Assessing Potential Peak Energy Demand Management Strategies In Agriculture

National Sustainability and Energy Extension Summit

The Westshore Grand

Tampa, FL

April 18. 2019

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

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Learning Objectives

- Introduction to Electric Demand Charges
- Summarize Peak Demand Study Design
- Review Preliminary Peak Demand Data from Dairy Farm
- Recap the Lessons Learned, Recommendations, and Next Steps

Understanding Your Electric Bill & Demand Charges

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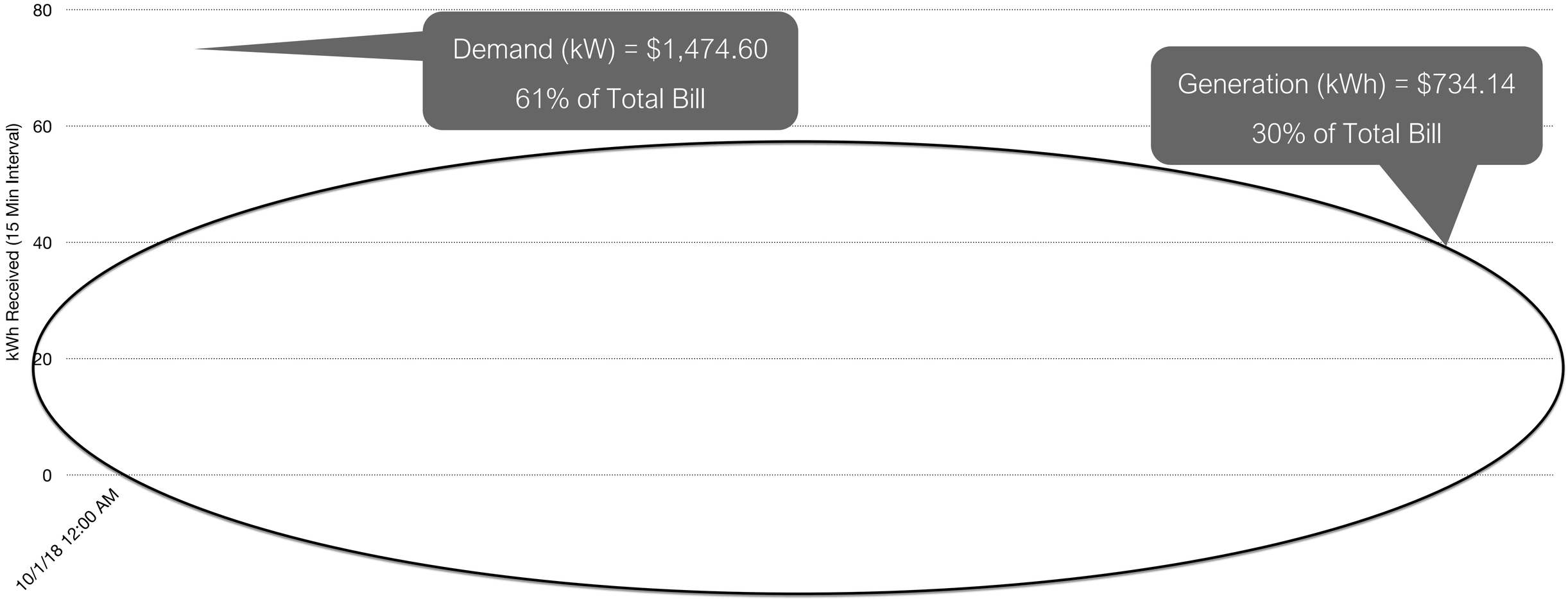
Introduction to Demand Charges



October 2018)

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Sample Electric Bill with Demand Charges

Summary of 15-Minute Monthly Peak Demand Charges	
Generation	$7.68
Transmission	$4.678
Distribution	$1.90
Total	$14.258
15 min Peak KW	x 73
15 min Demand Cost	$1,040

PJM High 5 Coincident Demand Rate	
Demand	$7.61
PJM 5 Demand - KW	x 57
PJM Demand Cost	$433

Total Demand Cost = $1,473

Billed Usage	20,680	73	57	
Generation & Trans:				
Demand - Monthly	$	7.68	73	$ 560.64
Demand - PJM 5	$	7.61	57	$ 433.77
Transmission	$	4.678	73	$ 341.49
Energy	$	0.00599	20,680	$ 123.87
Fuel	$	0.02701	20,680	$ 558.57
Total Generation & Transmission				$ 2,018.34
Distribution Service:				
Ser. Availability	$	80.00	1	$ 80.00
Demand	$	1.90	73	$ 138.70
Energy	$	0.0025	20,680	$ 51.70
Total Distribution				$ 270.40
Riders				$ 125.75
Total Energy Cost				$ 2,414.49

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Peak Demand Study Design

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Connect and Collaborate Grant Project Overview: Assessment of Potential Energy Demand Management Strategies in Agriculture

The goal of this project is to **assess how peak electric demand affects agricultural facilities** and, in turn, the manner by which farmers can implement energy management plans, production strategies, and make investments in equipment to **minimize costs** and foster long-term sustainability.

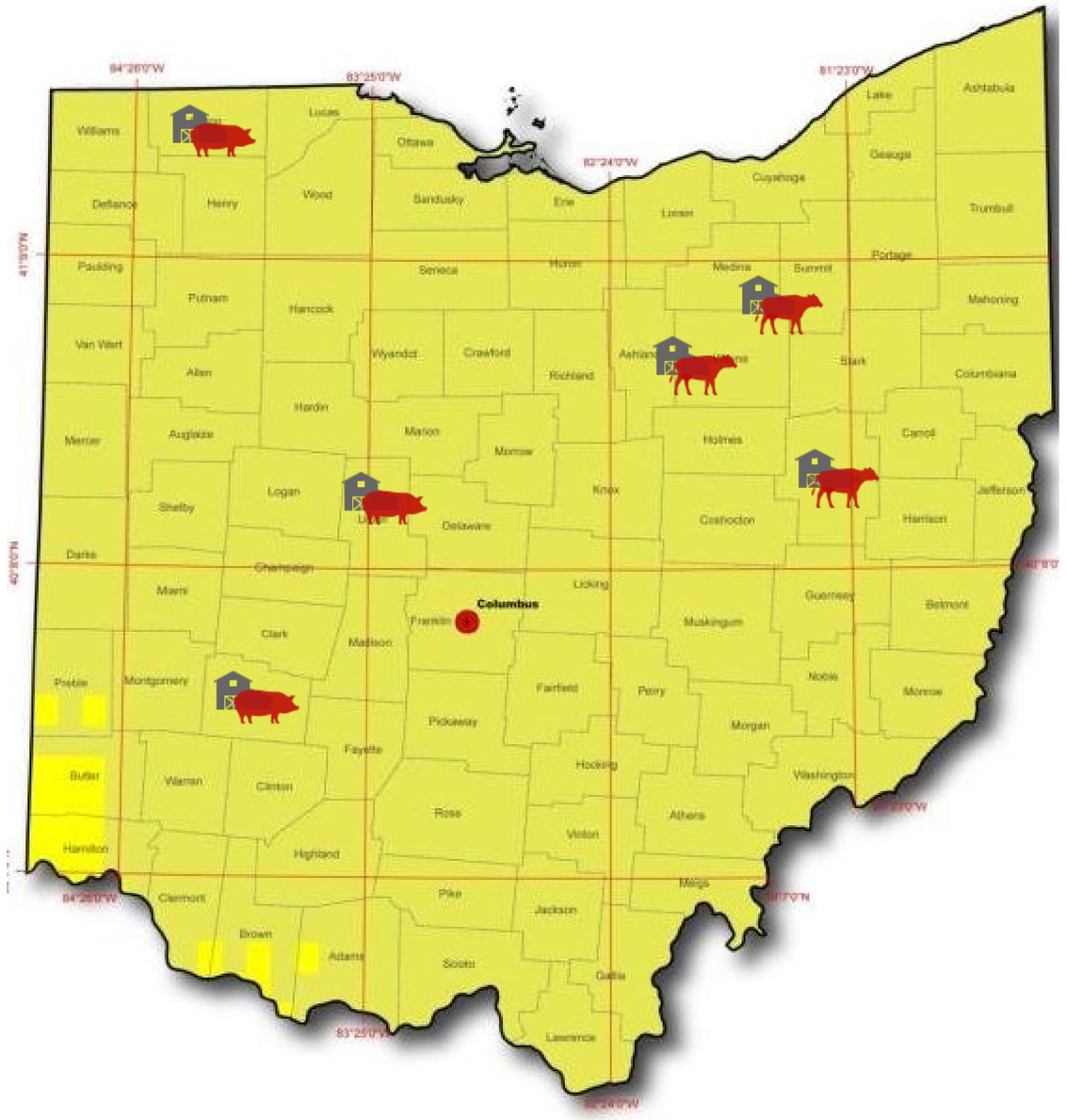
- **Research Goal:** Generate empirical measures of data for peak demand and power quality in swine and dairy facilities, assess the economic impact, and explore potential tools and solutions.
- **Outreach and Engagement Goal:** Develop outreach and education materials to disseminate the project research findings to agricultural producers and stakeholders throughout Ohio and beyond.
- **Program Evaluation and Growth Goal:** Monitor project deliverables, evaluate program success, and explore options for the expansion and sustainability of the program.

Funding Source Summary

Amount ($)	Cash or In-Kind	College, Department or Unit, Campus
$73,500	Cash	OSU Office of Outreach and Engagement
$7,000	Cash	OSU CFAES, OSU Extension – Community Development
$7,000	Cash	OSU CFAES, OSU Extension – Agriculture and Natural Resources
$7,000	Cash	OSU CFAES, Ohio Agricultural Research and Development Center, Wooster Campus
$9,000	In-Kind	OSU CFAES, Ohio State University Extension, Columbus Campus
$2,000	In-Kind	OSU CFAES, Ohio Agricultural Research and Development Center, Wooster Campus
$2,000	In-Kind	OSU CFAES, Ohio Agricultural Research and Development Center, Western Agricultural Research Campus
$5000	In-Kind	OSU College of Engineering, Department of Electrical and Computer Engineering, Columbus Campus

OSU Peak Electric Demand Study Partners and Test Sites

- Ohio State University Extension
- Ohio Agricultural Research and Development Center
- Ohio State University, Department of Food, Agricultural & Biological Engineering
- Ohio State University College of Engineering, Electrical & Computer Engineering
- Ohio State University, Office of Energy and Environment
- Private Farmers (Dairy and Swine)
- Ron Cull, Electrical Engineer, NASA Lewis Research Center, Retired
- Ohio Electric Cooperatives
- Ohio Pork Council
- Ohio Dairy Producers Association
- Ohio Soybean Council
- National Propane Council



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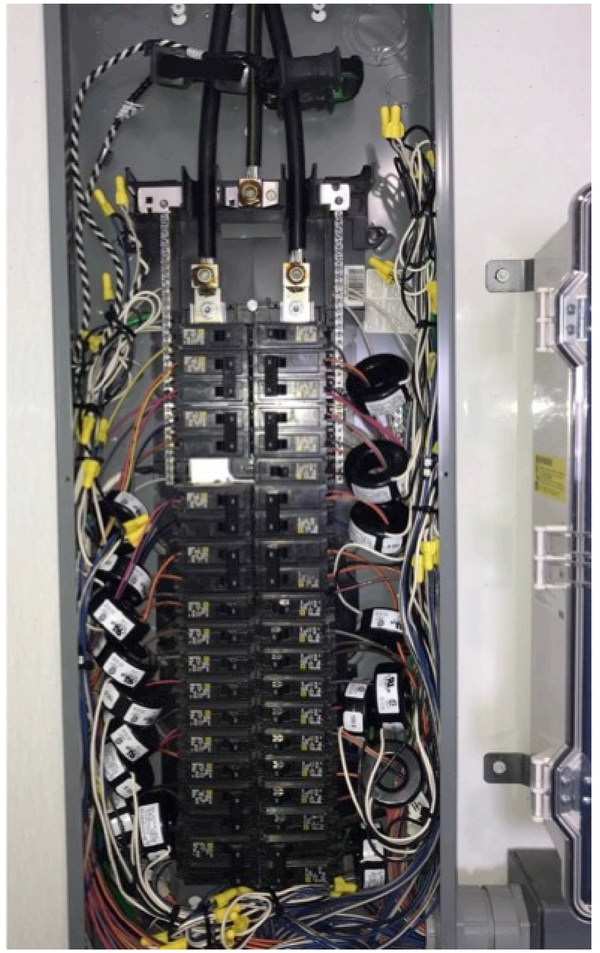
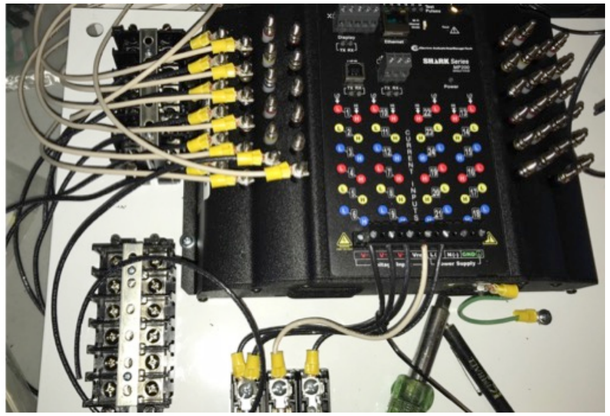
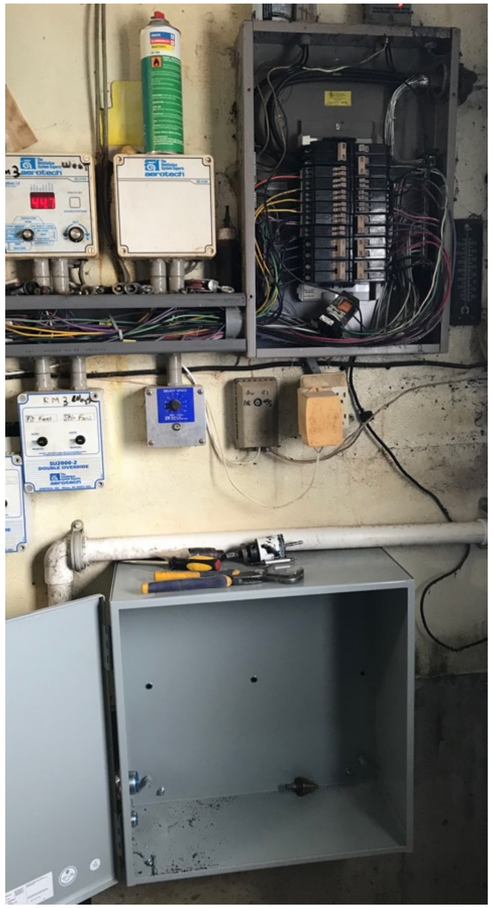
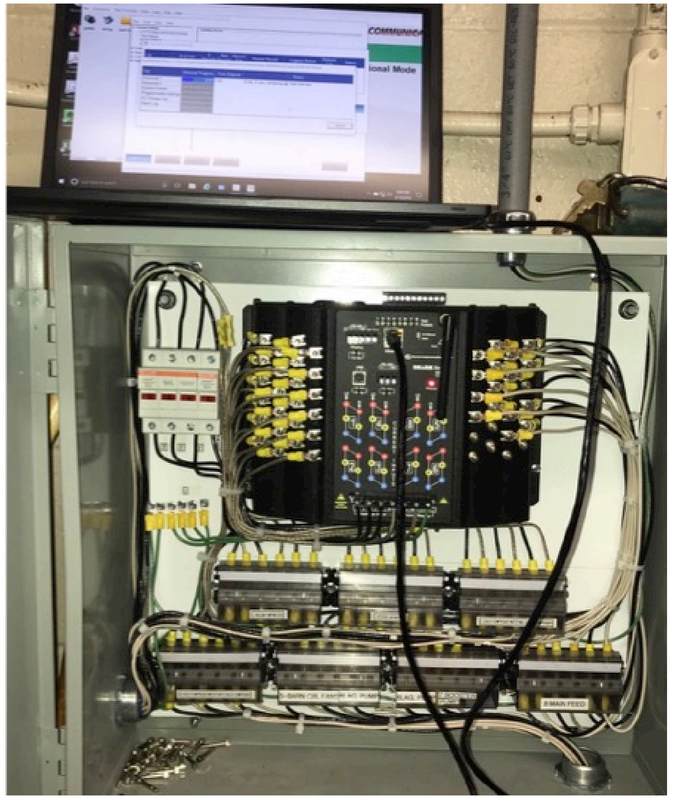
Equipment and Installation

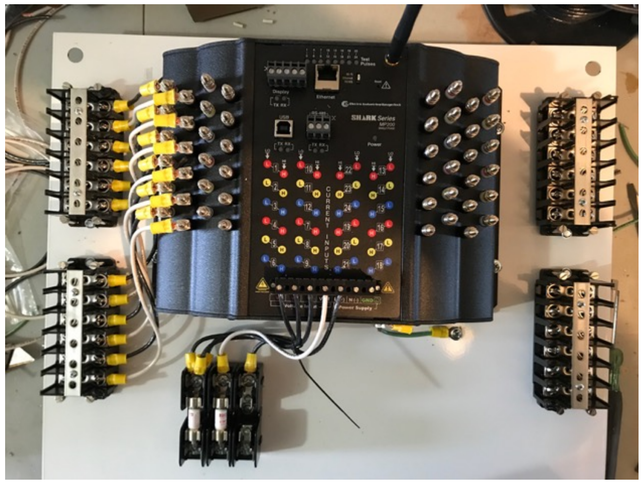


Equipment and Installation









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Preliminary Data - Dairy Farm

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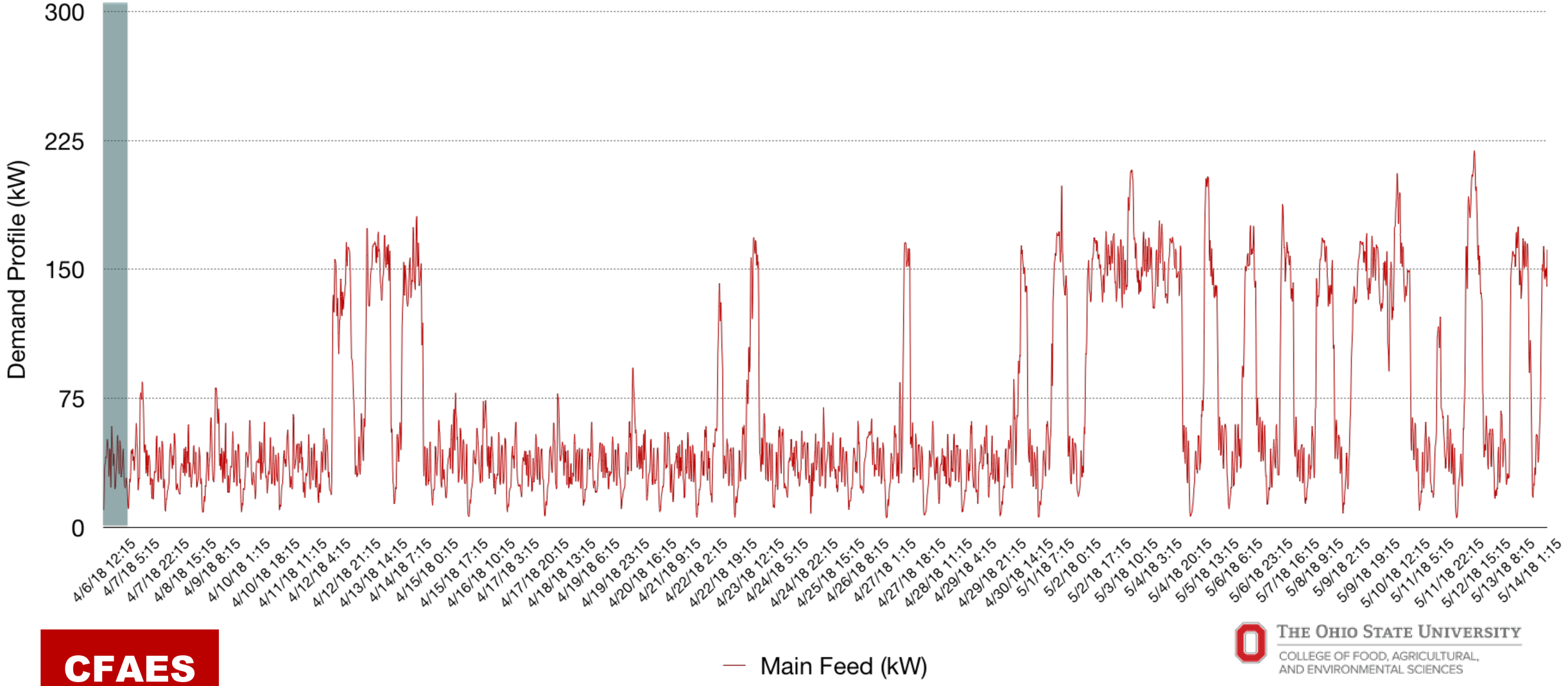
Monthly Peak Energy Demand Profile (15 Min Interval) - 300 Head Dairy Farm



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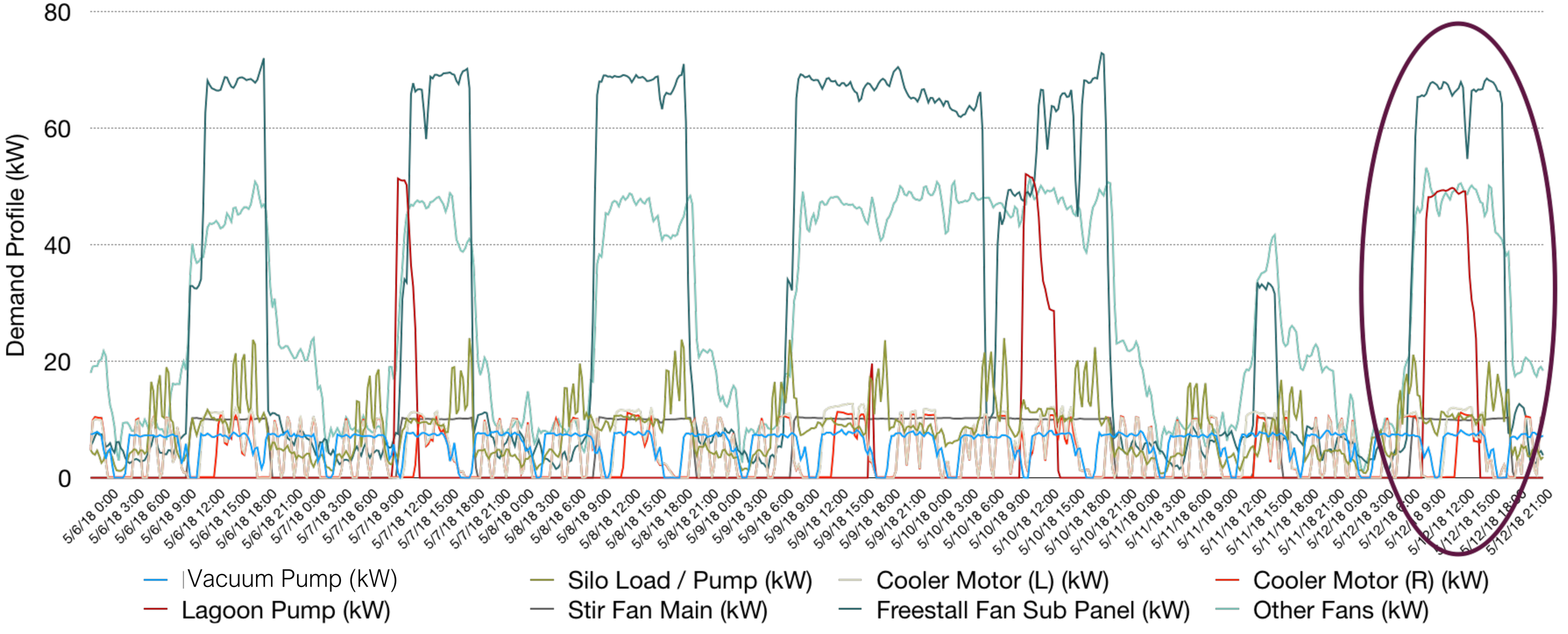
Weekly Peak Energy Demand Profile (15 Min Interval) - 300 Head Dairy Farm



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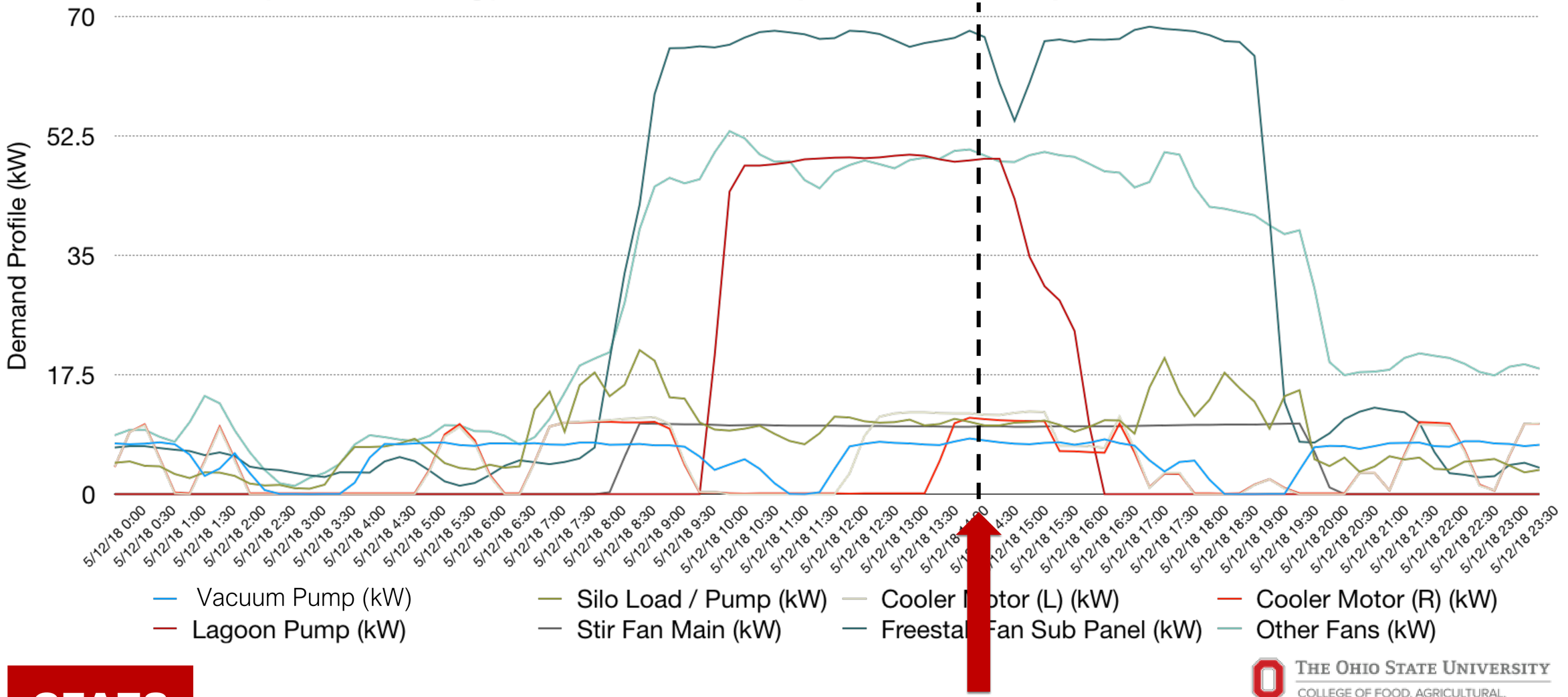
Daily Peak Energy Demand Profile (15 Min Interval) - 300 Head Dairy Farm



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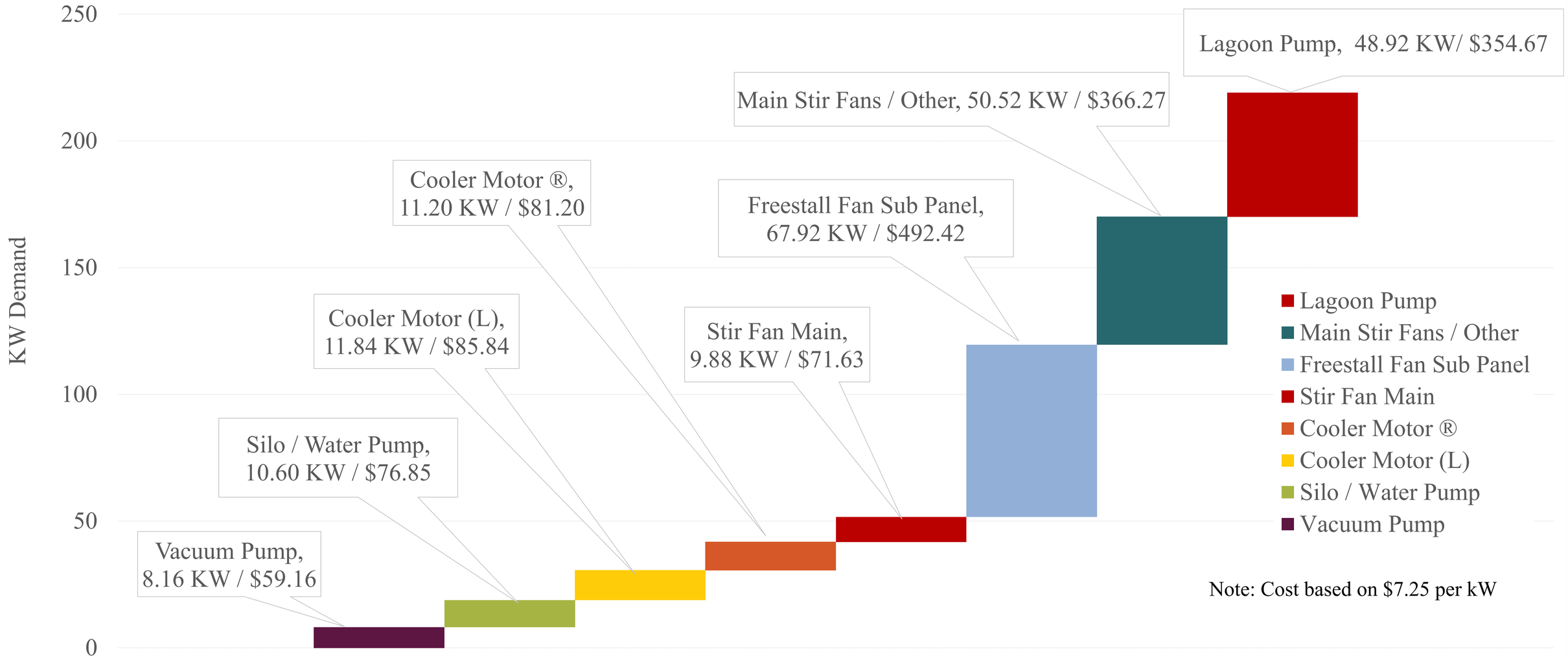
OHIO STATE UNIVERSITY EXTENSION

219 kW Monthly Demand Set on 5/12/18 @ 2:15 p.m.



Note: Cost based on $7.25 per kW

Outreach, Resources, and Next Steps

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Next Steps

Outreach and Education

- Share results via county and regional Extension programs
- Develop resources including case studies, research poster, marketing banner, and radio podcast
- National conferences
- Farm Science Review energy tent

Research Expansion and Growth

- Expand data sample and modeling on chicken farms, egg farms, turkey farms, grain handling, greenhouses
- Collect specific data on power factor and build a database of power factor charges
- Test possible solutions such as: power factor correction, energy efficiency, load shifting, peak shaving, and renewable energy and storage

Thank You!

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