Improving the Efficiency and Resiliency of Water Treatment and Conveyance Systems

Examining Data From 408 Resource Recovery Facilities Across Wisconsin

NASEO Midwest Regional Meeting

May 10, 2018

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Presentation Overview

- Why Address Energy Use?
- Training Initiative
- Best Practice Guide Forecasted Energy Use
- What Does The Collected Data Look Like
- Process Questions
- Facility Distribution
- What is The Data Telling Us
- Focus Assistance
- Summary – Actions – Q & A

Why Address Energy Use?

CMAR (Compliance Maintenance Annual Report)
One of the primary purposes of the CMAR is to foster **communication**.

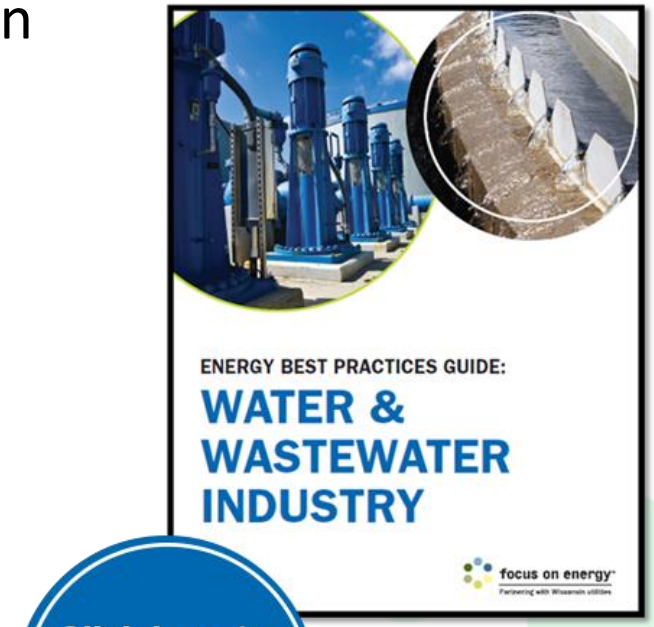
Communication of Wastewater Resource Recovery Facilities needs among **operators, governing bodies**, and the **DNR**.

This project allows the CMAR to become an educational tool that increases awareness of the importance and **value** of wastewater treatment **energy efficiency.**

Why Address Energy Use Through the CMAR?

The Clean Water Loan Fund requires an Energy Audit, first step of energy audit is to create an energy use baseline.

In 2017 Focus on Energy provided energy efficiency incentives to over 50 Wisconsin Wastewater Treatment Facilities.



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Collaborative Process to Develop Questions?

Design Phase (2015)

CMAR Energy External Workgroup with in-person meetings to develop the new questions and data table with the charge of keeping it short, simple and easy to complete.

Jack Saltes – DNR Madison
Joe Cantwell, Focus On Energy
Jeremy Cramer, Fond du Lac WWTP
Kevin Freber, Watertown WWTP
Sharon Thieszen, Sheboygan WWTP
Gary Hanson, Short Elliot Hendricksen
Steve Ohm, DNR-Rhinelander
David Argall, DNR-Madison
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WISCONSIN WASTEWATER OPERATORS' ASSOCIATION

focus on energy℠
Partnering with Wisconsin utilities

WISCONSIN DEPT. OF NATURAL RESOURCES

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Initial Questions on Energy Use/ Training Initiative

Committee determined that questions should be separated into “inside the fence” and “outside the fence”

WDNR, OEI, Focus held training sessions in all DNR regions. Great attendance, good questions, lots of important input.

Energy Best Practice Guide: Table 4

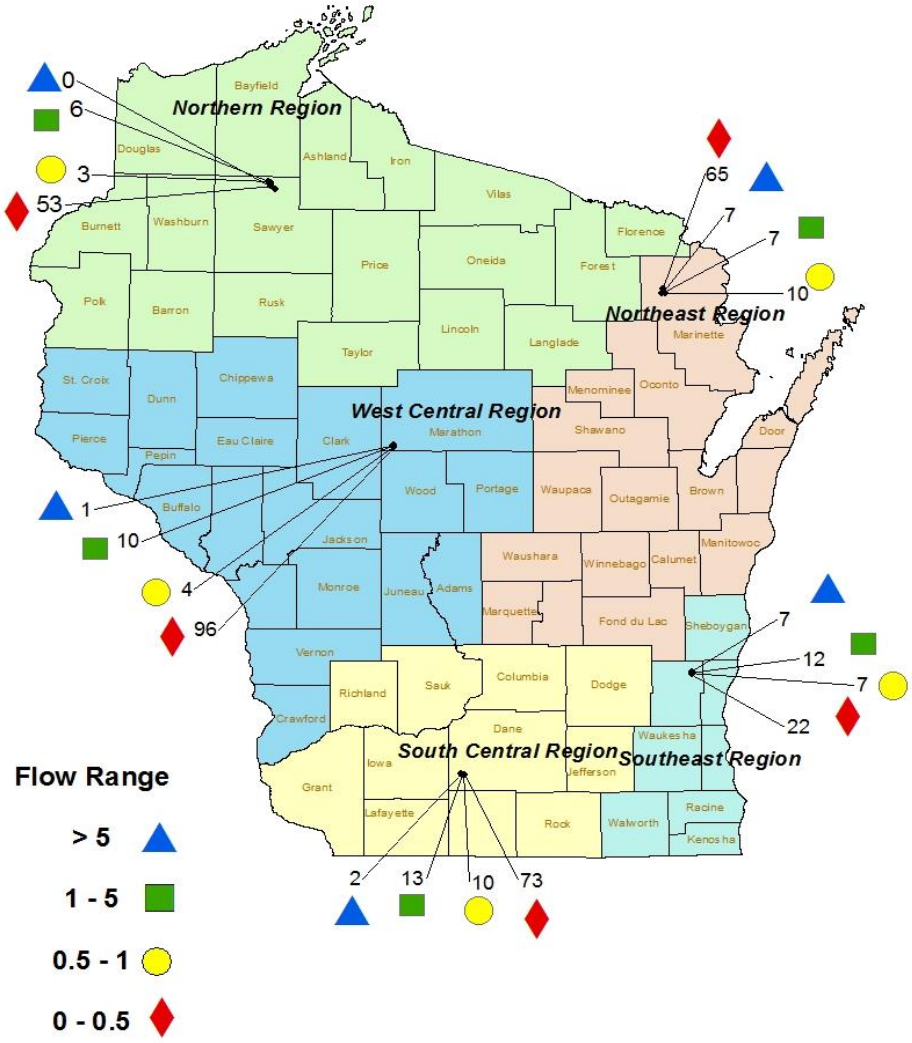
Table 4 Best Practice Benchmarks and Top Performance Quartiles for Wisconsin Wastewater Facilities

Facility Type	Flow Range (MGD)	Average Energy Use (kWh/MG)	Top Performance Quartile (kWh/MG)	Best Practice Benchmark (kWh/MG)	Average Potential Savings
Activated Sludge**	0 -1	5,440	< 3,280	3,060	44%
	1 - 5	2,503	< 1,510	1,650	34%
	> 5	2,288	< 1,350	1,760	23%
Aerated Lagoon	< 1	7,288	< 4,000	3,540	51%
Oxidation Ditch	< 1.2	6,895	< 4,000	4,320	37%

Facility Distribution Across the State

	DNR Region					
Size Range	Northeast	Northern	South Central	West Central	Southeast	Totals
0.0-0.05	17	19	28	23	2	**89**
0.05-0.125	21	15	17	32	6	**91**
0.125-0.25	21	11	13	23	5	**73**
0.25-0.5	6	8	15	18	9	**56**
0.5-1.0	10	3	10	4	7	**34**
1.0-5.0	7	6	13	10	12	**48**
>5	7	0	2	1	7	**17**
Total Surveyed	**89**	**62**	**98**	**111**	**48**	**408**
Total WPDES	**134**	**114**	**149**	**176**	**68**	**641**

Facility Distribution Across the State



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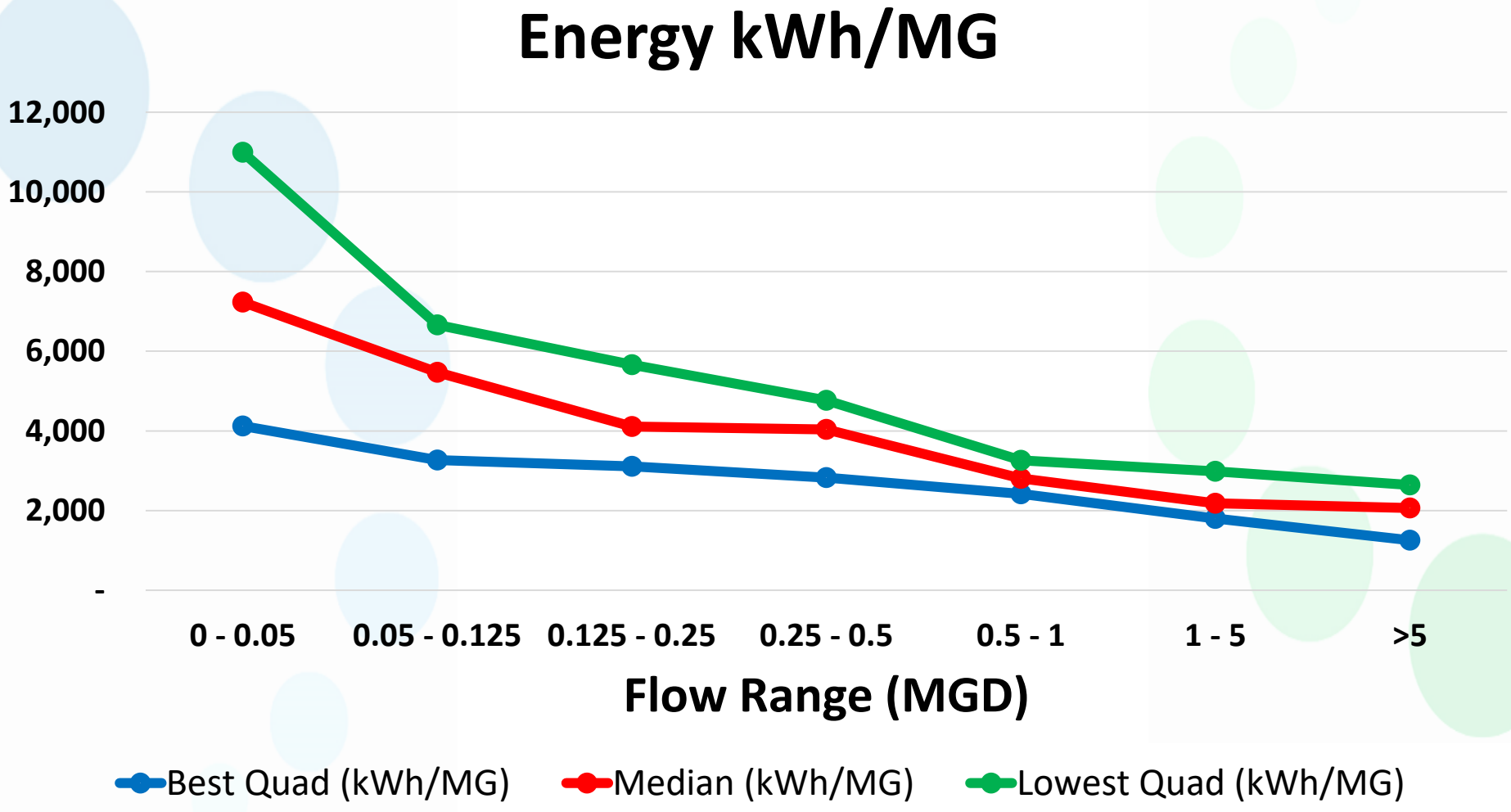
What the Data Looks Like and What it Tells Us

Flow Range (MGD)	Number of Facilities	Median Flow (MGD)	Best Quad (kWh/MG)	Median (kWh/MG)	Lowest Quad (kWh/MG)
0 - 0.05	89	0.030	4,124	7,236	10,995
0.05 - 0.125	91	0.073	3,269	5,468	6,663
0.125 - 0.25	73	0.184	3,111	4,109	5,664
0.25 - 0.5	56	0.355	2,826	4,033	4,765
0.5 - 1	34	0.659	2,421	2,806	3,263
1 - 5	48	1.625	1,803	2,184	2,987
>5	17	12.860	1,253	2,062	2,641
0-100	408	0.161	2,601	4,023	6,192

What the Data Looks Like and What it Tells Us

Flow Range (MGD)	Savings Median to Best	Median Savings Electric Cost Median to Best	Savings Worst to Best	Minimum (kWh/MG)	Maximum (kWh/MG)
0 - 0.05	43%	$ 2,770	62%	1,702	26,926
0.05 - 0.125	40%	$ 5,748	51%	1,306	26,312
0.125 - 0.25	24%	$ 6,607	45%	1,324	19,720
0.25 - 0.5	30%	$ 15,115	41%	1,460	14,243
0.5 - 1	14%	$ 10,027	26%	1,625	9,772
1 - 5	17%	$ 27,266	40%	1,452	5,661
>5	39%	$ 256,682	53%	690	3,687
0-100	35%	$ 9,081	58%	690	26,926

What the Data Looks Like and What it Tells Us



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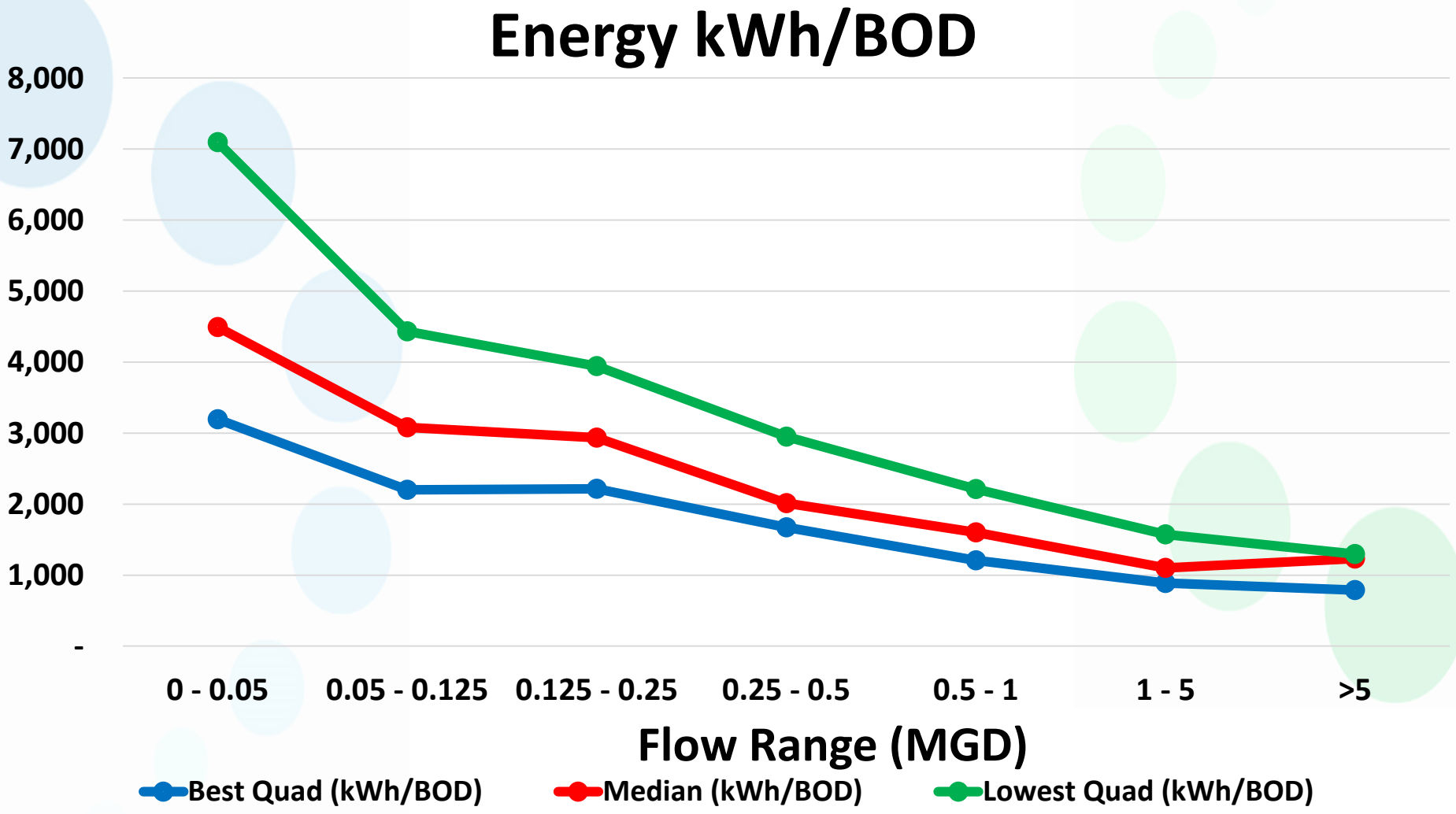
What the Data Looks Like and What it Tells Us



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Process Questions

7.2 Energy Related Processes and Equipment

7.2.1 Indicate equipment and practices utilized at your treatment facility (Check all that apply):

- ☐ Aerobic Digestion
- ☐ Anaerobic Digestion
- ☐ Biological Phosphorus Removal
- ☐ Coarse Bubble Diffusers
- ☐ Dissolved O2 Monitoring and Aeration Control
- ☐ Effluent Pumping
- ☐ Fine Bubble Diffusers
- ☐ Mechanical Sludge Processing
- ☐ Nitrification
- ☐ SCADA System
- ☐ UV Disinfection
- ☐ Variable Speed Drives
- ☐ Other:

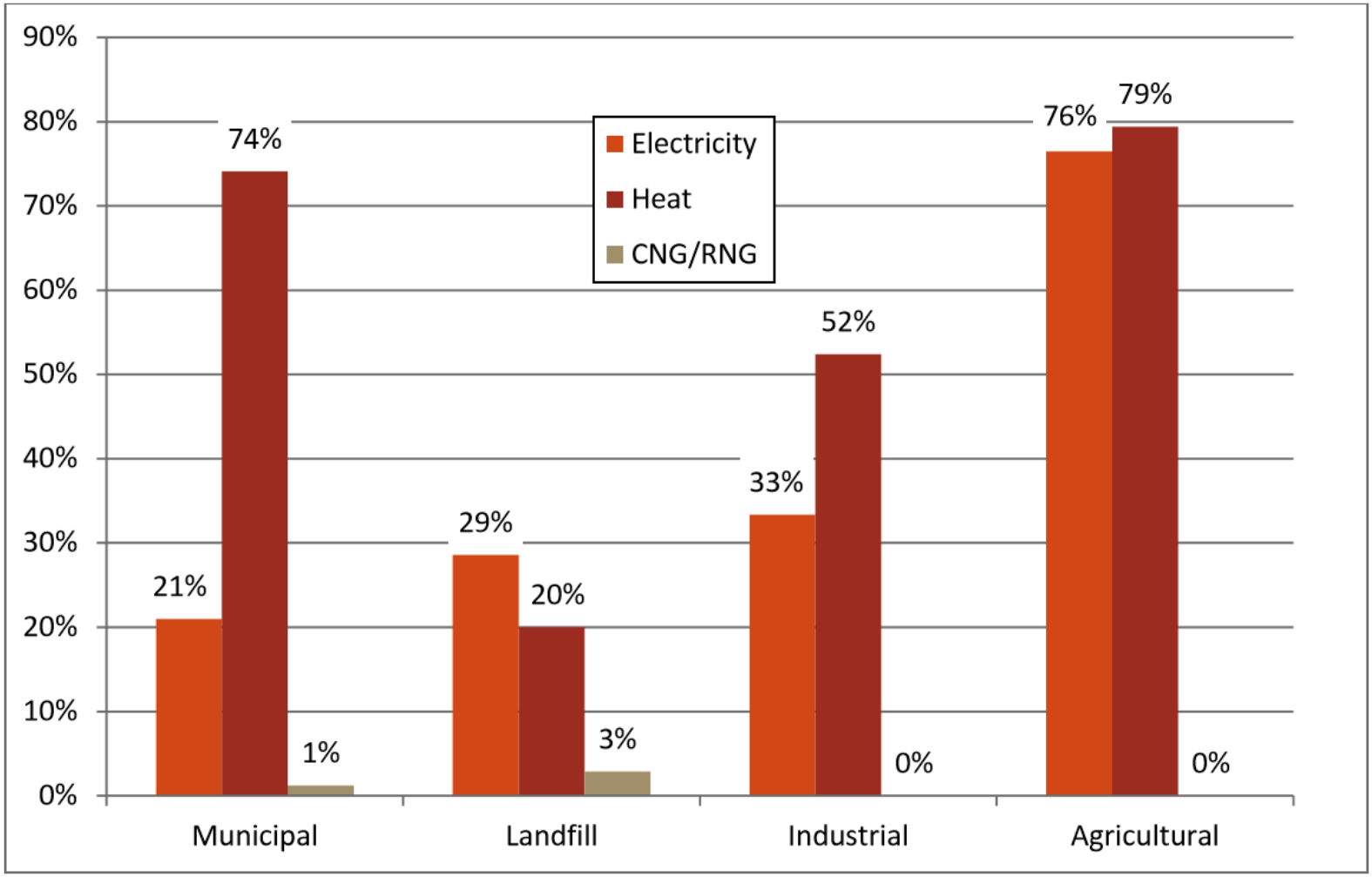
What Can We DO About it?

Flow Range	Number of Facilities	Average Energy Use (kWh/MG)	Average Flow (MGD)	Present Ave Annual Energy Use (MWh/year)	Best Quad (kWh/MG)	Forecast of Yearly Energy Use if all at Best Quad (MWh/yr)	% Energy Reduction (Ave to Quad) Per Flow Range
0-0.05	89	8,309	0.03	7,507	4,124	3,781	50%
0.05-0.125	91	5,841	0.08	15,103	3,269	6,651	44%
0.125-0.25	73	4,569	0.18	22,164	3,111	7,072	32%
0.25-0.5	56	4,123	0.35	29,726	2,826	9,354	31%
0.50-1.0	34	3,168	0.69	27,042	2,421	6,378	24%
1-5	48	2,461	2.01	86,742	1,803	23,190	27%
> 5	17	1,978	23.17	284,409	1,253	104,240	37%

What Can We DO About it?

Flow Range	Number of Facilities	Present Ave Annual Energy Use (MWh/year)	Forecast of Yearly Energy Use if all at Best Quad	Forecast of Potential Energy Use Reduction to Best Quad Value (MWh/year)	Per Cent of Total
0-0.05	89	7,507	3,726	3,781	2.4%
0.05-0.125	91	15,103	8,453	6,651	4.1%
0.125-0.25	73	22,164	15,092	7,072	4.4%
0.25-0.5	56	29,726	20,372	9,354	5.8%
0.50-1.0	34	27,042	20,664	6,378	4.0%
1-5	48	86,742	63,551	23,190	14.4%
> 5	17	284,409	180,169	104,240	64.9%

Biogas Across the State



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Biogas Across the State

Sector	Number of systems
Municipal wastewater with digester	81
Landfill with gas capture	35
Industrial wastewater with digester	21
Agricultural with digester	34

Top 25 Low Cost No Cost Measures to Implement

https://focusonenergy.com/business/WWbridge

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2017 Energy Advisor Territory Map

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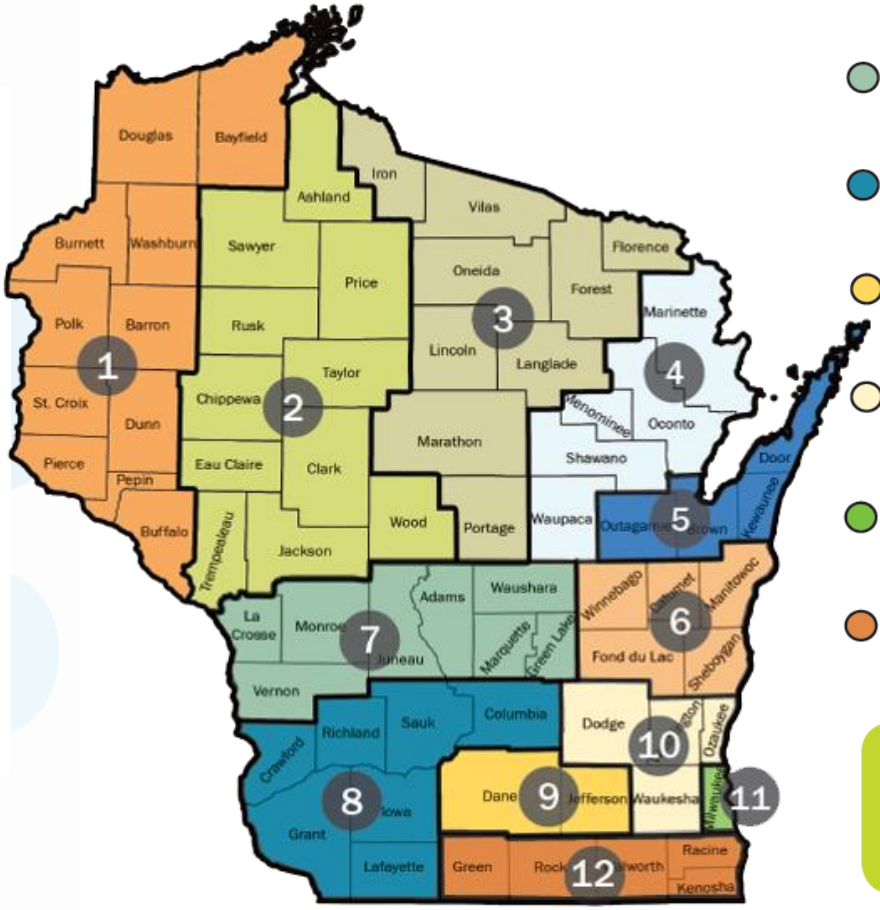

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Summary

- Range of reported energy use: **690 to 26,926 kWh/MG**
- Average energy use:
  - 0.0 - 0.05 MGD: **8,309 kWh/MG**
  - 0.5 – 1.0 MGD: **3,168 kWh/MG**
  - > 5 MGD: **1,978 kWh/MG**
- Per Cent of Energy Reduction Available (From Average to 75 %'ile Data): **24 to 50 %**
- Amount of forecasted energy savings available from wastewater facilities: **256 MWh/year**
- Forecasted value of energy savings at $0.10 /kWh
  256,000,000 kWh X 0.10 $/kWh = **$25,600,000 / year**

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Take Away & Actions

- **TAKE AWAY**

  - Wastewater System energy use can be reduced, systems in need of upgrades should consider energy profile and resiliency
  - Focus on Energy assistance is available- partnership with OEI and WDNR
  - If a facility has completed one energy project now look for the second, third, fourth- Clean Water Loan Fund Principal Forgiveness is a possibility

- **ACTIONS**

  - Continue data analysis
  - Expand program to Water Utilities
  - Reach out to facilities with high energy use
  - Develop and provide additional education and training materials and/or sessions
  - Encourage facilities to contact Focus on Energy for assistance

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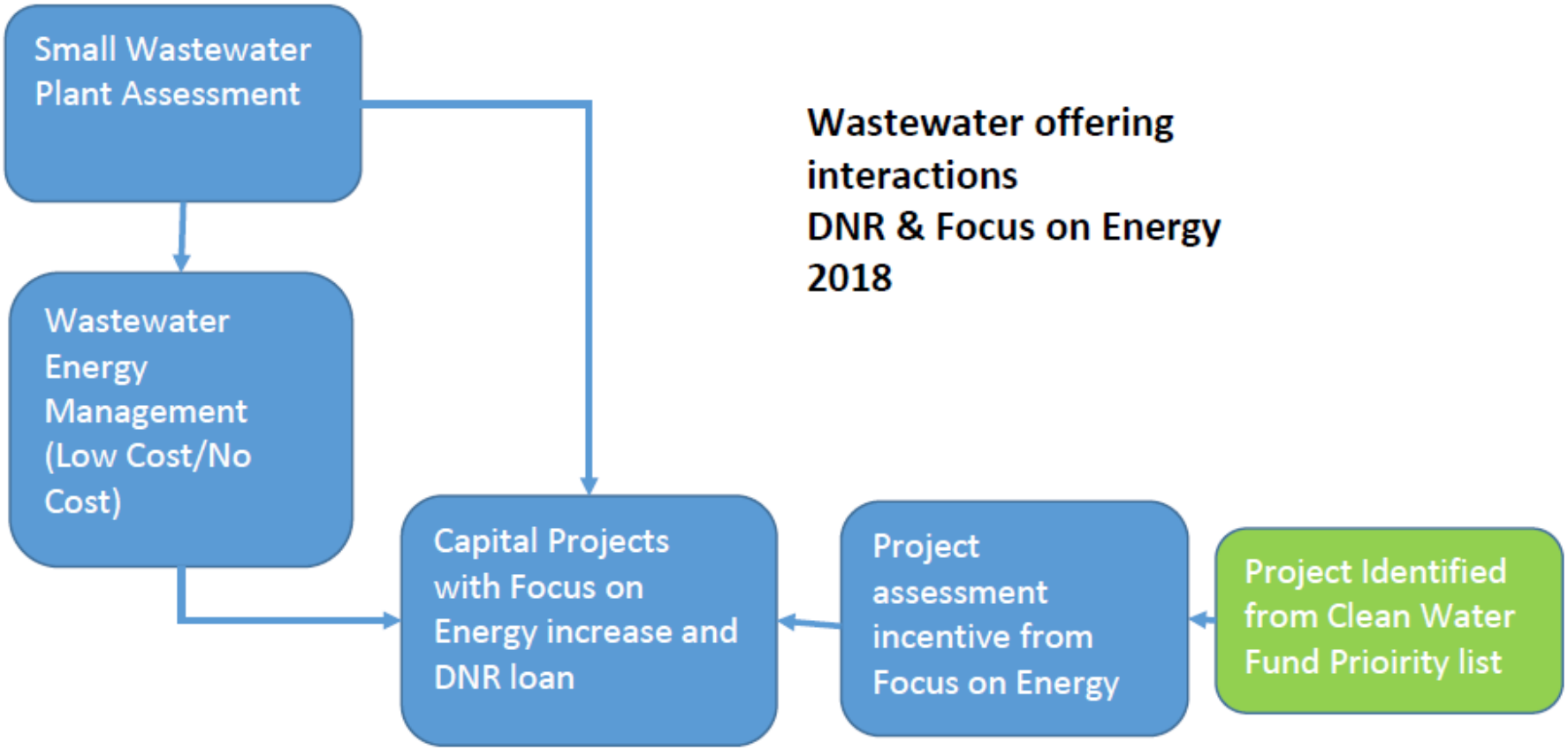
Take Away & Actions



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Questions – Comments - Contact

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