Best Practices in Benchmarking Energy Performance at Water and Wastewater Treatment Facilities

Examining Data From 584 Resource Recovery Facilities Across Wisconsin 2016-2018

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NGA Energy Water Nexus Learning Lab
September 2020

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Presentation Overview

- Why Address Energy Use Through Regulatory Reports?
- Collaborative Process to Develop Questions
- Process Questions
- Facility Distribution
- What The Data Is Telling Us
- Summary – Actions – Q & A

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Why Address Energy Use Through the Regulatory Process

One of the primary purposes of the Compliance Maintenance Annual Report (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.**

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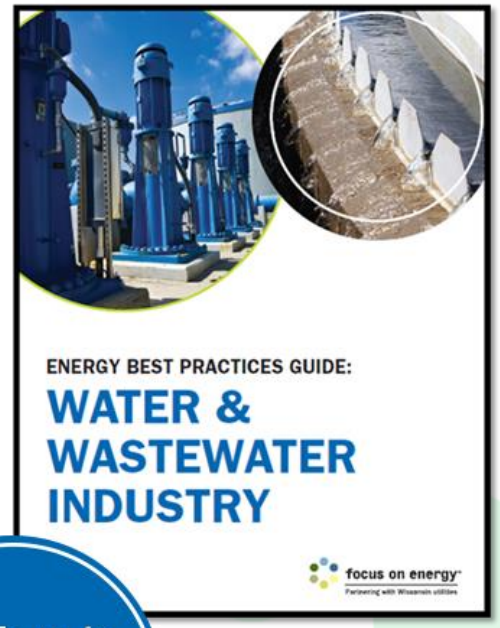
Why Address Energy Use Through the CMAR?

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

Focus on Energy provides energy efficiency incentives to 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
Megan Levy, OEI
Kevin Splain, OEI

WISCONSIN WASTEWATER OPERATORS' ASSOCIATION

focus on energy℠
Partnering with Wisconsin utilities

WISCONSIN DEPT. OF NATURAL RESOURCES

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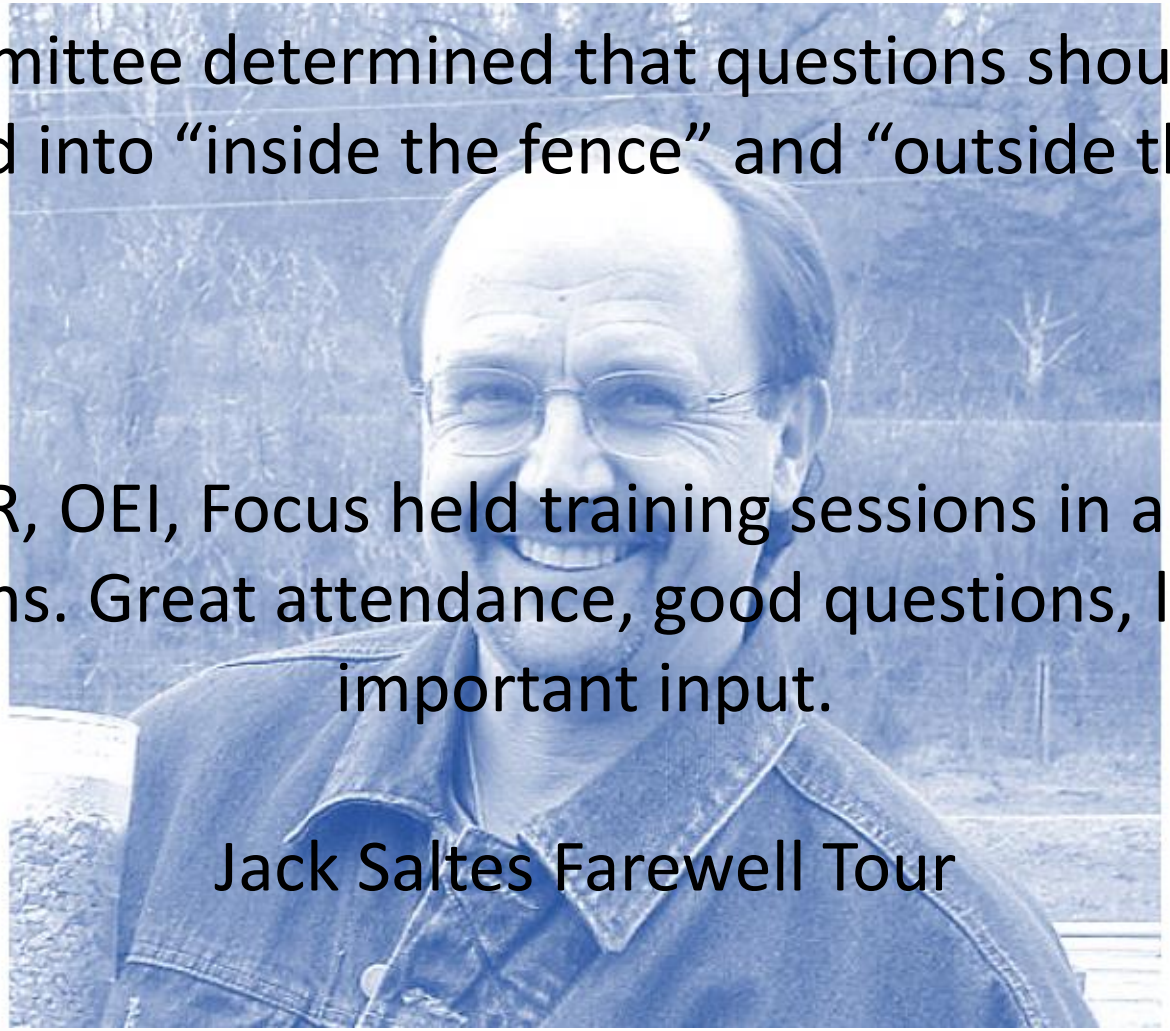
Initial Questions on Energy Use/ Training Initiative

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.

Jack Saltes Farewell Tour

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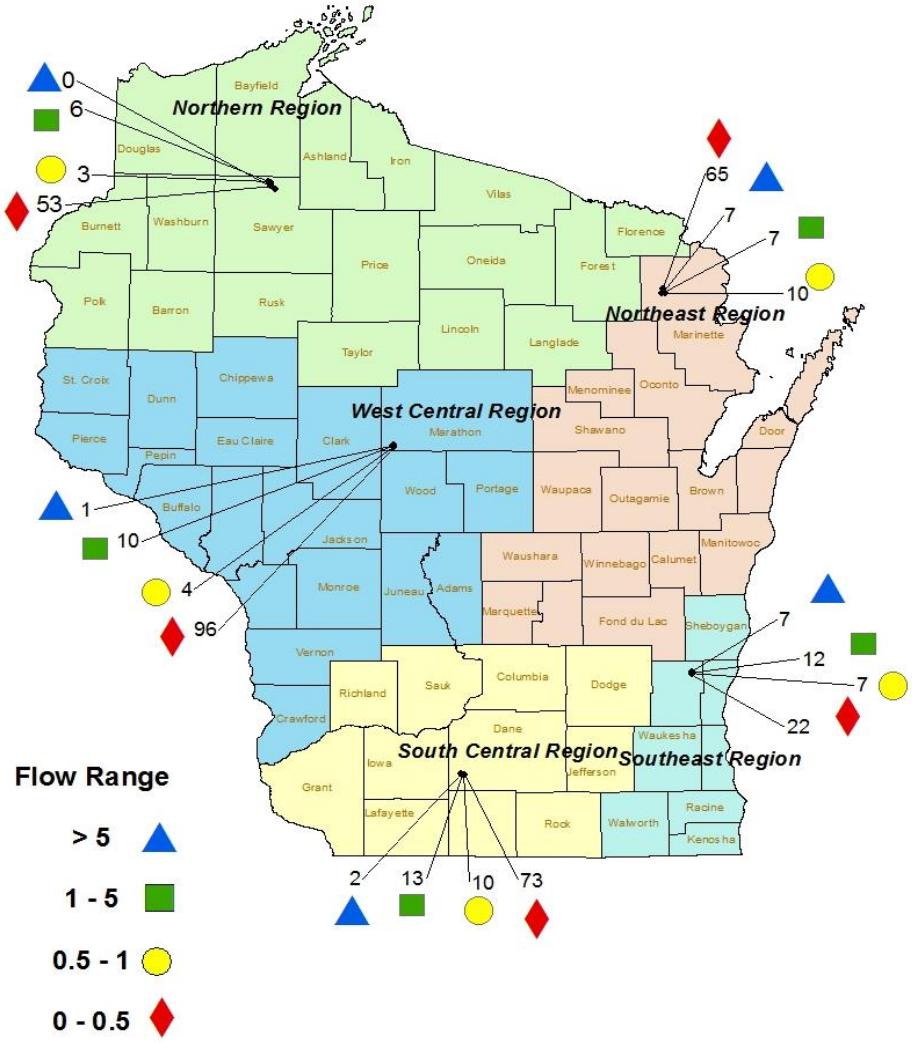
Facility Distribution Across the State



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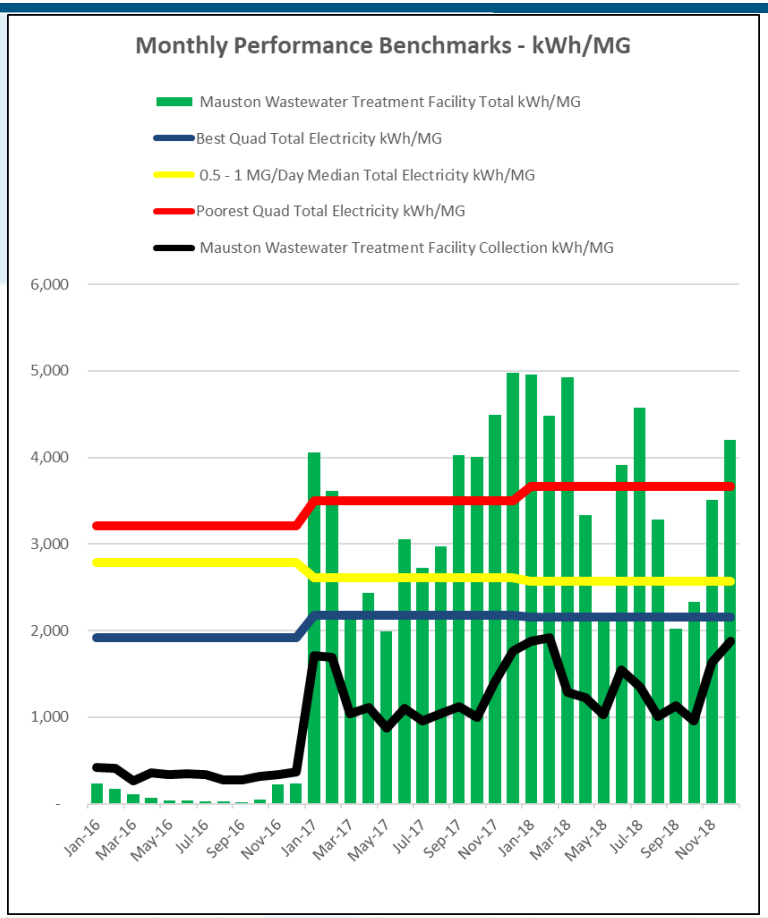
Process Questions

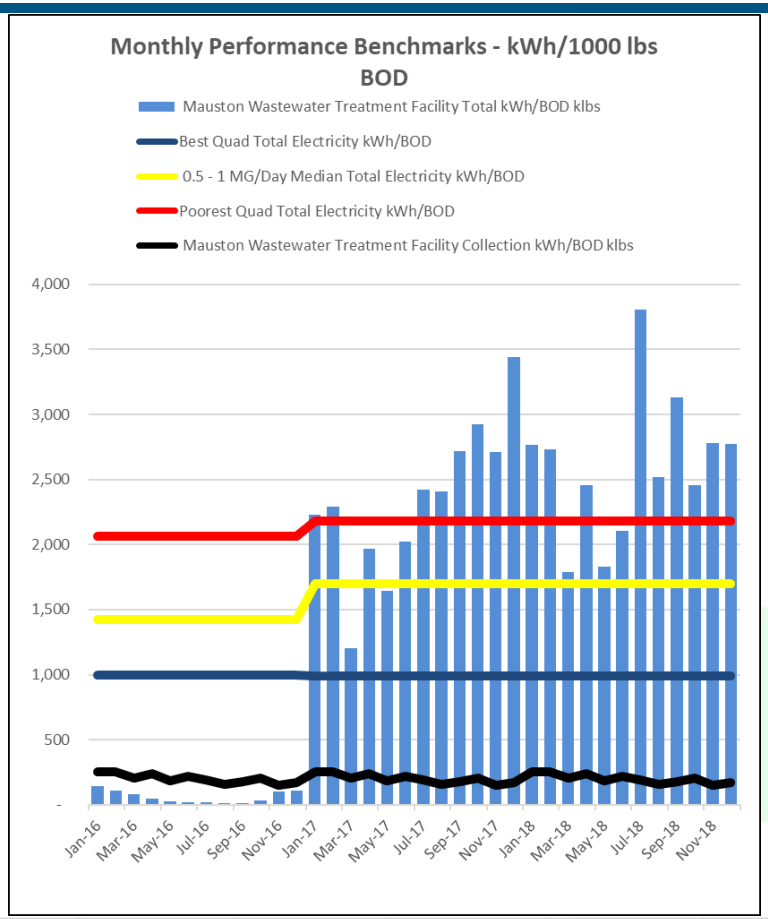
7.2 Energy Related Processes and Equipment

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:

Facility Performance and Benchmarking Analysis





Water and/or wastewater utility managers index their facility's energy usage through a production or demand index, such as kWh/MGD or kWh per 1,000lb of Biological Oxygen Demand (BOD). This index is called a Key Performance Index (KPI) or Energy Performance Index (EPI). Establishing an energy baseline helps facility managers understand the relative efficiency or change in efficiency relative to the core purpose of the operation, i.e., water production or wastewater treatment. It is recommended utilities set a goal to save five to ten percent of its energy after it has implemented energy efficiency measures, a new annual average line is set as the targeted KPI level with monthly Monitoring & Verification (M&V).

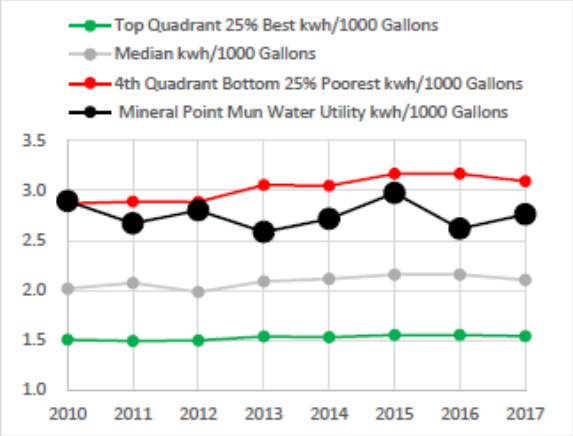
Water Utility Analysis

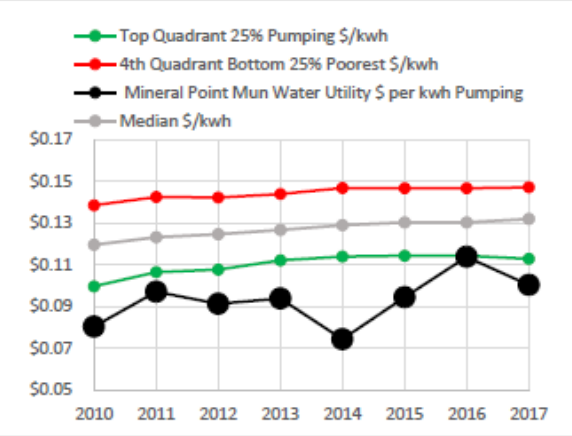
Quartile Statistical Benchmarks where 1 = Top Quadrant 25% Best, 2 = 2nd Quadrant Good, 3 = 3rd Quartile below Median & 4 = 4th Quadrant Bottom 25% Poorest

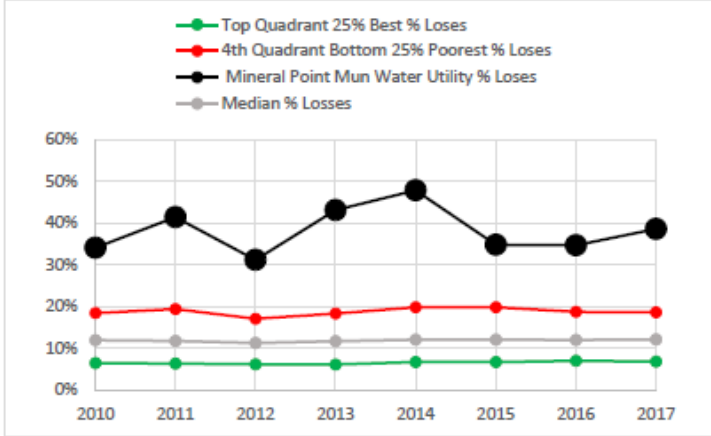
Utility ID	Utility	Performance Benchmark	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017 Average
3740	Mineral Point Mun Water Utility	kwh/1000 Gal Quad	4	3	3	3	3	3	3	3	3
3740	Mineral Point Mun Water Utility	% Water Losses Quad	4	4	4	4	4	4	4	4	4
3740	Mineral Point Mun Water Utility	$ per kwh Pumping Quad	1	1	1	1	1	1	1	1	1
3740	Mineral Point Mun Water Utility	$ per 1000 Gallons Quad	2	3	3	2	2	2	3	2	2

Water utilities with benchmarks of 3 (Yellow) and 4 (Red) can request that MEETAP prepare a system analysis of wells, towers and pumps to estimate demand, energy and cost savings (capacity and average operating characteristics – on-peak, capacity factor, constant flow high pressure control vs variable flow constant pressure, etc.).

Utility ID	Utility	Performance Benchmark	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017 Average
3740	Mineral Point Mun Water Utility	kwh/1000 Gallons	2.89	2.67	2.80	2.58	2.72	2.97	2.62	2.76	2.75
3740	Mineral Point Mun Water Utility	% Water Losses	34.07%	41.39%	31.15%	43.07%	47.78%	34.77%	34.66%	38.55%	38.18%
3740	Mineral Point Mun Water Utility	$ per kwh Pumping	$ 0.08	$ 0.10	$ 0.09	$ 0.09	$ 0.07	$ 0.09	$ 0.11	$ 0.10	$ 0.09
3740	Mineral Point Mun Water Utility	$ per 1000 Gallons	$ 0.23	$ 0.26	$ 0.26	$ 0.24	$ 0.20	$ 0.28	$ 0.30	$ 0.28	$ 0.26







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Top 25 Low Cost No Cost Measures to Implement

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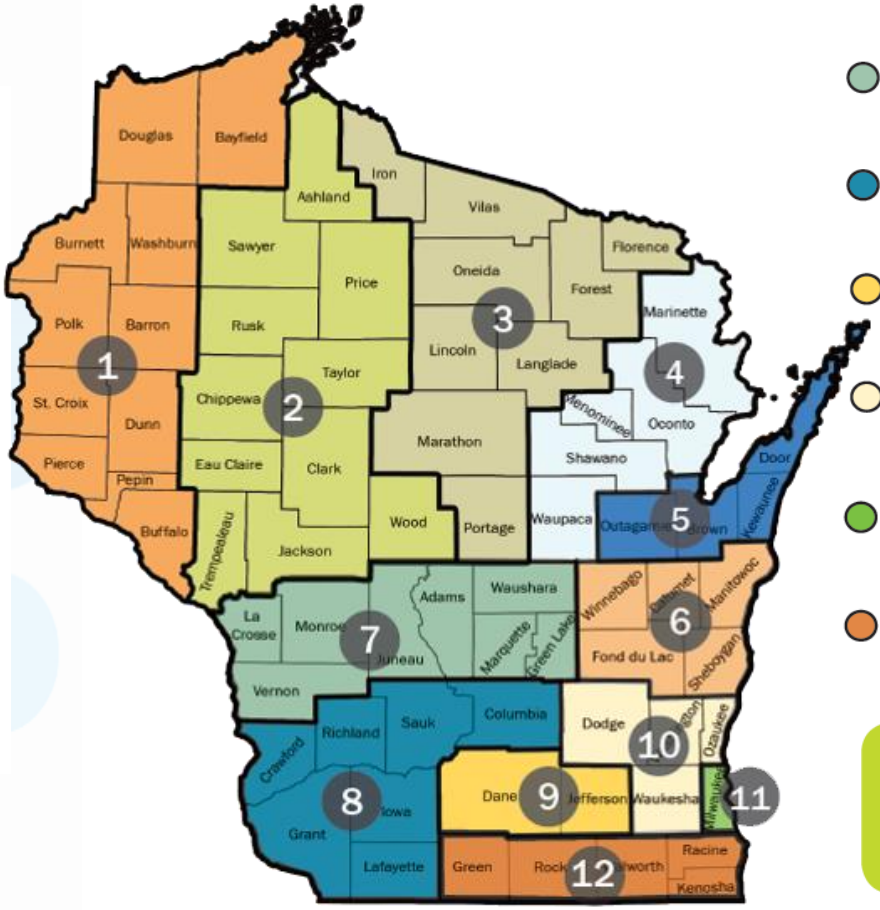

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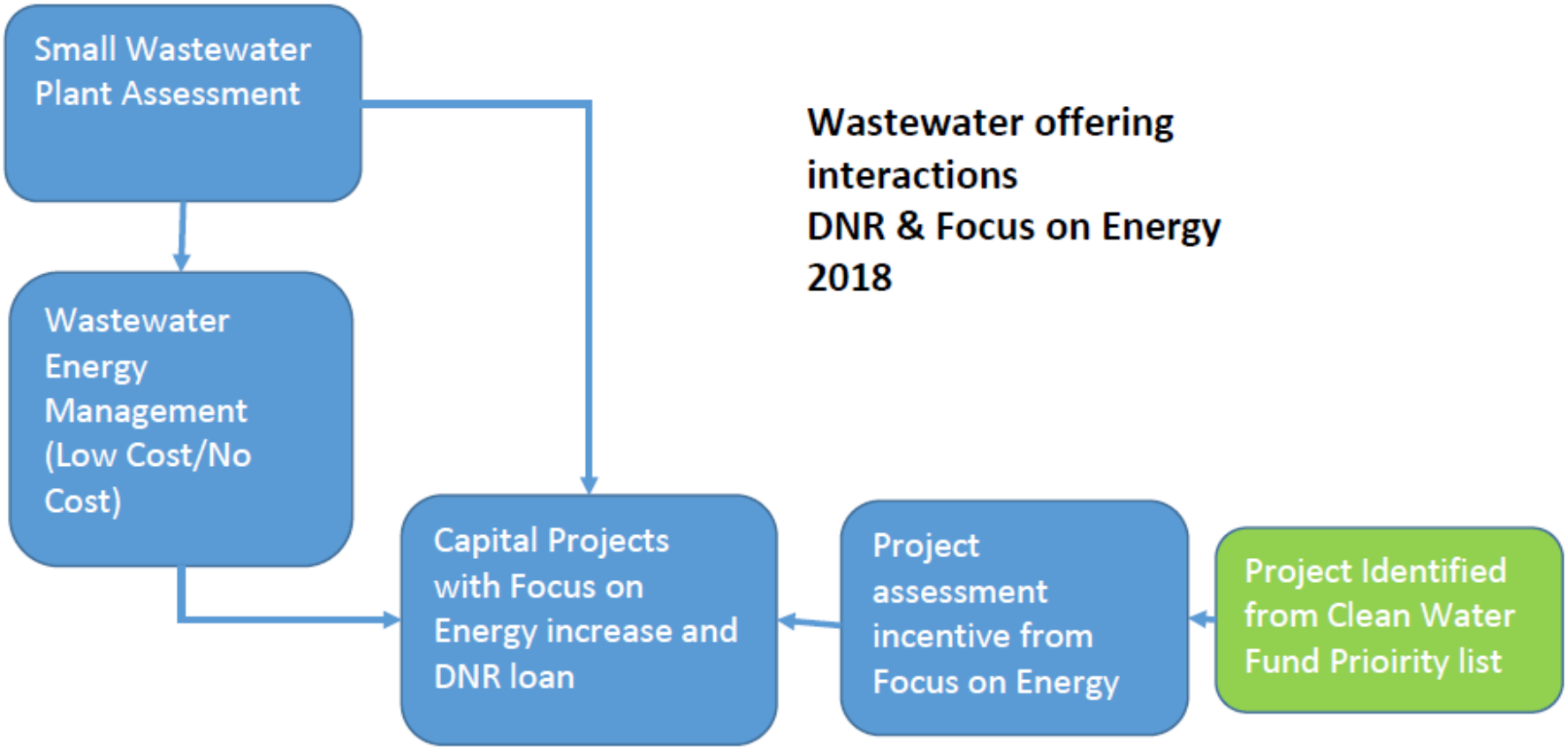
Take Away & Actions



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