	How do I apply?
<p>Subject to funding availability, MEA will provide grants on a competitive basis to farms/businesses in the agriculture sector to cover up to 50% of the cost of eligible energy efficiency upgrades and up to 25% of the cost of eligible renewable energy upgrades, if applicable, after all other incentives have been applied.</p> <p>In fiscal year 2016, there is up to \$650,000 available for eligible energy efficiency measures and up to \$250,000 available for eligible renewable energy measures.</p>	<ul style="list-style-type: none">• Energy efficiency projects, as well as projects that combine energy efficiency and renewable energy measures, are eligible for funding.• Renewable energy projects must be installed in conjunction with energy efficiency projects.• For projects that incorporate energy efficiency and renewable energy, at least 25% of the total award amount for all proposed projects must be for cost-effective energy efficiency measures.• All energy measures must be installed before February 1, 2017.• Invoices are due March 1, 2017	<p>Applications must be submitted by Wednesday, January 20, 2016</p> <ul style="list-style-type: none">• Applications• Additional information• Program Overview and Q&A <p>All available on the program webpage:</p> <p>http://energy.maryland.gov/business/Pages/incentives/FY2016mathiasag.aspx</p>



How Do These Programs Help Agriculture?

- ▶ Programs are an opportunity to impact policy and stakeholder behavior
 - ▶ Farming best practices
 - ▶ Utility programs
 - ▶ PSC
 - ▶ Federal
 - ▶ Other states
 - ▶ Other countries
- ▶ Information learned needs to be shared
 - ▶ Farms/businesses
 - ▶ State
 - ▶ Others

Showcasing is a way to share this information

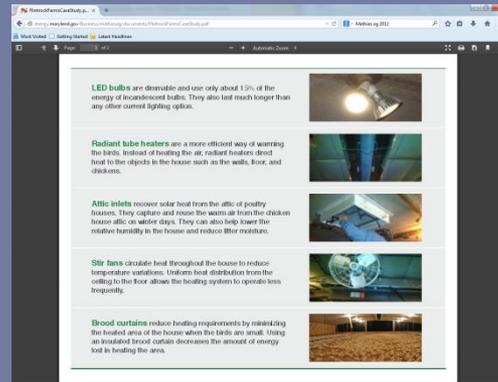


Past Programs as Resources: 2012-13

- Use media to encourage viewers to “dig deeper”



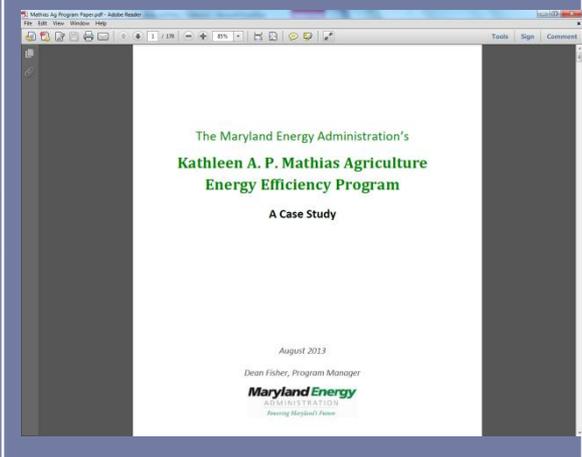
- Include case studies and other relevant information



- Graphs, charts showing savings and costs

Table 1: Implemented Efficiency Measures and Associated Savings

Recommended Measure	Electric Savings (\$/Year)	Program Design Cost	Estimated Annual Energy Cost Savings	Installed Cost	Estimated Payback in Years
Lighting	50,977		\$5,538	\$51,149	6.3
Lighting					
Replace 92 60-watt dimmable cool white fluorescent (CFL) bulbs and 4 40-watt CFL bulbs per house with 124 60-watt dimmable light emitting diode (LED) bulbs per house for houses 1-6.					
Replace 170 100-watt dimmable incandescent bulbs per house with 170 15-watt dimmable light emitting diode (LED) bulbs per house for houses 7-9.					
Radiant Tube Heaters	3,443	\$5,045	\$38,900	6.6	
Radiant Tube Heaters					
Replace 4 known hot air heaters per house with 4 125,000 BTU radiant tube heaters per house.					
Attic Inlets	2,725	\$4,700	\$43,824	8.1	
Attic Inlets					
Install 20 activated attic inlets per house and 1 electronic control unit per house in houses 7-9 that will activate attic inlets.					
Sir Fans	(5,025)	1,500	\$2,800	\$25,961	11.8
Sir Fans					
Install 6 variable speed 18" heat set fans per house to the ceilings of houses.					
Broad Curtains	712	\$306	\$6,078	24.8	
Broad Curtains					
Replace 2 existing pre-installed broad curtains per house with 2 installed broad curtains per house. Installed broad curtains should have a minimum R-value of R-2.5.					
Totals	46,482	7,807	\$18,610	\$149,992	6.1



Past Programs as Resources: 2014

- Use media to encourage viewers to “dig deeper”

MEA South Mountain Creamery



Dean Fisher
Maryland Energy Administration

affordable, reliable, and clean energy. Refrigeration upgrades like these at South Mountain Creamery,

Video



The 2014 Mathias Ag Program saved enough propane to fill a 250 gallon tank like the one pictured 310 times. That's enough to heat more than 150 Maryland homes during an average heating season. Given Maryland's propane shortage in the winter of 2014, the avoided fuel use is a significant benefit

- Include case studies and other relevant information



2014 Mathias Ag Program
Dairy and Milk Processing Case Study

Maryland Energy
Powering Tomorrow's Needs

The Maryland dairy industry numbers 463 farms and ranks fourth in state agricultural sales. As energy-intensive operations, dairy and milk processing facilities are excellent targets for efficiency improvements. Through the 2014 Kathleen A.P. Mathias Agriculture Energy Efficiency Program, three Maryland dairies and milk processing facilities increased the economic and environmental sustainability of their operations. Participating facilities achieved about a 20 percent reduction in their energy consumption by installing the following measures:

- LED lighting
- Ventilation
- Milk cooling
- Refrigeration
- Compressor heat recovery
- Ventilation recovery



LED Lighting is the most efficient and one of the longest-lasting forms of lighting available. LEDs are highly sought after in the dairy industry for these qualities. Partly when lighting is installed that requires a lift to change fixtures or bulbs, the long stated life of LEDs can significantly reduce the maintenance time and cost associated with this task.



Ventilation is an extremely important for the health of the cow. A cow begins to suffer heat stress at about 72 degrees Fahrenheit, which negatively affects milk production and can lead to other health issues as well. High efficiency ventilation helps provide proper cow cooling while reducing energy consumption and demand in the warmer months.



Milk cooling is typically a large energy-consuming process at dairy farms. Milk processing facilities also require efficient methods for cooling milk after collection. Energy efficiency solutions such as plate coolers that pre-cool the milk using well water, scroll compressors that offer 15 to 20 percent greater efficiency than standard reciprocating compressors, and high efficiency chillers are all good examples of ways to reduce energy for milk cooling.

To implement these measures and the ones on the following page, three Maryland farms received grants totaling \$206,824 toward total project costs of \$495,613. The following table summarizes the savings and costs associated with the upgrades at these facilities. Costs and paybacks for similar measures on other farms will vary.

- Graphs, charts showing savings and costs

Field and On-farm Energy Case Study

2014 Mathias Ag Program

Project Name	Project Savings (\$/yr)	Annual Energy Savings (kWh)	Annual Energy Savings (\$/yr)	Estimated Annual Energy Cost (\$/yr)	Estimated Annual Energy Cost (\$/yr)	Estimated Annual Energy Cost (\$/yr)		
On-farm LED	7,405		488	\$1,642	\$102,018	14.1		
On-farm LED		1,070	3,763	377	\$6,427	111.0		
On-farm LED		1,346	4,805	5,449	715	\$8,858	\$17,716	8.7
On-farm LED		43,974		4,174	\$47,716	\$111,300	1.4	
Electric Compressors		4,200	\$5,975	440	\$9,260	\$36,866	6.2	
Scroll Compressors		10,792	3,036	\$5,651	4,007	\$24,512	\$23,491	7.4
Total								

The farm received grants totaling \$206,824 toward the total project cost of \$495,613. Projects were installed during the summer and fall of 2014.

Many farms in Maryland from similar energy efficiency programs. Even without the grant, these programs pay for themselves in a matter of about 12 months. A summary table from 8 to 10 months for the total program. Many programs will have a payback for 25-30 years and the remaining energy savings will be passed on to the next generation. The program provides a significant benefit to the farm and the state. The program provides a significant benefit to the farm and the state. The program provides a significant benefit to the farm and the state.

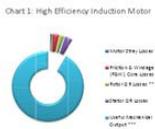
Maryland Energy
Powering Tomorrow's Needs

Motor and Control Upgrades as an Electricity Saving Measure

Electric motors, designed for use in various systems, range in efficiency from below 40% to over 90%. Electric motors are used in a wide range of applications and are one of the most common types of motors used in small and large businesses and manufacturing.

High efficiency motor can operate at 92% or better efficiency. Chart 1 below shows motor load in industrial motor applications, which are the most common type of motors used in small and large businesses and manufacturing.

Chart 1: High Efficiency Induction Motor



92% (100% Load)
85% (100% Load)
75% (100% Load)
65% (100% Load)
55% (100% Load)
45% (100% Load)
35% (100% Load)
25% (100% Load)
15% (100% Load)
5% (100% Load)

There is a significant benefit to the farm and the state. The program provides a significant benefit to the farm and the state. The program provides a significant benefit to the farm and the state.

Agriculture Energy Project Resources for assorted stakeholders

- ▶ Already mentioned “Showcasing”
- ▶ Each Mathias Ag program has had an updated “Other Potential Funding Sources for Farms and Businesses”
 - Based on feedback at the Better Buildings Case Competition... a “one stop shopping” list of funding opportunities

<http://energy.maryland.gov/business/Documents/2014MathiasAgAlternativeFundingSources.pdf>

- Drives people to our webpage
 - Offers funding options
- ▶ In 2014 a Jane E. Lawton Conservation Loan was leveraged to help pay the farmer’s share
 - <http://energy.maryland.gov/govt/Pages/janeelawton.aspx>
- ▶ All MEA Incentives
 - ▶ Residential Incentives, Business Incentives, State, Local, and Non-Profit Incentives, Transportation Incentives
 - <http://energy.maryland.gov/Pages/all-incentives.aspx>
- ▶ Utility Program Incentives and others
 - <http://programs.dsireusa.org/system/program?state=MD>



Savings in Aggregate

- ▶ When energy measures are considered in aggregate energy efficiency can be used to reduce the simple payback of a measure
 - ▶ Aggregate definition: Looking at the costs and the savings of all measures together to determine a total payback
 - ▶ Low-hanging fruit opportunities = cost effective measures with a quicker payback will lower the payback of measures with a longer payback when considered in aggregate
- ▶ This can be done by building, farm, business, sector

Economic Details of Four Poultry House Energy Efficiency Upgrades

Installed Measures	Estimated Electric Savings (kWh)	Estimated Propane Savings (gal)	Estimated Energy Savings (MMBtu)	Estimated Annual Energy Cost Savings	Installed Cost	Payback in Years
1. LED Lighting Upgrade	5,124		17	\$525	\$6,160	11.7
2. Insulate Sidewalls		1,681	154	\$2,445	\$3,087	1.3
3. Tunnel Intake Doors		978	90	\$1,582	\$39,360	24.9
4. Radiant Tube Heaters		1,273	117	\$2,061	\$24,786	12.0
5. Insulated Endwall and Sidewall doors		494	45	\$799	\$22,650	28.3
6. Enclose Curtain Walls		1,231	113	\$1,993	\$3,087	1.5
Totals	5,124	5,657	536	\$9,405	\$99,130	10.5

Note: All program calculations are from independent, 3rd party agriculture energy experts. Desk audits verify deemed savings based on contractor invoices

Program Observations

- ▶ **Propane consumption reduction opportunities**
 - ▶ Propane is the fuel used in many farms/farm businesses
 - ▶ There are no programs specifically for propane reduction
- ▶ **Farmers are very leveraged. Often they are unable to take out additional loans. Grant programs help to enable energy efficiency upgrades that will help them stay competitive.**
 - ▶ Many of the buildings/measures that were upgraded were measures or upgrades that would not have occurred without the grant program.
 - ▶ Many of the farmers served under the ag programs are multi-generational farmers striving to stay competitive in today's market.
 - ▶ In today's globalized and "agri-business" market this helps Maryland's small farmers.
 - ▶ This helps Maryland keep its agricultural heritage intact and helps with sustainability.
- ▶ **MEA Ag Programs provide information to stakeholders**
 - ▶ Consider measuring upgrades in terms of aggregated savings
 - ▶ Many farmers are on residential meters and the utility programs are unavailable to help them utilize the appropriate commercial-type upgrades
 - Delmarva and PE now have programs aimed at Ag savings
 - ▶ Poultry house door upgrades can be done cost effectively with end door covers
 - MEA will highlight this for the FY15 program



Wrap up

Data from the FY 14 Mathias Ag Program

- ✓ Jobs created: 6,605.5 hours
- ✓ Economic focus:
 - ✓ Annual estimated energy cost savings: \$239,146
 - ✓ Payback: 6.99 year simple payback
 - ✓ Geographic area of emphasis: mainly rural
- ✓ Leveraged funds: Yes, utility programs, in-kind, other grants
- ✓ Ancillary gains: Decreased animal mortality, quicker “grow time,” lower GHG emissions, lower throughput, more competitive farmers, best practices, information shared/gained, peak load reduction, increased compliance with nutrient management, MD leading the way on Ag programs, etc...
- ✓ Showcased that cost-effective “deep retrofits” are possible in the Ag sector

And on top of all of that the program saved energy

