Baselining of Large Water Resource Recovery Facilities in New York State

Final Report | Report Number 20-12 | April 2020

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Baselining of Large Water Resource Recovery Facilities in New York State

Final Report

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NYSERDA Report 20-12 NYSERDA Contract 120915 April 2020

Notice

Abstract

To support New York State's ambitious clean energy goals, a baselining effort was undertaken to assess whether Integrated Capital and Energy Planning (ICE Planning) would be beneficial to large municipal Water Resource Recovery Facilities (WRRF), and if so, to identify the facilities able to perform ICE Planning in the near term. It was determined that large WRRF in New York State would benefit from ICE Planning. Twenty-four were identified as being suitable to begin ICE Planning immediately.

Keywords

Integrated Capital and Energy Planning (ICE Planning), Water Resource Recovery Facilities (WRRF), baselining, benchmarking, wastewater operations, water resource recovery, wastewater treatment, energy solutions for wastewater facilities, energy management best practices, integrated state of good repair

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Acronyms and Abbreviations

BOD	biochemical oxygen demand
CIP	capital improvement plan
DO	dissolved oxygen
ECM	energy conservation measure
ESCO	Energy Service Company
FEMA	Federal Emergency Management Agency
ICE	Integrated Capital and Energy
IFAS	Integrated Fixed Film Activated Sludge
kW	kilowatt
kWh	kilowatt-hour
LTCP	Long Term Control Plan
mg/L	milligrams per liter
MG	million gallons
MGD	million gallons per day
NH_3	ammonia
NYC DEP	New York City Department of Environmental Protection
NYPA	New York Power Authority
NYS EFC	New York State Environmental Facilities Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric & Gas
NYSERDA	New York State Energy Research and Development Authority
O&M	operations and maintenance
PSEG-LI	Public Service Enterprise Group - Long Island
PV	photovoltaic
RBC	rotating biological contactor
RG&E	Rochester Gas and Electric
SBC	sequencing batch reactor
SCADA	Supervisory Control and Data Acquisition
TKN	total Kjeldahl nitrogen
WERF	Water Environment Research Foundation, now Water Research Foundation
WIIA	Water Infrastructure Improvement Act
WQIP	Water Quality Improvement Project
WRRF	Water Resource Recovery Facility

Executive Summary

To support New York State's ambitious clean energy goals a baselining effort was undertaken to assess whether Integrated Capital and Energy Planning (ICE Planning) would be beneficial to large municipal Water Resource Recovery Facilities (WRRF),[1] and if so, to identify the facilities able to perform ICE Planning in the near term. WRRFs are excellent candidates for such planning as they are significant energy users that may offer the potential for sizeable energy savings.

The objective of ICE Planning is to develop a comprehensive strategy for sustainable infrastructure investment; a strategy in which energy projects are woven into capital projects, rather than implemented as stand-alone endeavors. Regular collection and monitoring of operational and energy data is an integral component of ICE Planning to ensure a facility's list of potential energy projects remains current and to quantify the energy savings associated with completed tasks. Ideally, ICE Planning should result in projects that are funded partially or entirely by dollars saved via energy efficiency and on-site renewable energy generation activities.

Sixty-five large WRRFs were initially screened to determine their willingness and suitability[2] to participate in the baselining effort.[3] The screening was performed by three consultants—Arcadis of New York Inc. (Arcadis); OBG, part of Ramboll (OBG); and Wendel. The Arcadis team also served as the overall project manager for the effort. Forty-four of the 65 WRRFs were willing—and deemed suitable—to participate in the effort.

Consultants met with staff at each of the 44 WRRFs to garner an understanding of treatment configurations and processes used as well as how plants plan and pay for infrastructure investments, and if energy is factored into the planning process. The consultants also identified energy-intensive equipment and potential energy opportunities along with collecting operational data, system schematics, and planning documents (e.g., capital improvement plans, recent energy audits, asset management plans). Multiple follow-up conversations took place between the consultants and plant staff.

The 44 baselined WRRFs varied greatly in size, treatment configurations, processes used, and infrastructure planning and investment approaches. The following are examples:

- Average WRRF design flows range from 5 million gallons per day (MGD) to greater than 75 million gallons per day (MGD).

- Five WRRFs use anaerobic digester gas to generate electricity, nine burn the gas for digester heating, and the remaining either don't produce gas or don't use it beneficially.
- Most facilities follow a specific planning process, but the sophistication of the process, the number of stakeholders involved, and the number of staff available to help implement the process is highly variable.
- While some plants prefer to self-fund projects, most rely on state and/or federal loans and grants.

Once baselining was completed, an individualized baselining report was developed for each WRRF. Each report included four benchmarking values that were calculated specifically for each WRRF. They included: energy use per million gallons treated (kilowatt-hour [kWh]/million gallons [MG]); energy use per pound biochemical oxygen demand removed (kWh/lb BOD); energy use per pound nutrients (ammonia [NH_3] or total Kjeldahl nitrogen [TKN]) removed (kWh/lb NH_3 or TKN); and energy use per pound solids disposed (kWh/lb solids).

It was determined that large WRRFs in New York State would benefit from ICE Planning and that 24 were suitable to begin such planning immediately. For determining suitability for immediate planning, particular focus was given to whether the WRRF had a system in place for planning capital expenses, if a culture exists in which energy is considered during planning, and if energy is valued as a means to reduce operational costs, shorten project paybacks, and support environmental and sustainability objectives.

1 Introduction

Sixty-five large New York State municipal Water Resource Recovery Facilities (WRRF) were identified using the Descriptive Data of Municipal Wastewater Treatment Plants in New York State document.[4] While the 14 New York City Department of Environmental Protection (NYC DEP) facilities are large NYS WRRFs, they were excluded from this effort, since they were recently evaluated under an Integrated State of Good Repair (ISOGR) effort.[5]

The 65 WRRFs were grouped into three categories based on average design flow (5 to 20 MGD, 20 to 75 MGD, greater than 75 MGD). These categories were also used for a study supported by NYSERDA in 2015[6] (2015 study). Within each category, the WRRFs differ widely in terms of treatment processes, regulatory requirements, level of stakeholder engagement, and sophistication of planning process.

Each of the 65 WRRFs was assigned to one of three consultants (Arcadis, OBG, or Wendel) based on past relationships, geographical location, and achieving general equity in terms of numbers and sizes of facilities. The WRRFs were initially screened to determine willingness and suitability to participate in the baselining effort. Forty-four WRRFs were willing—and deemed suitable—to participate in the effort.

2 Baselining

The baselining site visits were conducted between November 2018 and September 2019. Before site visits were conducted, templates were developed to ensure each consultant followed a standardized approach to baselining. Prior to the site visit, each WRRF received a data collection list, which identified the information that would be needed (i.e., design parameters, operational data, process ontrol descriptions, energy data, planning documents). During the site visit and subsequent phone conversations, the consultants collected information on day-to-day operations, planning and budgeting processes, including projects planned for near-term implementation, and other potential opportunities for energy savings. The consultants then prepared individualized baselining reports for each facility, which were reviewed by plant personnel before it was deemed as a final version and submitted for NYSERDA review.

Each baselining report contained the following sections:

- Section 1: *WRRF Background*—Included high-level information on facility history, treatment processes, where/when energy is used; whether systems are in place to control energy use; and operational and energy data.
- Section 2: *WRRF Benchmarking*—Included calculated benchmarking values and a comparison of the calculated values to those calculated as part of the 2015 study. Benchmarking values for nutrients removed and solids disposed weren't calculated as part of the 2015 study; however, the values established as part of the baselining effort can be used for future comparisons.
- Section 3: *Review of Planning Documents*—Included brief descriptions of planned energy projects or capital projects with an energy component, as well as other potential energy opportunities identified during the site visit and review of documents (e.g., upgrading/replacing pumps, aeration systems, solids thickening processes; use of automated controls; building upgrades, including lighting systems).
- Section 4: *Discussion and Justification*—Included an assessment as to whether the WRRF is ready to perform ICE Planning in the near term. In particular, whether the WRRF has a system in place for planning capital expenses, if a culture exists in which energy is considered during planning, and if energy is valued as a means to reduce operational costs, shorten project paybacks, and support environmental and sustainability objectives.

3 Summary Description of Participating WRRFs

Section 3 provides summary information on the participating WRRFs, including facility size; treatment, monitoring, and control processes/approaches; whether energy recovery, on-site generation, peak energy management are performed; how energy is procured; how projects are funded; and how planning and assets are managed. Section 4 provides summary information on the performance of the participating WRRFs with respect to the calculated energy benchmarking values.

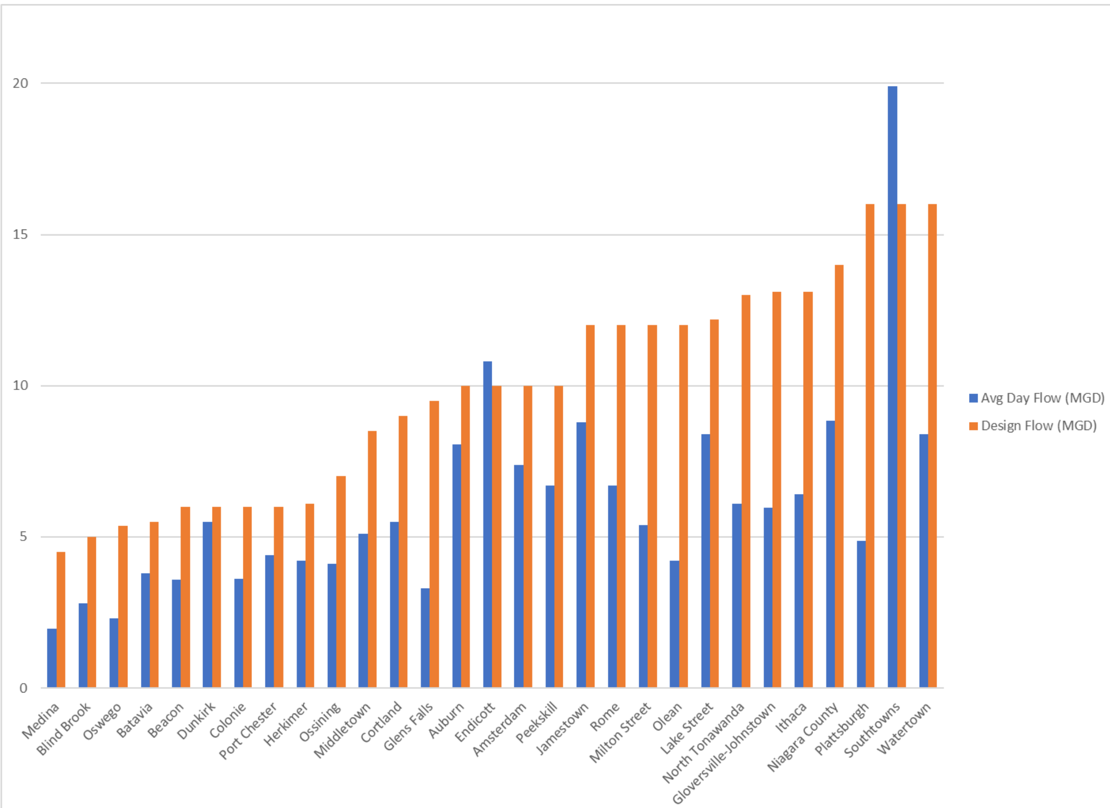
3.1 Facility Size

Of the 44 participant WRRFs, 29 have average design flows between 5 and 20 MGD, 12 have flows between 20 and 75 MGD, and three have flows exceeding 75 MGD. In most cases, plants are operating below design capacity. In fact, the 2015 study showed that more than 100 of the 189 plants larger than one MGD had experienced double-digit percentage declines in the previous 10 years.

3.1.1 WRRFs with 5 to 20 MGD Average Design Flow

The 29 WRRFs in the 5 to 20 MGD average design flow category represent 64 percent of all New York State WRRFs in this category. The majority of the 29 have an actual average day flow between 5 and 10 MGD. Figure 1 shows the average day flow compared to the average design flow for these 29 facilities.

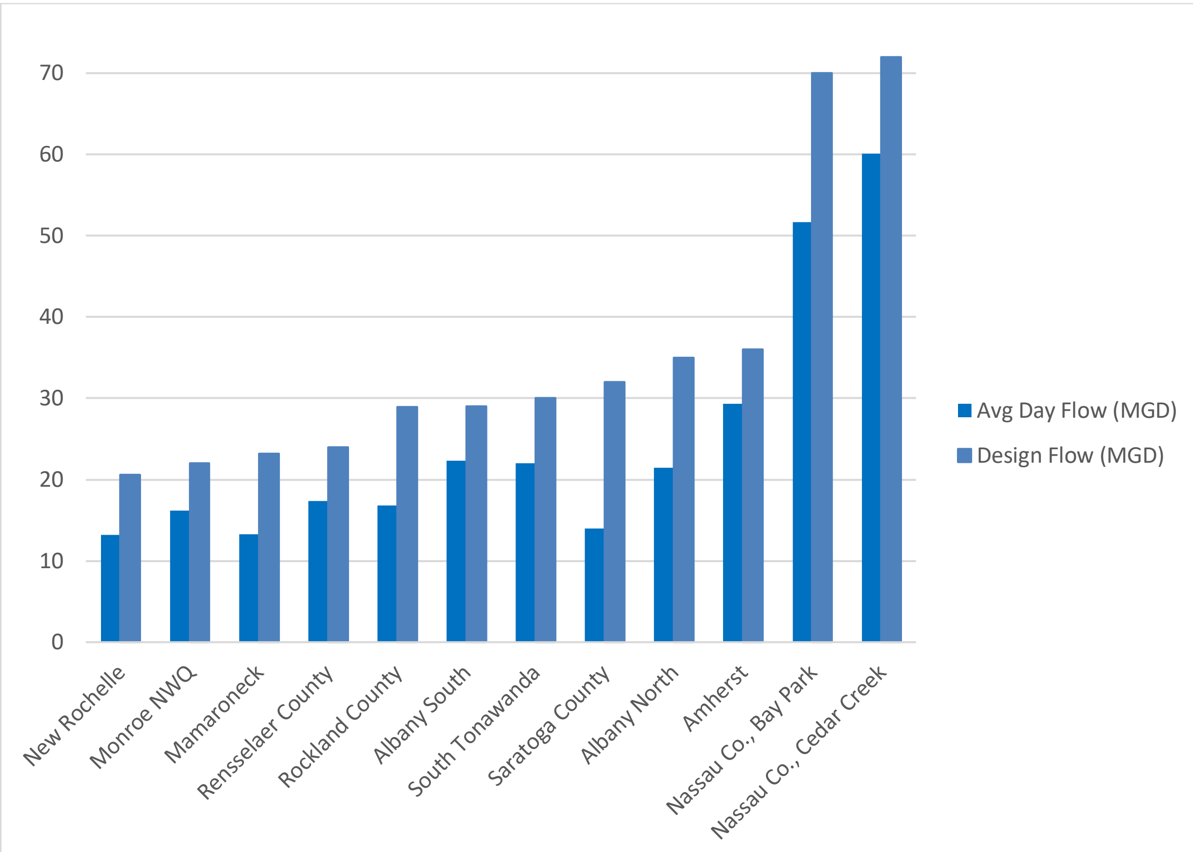
Figure 1. Design and Average Day Flows (5 to 20 MGD)



3.1.2 WRRFs with 20 to 75 MGD Average Design Flow

The 12 participants in the 20 to 75 MGD average design flow category represent 60 percent of all New York State WRRFs in this category. The actual average day flow ranges between 15 and 60 MGD. Figure 2 shows the average day flow compared to the average design flow for these 12 facilities.

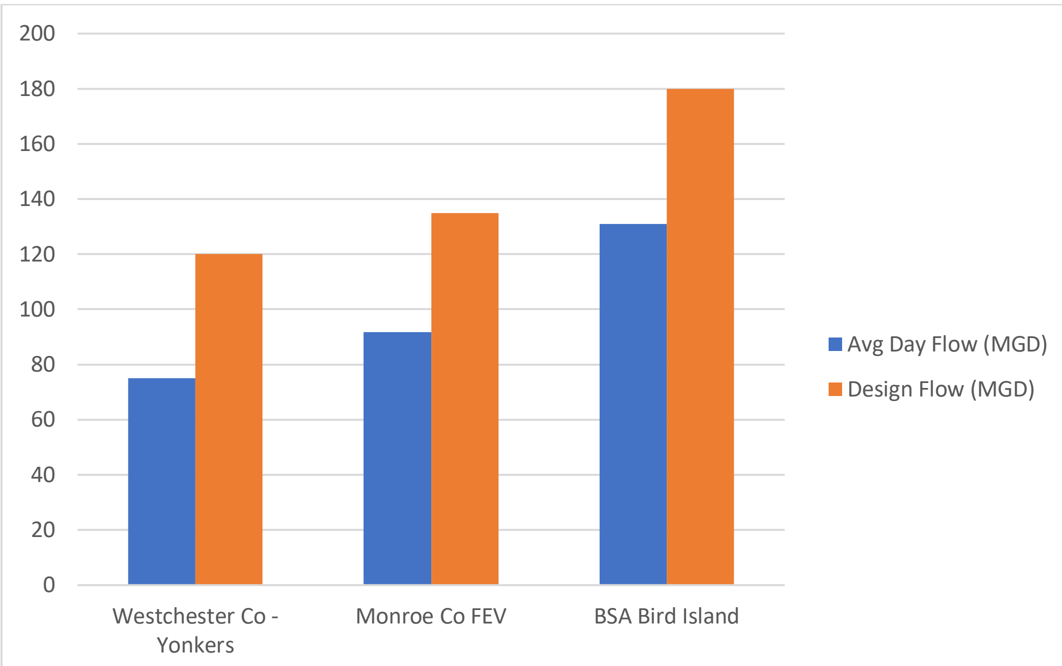
Figure 2. Design and Average Day Flows (20 to 75 MGD)



3.1.3 WRRFs with Over 75 MGD Average Design Flow

The three facilities in the over 75 MGD average design flow category represent 21 percent of all New York State WRRFs in this category. The actual average day flow ranges from 75 to 130 MGD. Figure 3 shows the average annual treated flow compared to the average design flow for the three facilities.

Figure 3. Design and Average Day Flows in the >75 MGD Group



3.2 Secondary Treatment

Secondary treatment processes vary widely across facilities. Secondary treatment is typically the largest energy consumer in a WRRF—in particular, the blower systems for activated sludge secondary treatment and/or nitrification.

Of the 29 WRRFs in the 5 to 20 MGD category, approximately 70 percent use activated sludge for secondary treatment. Twenty-four percent of facilities use fixed film technologies for secondary treatment, which are typically less energy intensive than activated sludge. Five of the WRRFs use trickling filters or a combination of trickling filters/activated sludge and two use rotating biological contactors (RBCs). Two WRRFs use neither activated sludge or fixed film technologies for secondary treatment; one facility has a physical-chemical treatment system, and the other uses aerated ponds and wetlands. Twenty-four percent of WRRFs in this category employ nitrification.

Of the 12 WRRFs in the 20 to 75 MGD category, approximately 90 percent of the facilities use activated sludge secondary treatment and 25 percent employ nitrification. One facility in the 20 to 75 MGD category uses RBCs for secondary treatment.

The three facilities in the greater than 75 MGD category use activated sludge for secondary treatment.

3.3 Sludge Treatment

Sludge treatment can also have a significant impact on overall energy use at a WRRF. Twenty of the 44 WRRFs use anaerobic digestion followed by dewatering for sludge treatment, and one composts the sludge in place of conventional dewatering. One facility uses aerobic digesters for sludge treatment. Two facilities incinerate dewatered sludge. Approximately 30 percent of the facilities thicken their (non-digested) sludge before dewatering, two landfill the thickened sludge directly, and three send their sludge to another plant for treatment. One plant uses a series of wetlands for sludge treatment.

3.4 Energy Recovery/On-site Generation

Of the 20 WRRFs that use anaerobic digestion, five generate electricity with combined heat and power systems—three have engine-generators and two have microturbines. A sixth plant is installing a microturbine in 2021. Ten WRRFs use digester gas for heating, including one WRRF that uses it as fuel for its incinerator and one that uses it as fuel in its sludge dryer. One of the 10 facilities also generates on-site electricity via a 75-kW solar photovoltaic (PV) system. Five WRRFs flare the digester gas, although one of these is planning to use digester gas in a sludge dryer in the near term. Two WRRFs benefits from remote net-metering from municipal solar PV systems.

3.5 Process Monitoring and Control

Process monitoring and control is typically managed via Supervisory Control and Data Acquisition (SCADA). SCADA is a system of software and hardware elements that provides the WRRFs with the opportunity to do the following:

- Control processes locally or at remote locations
- Monitor, gather, and process real-time data

- Directly interact with devices such as sensors, valves, pumps, motors through human-machine interface (HMI) software
- Record events into a log file

The basic SCADA hardware includes programmable logic controllers (PLCs) or remote terminal units (RTUs), microcomputers that communicate with the devices and convey the information from the devices to the computers loaded with SCADA software. The SCADA software processes, distributes, and displays the data, which allows operators the ability to analyze the data and make important decisions.

A SCADA system can be configured such that it continuously transmits WRRF data to a Real Time Energy Management (RTEM) system, where the data can be centrally monitored and analyzed. Due to the granularity and frequency of data received from an RTEM system, operators can make smart decisions about system energy use and detect issues before they lead to costly inefficiencies. RTEM systems also include solutions that interact with the grid to receive and react to demand response signals.

Seventy percent of the baselined WRRFs rely on SCADA to monitor and control process equipment. Twenty five percent of the plants use a combination of SCADA and manual operation. Two facilities in the 5 to 20 MGD category rely solely on manual operation; one is currently operating manually as its SCADA system is out of service.

3.6 Energy Procurement

Approximately 45 percent of the facilities receive delivery of electricity from National Grid, seven percent from NYPA, and five percent from New York State Electric & Gas (NYSEG); one facility receives delivery from Public Service Enterprise Group—Long Island (PSEG-LI), and six facilities receive delivery through a municipally owned power system. One facility is in Central Hudson Gas and Electric territory, two are in Orange & Rockland territory, and two are in Rochester Gas and Electric (RG&E) territory. One facility generates 100 percent of its electricity on site via engine-generators fueled with anaerobic digester gas.

Approximately one quarter of the facilities receive natural gas from National Grid, 18 percent from National Fuel, and 16 percent from NYSEG. Four facilities use ConEdison as their natural gas provider; one facility receives gas from its municipal utility cooperative.

Four facilities use fuel oil for heating. Three facilities rely on electricity as their only fuel source.

3.7 Peak Energy Management

Thirty percent of the WRRFs stated that they are currently participating in demand/response or load shedding programs with their electric utility or have participated in these programs in the past and are still able to do so. Approximately 40 percent of the WRRFs stated that they do not participate in such programs. No information was available to determine if the remaining 30 percent of the WRRFs participate in a load shedding program. Most WRRFs are equipped with diesel-powered emergency generators and would be able to temporarily shed load for a few hours if needed.

3.8 Funding

Most WRRFs take advantage of funding from the New York State Environmental Facilities Corporation (NYS EFC), including State Revolving Funds loans and grants (i.e., Water Infrastructure Improvement Act [WIIA]), or from the NYSDEC (i.e., Water Quality Improvement Project [WQIP] Program). About a third of the facilities rely solely on self-funding by issuing municipal bonds or using funds from their Operation and Maintenance (O&M) budgets. Nine percent of the facilities have taken advantage of Energy Savings Performance Contracts through an Energy Service Company (ESCO). Two facilities have projects funded by the Federal Emergency Management Agency (FEMA).

3.9 Planning and Asset Management

Typically, the smallest facilities have a simple decision-making structure in place; one person (i.e., Town or City Engineer, Chief Operator) decides which projects are critical and how and when to fund them. As facility size increases, the decision-making structure typically becomes more complex. More decision-makers as well as outside stakeholders are involved and formalized capital improvement planning, which is updated frequently, is performed.

Approximately 60 percent of WRRFs do not have an Asset Management Plan or preliminary list of assets. Of the approximately 40 percent with an Asset Management Plan or preliminary list of assets, the majority fall into the 20 MGD to 75 MGD category. In addition to inventorying equipment, asset management plans may include energy efficiency ratings, which can be used as a criterion when rating the risk of failure or identifying assets with obsolete efficiency ratings compared to newer equipment.

4 Comparison of Energy Metrics

Each individualized baselining report included four benchmarking values that were calculated specifically for each WRRF; energy use per million gallons treated (kWh/MG); energy use per pound biochemical oxygen demand removed (kWh/lb BOD); energy use per pound nutrients (ammonia [NH_3] or total Kjeldahl nitrogen [TKN]) removed (kWh/lb NH_3 or TKN); and energy use per pound solids disposed (kWh/lb solids). The benchmarking values were used to evaluate how a facility was performing in relationship to other similarly sized facilities to help quickly identify whether they may have opportunities for improvement. The first two of these benchmarking values were compared to similar benchmarks values calculated for each WRRF as part of the 2015 study (which was based on data from 2012–13.) The comparison was used to evaluate how, in aggregate, NYS WRRFs were performing in 2018–2019 compared to 2012–2013.

Average benchmark values calculated for each design flow category as part the baselining effort—and those from the 2015 study—are presented in Table 1.

Table 1. WRRF Energy Benchmarking

Design Flow Range	Andrews N., 2015a		WRRF Baselining, 2019			
	Flow-based Energy Use (kWh/MG)	BOD-based Energy Use (kWh/lb BOD)	Flow-based Energy Use (kWh/MG)	BOD-based Energy Use (kWh/lb BOD)	Nutrient-based Energy Use (kWh/lb N)	Solids-based Energy Use (kWh/lb solids disposed)
Statewide Average	1,800	-	**1,640**	**1.6**	**15.7**	**1.5**
5 – 20 MGD	1,970	2.0[b]/ 1.6[c]	**1,680**	**1.6**	**15.5**	**1.5**
20 – 75 MGD	1,370	1.2	**1,710**	**1.8**	**12.8**	**1.7**
>75 MGD	1,280	1.1	**1,040**	**1.2**	**21.4**	**1.0**

a Andrews, N., Willis, J., Nascimento, D., Current Energy Position of New York State Wastewater Treatment Facilities, WERF ENER7C13a, 2015.

b All data.

c North Tonawanda plant screened due to unusually low BOD concentration.

4.1 Flow-Based Benchmarks

Flow-based benchmarks values calculated as part of the baselining effort are of the same order of magnitude as those calculated for the 2015 study. Similar to the 2015 study, WRRFs in the 20 to 75 MGD category are, on average, more energy intensive than those in other categories. (Note: The 2015 study included the 14 NYC DEP plants, while the baselining effort did not.)

While average flow-based energy use values are presented above, it is important to note that actual facility values vary widely on a facility-by-facility basis, especially for smaller WRRFs. In the 5 to 20 MGD category, the range spans from 570–4,130 kWh/MG. In the 20 to 75 MGD and >75 MGD categories the ranges are closer, 890–2,480 kWh/MG and 950–1,170 kWh/MG, respectively. It is also important to note that although the majority of plants are operating below design flow, their fixed electrical base loads remain unchanged; as such, this can make it difficult to correlate energy use to specific process differences (e.g., secondary treatment approaches, nutrient removal requirements, biosolids treatment approaches).

It is difficult to directly compare the NYC DEP plants to those participating in the baselining effort, since the ISOGR effort was based on 2014 energy data and no flow information was provided. However, if the assumption is made that flow during the period was 70 percent of design capacity, the average flow-based electricity use for the four NYC DEP WRRFs in the 20 to 75 MGD category ranges from 980–2,160 kWh/MG, with an average usage of 1,330 kWh/MG. And for the 10 WRRFs in the >75 MGD category, energy use ranges from 950–1,800 kWh/MG, with an average usage of approximately 1,370 kWh/MG. [Note: Most of the NYC DEP WRRFs, especially those in the largest category, have stringent nutrient removal requirements.]

4.2 Biochemical Oxygen Demand-Based Benchmarks

BOD-based benchmark values calculated as part of the baselining effort are also of the same order of magnitude as those calculated for the 2015 study and show an increase in the 20 to 75 MGD category. While BOD effluent limits are very similar across the State (generally 25 or 30 milligrams per liter [mg/L]), influent BOD concentrations vary greatly, with some plants receiving a very dilute influent (60 mg/L) and others receiving a high-strength influent (greater than 400 mg/L). Data from the ISOGR effort required to calculate the BOD-based benchmarks were not readily available; therefore, a discussion of the BOD-based benchmarks for the NYC DEP WRRFs is not included.

4.3 Benchmarks Associated with Nitrogen Removal

Calculating kWh/lb NH_3 or TKN nitrogen removed presented challenges, due to the variability of nitrogen effluent limits. Approximately one quarter of the WRRFs require some degree of nitrification to achieve their effluent limit; only these were included in nitrogen-based benchmark calculations. The calculated statewide average was 15.7 kWh/lb NH_3, ranging from 6.9–33.3 kWh/lb NH_3. Data for the ISOGR effort required to calculate the NH_3-based benchmarks were not readily available; therefore, a discussion of these for the NYC DEP WRRFs is not included.

4.4 Benchmarks Associated with Solids Disposed

The solids-based energy used benchmarks that were consistent across the participating WRRFs, although variations based on the type of sludge treatment technology was observed. Data for the ISOGR effort required to calculate the solids-based benchmarks were not readily available; therefore, a discussion of the data for the NYC DEP WRRFs is not included.

5 Typical Energy Best Practices

5.1 Best Practices

NYSERDA has issued a guidance manual entitled, Wastewater Energy Management Best Practices Handbook.[7] The handbook outlines a wide range of best practices for the wastewater sector. Several best practices are either followed at many of the baselined WRRFs, in the process of being implemented at the facilities, or planned for future implementation. The following sections describe these best practices.

5.1.1 Planning Best Practices

Common planning best practices include:

- Having a regular, structured process for developing and maintaining the Capital Improvement Plan (CIP)
- Creating and maintaining a culture that continuously identifies opportunities for energy improvement (i.e., energy efficiency, on-site energy generation, resource recovery)
- Integrating energy efficiency, energy generation, and resource recovery into the CIP planning process (i.e., ICE)

5.1.2 Process- and Building-Related Best Practices

Common process- and building-related best practices include:

- Non-maintenance related aeration, pumping, and odor control systems best practices:
  - Using automated controls to better match process-specific needs
  - Right-sizing blowers, pumps, and motors to avoid over aeration or frequent cycling
  - Upgrading diffusers to maximize oxygen transfer efficiency
  - Optimizing odor control systems via leak detection and repair
- Building systems best practices:
  - Avoiding unnecessary or excessive ventilation
  - Converting lighting systems to light-emitting diode (LED) technology and using occupancy sensors or other automated lighting controls
  - Using thermostats, temperature setbacks, occupancy sensors, and other automated controls
  - Building envelope and overhead door improvements
- Maintenance best practices:
  - Replacing blower filters to avoid excessive pressure loss
  - Replacing air handling and furnace filters to avoid excessive pressure loss
  - Cleaning and calibrating dissolved oxygen probes and diffusers to maintain optimal performance

- Best practices associated with anaerobic digesters:
    - Eliminating digester gas leaks from piping and digester covers
    - Improving sludge thickening and pumping operations to reduce excess water, which results in reduced heating requirements and improved digester performance
    - Recovering digester gas to fire boilers and/or for on-site electricity generation
    - For facilities where digester gas is recovered and beneficially used—and excess digester capacity is available—importing other sludges or feedstocks to augment digester gas production and potentially generate additional revenue

5.2 New York City Department of Environmental Protection ISOGR Effort

As mentioned earlier, while the 14 NYC DEP facilities are large NYS WRRFs, they were excluded from the baselining effort since they were recently evaluated through an ISOGR effort.[8] The intent of this effort was to identify energy conservation measures (ECM) that resulted in maintaining the "state of good repair" of the 14 WRRFs, had the potential to yield energy and greenhouse gas (GHG) savings, and could be implemented as part of, or in conjunction with, other capital infrastructure investments. The ultimate objective was to ensure the WRRFs were on track to achieve several of New York City's long-term goals (i.e., 2050 GHG reduction, resource recovery, energy neutrality).

Results of the ISOGR effort are summarized in a report published in 2018. The report highlights source energy consumption and production, anticipated impacts on GHG emissions and operating costs, and capital costs for three scenarios: Baseline—before any projects are implemented, CIP—with projects identified in the CIP implemented, and CIP with ECMs—integrating CIP and ECM projects implemented. Calculations for anticipated impacts on GHG emissions and operating costs were based on process and energy balances developed for various ECM/CIP project combinations.

Biosolids are one of the most significant factors on source energy consumption and production for NYC DEP facilities, and as such, are associated with some of the greatest opportunities for reducing GHG emissions and operating costs. In fact, six of the 14 WRRFs have been deemed as already having viable pathways to achieve the 2050 GHG goal of 80 percent reduction of GHG emissions through use of digester gas in cogeneration facilities.

Developing the integration plan was facilitated by the following:

- Energy audits were completed for all WRRFs in 2012, which resulted in the identification of ECMs
- Projects that focus on improving biosolids management (e.g., sludge thickening, digester heating and mixing, recovery/beneficial use of anaerobic digester gas) are prevalent in the CIP
- Projects for all 14 WRRFs are managed under a single CIP
- Goals for reducing GHGs, achieving energy neutrality, and eliminating disposal of organic wastes in landfills were previously established

6 Suitability for Integrated Capital and Energy Planning

Most WRRFs have some type of system in place for planning capital expenditures and projects are typically selected for a CIP for one or both of the following reasons: the project is required to achieve a new effluent limit or to maintain the collection system and/or treatment facility in a state of good repair. Most WRRFs take energy use into consideration during planning, since reducing grid-supplied energy use is valued as a means to control operating costs and generate savings that can be used for future projects.

Twenty-four of the participating WRRFs are suitable to perform ICE Planning in the near term (see Table 2). The remaining WRRFs may be suitable in the future (see Table 3). The reasons why some WRRFs are not currently suitable include:

- The WRRF is satisfied with their current planning process
- The WRRF has a limited number of near-term capital projects with energy savings potential
- The WRRF has insufficient funding or staffing to adequately support ICE planning and/or project implementation

Table 2. WRRFs Suitable to Perform ICE Planning in the Near Term

WRRF	Design Flow (MGD)	Capital Plan	Capital Projects with Energy Component	Energy Opportunities	Suitable for ICE
Oswego	5.35	Yes	Yes	Yes	Yes
Auburn	10	Yes	Yes	Yes	Yes
Endicott	10	Yes	Yes	Yes	Yes
Milton Street	12	Yes	Yes	Yes	Yes
North Tonawanda	13	Yes	Yes	Yes	Yes
Gloversville-Johnstown	13.1	Yes	Yes	Yes	Yes
Plattsburgh	16	Yes	Yes	Yes	Yes
Southtowns	16	Yes	Yes	Yes	Yes
Watertown	16	No	Yes	Yes	Yes
New Rochelle	20.6	Yes	Yes	Yes	Yes
Monroe NWQ	22	Yes	Yes	Yes	Yes
Mamaroneck	23.2	Yes	Yes	Yes	Yes
Rensselaer County	24	Yes	Yes	Yes	Yes
Rockland County	28.9	Yes	Yes	Yes	Yes
Albany South	29	Yes	Yes	Yes	Yes
South Tonawanda	30	Yes	Yes	Yes	Yes
Saratoga County	32	Yes	Yes	Yes	Yes
Albany North	35	Yes	Yes	Yes	Yes
Amherst	36	Yes	Yes	Yes	Yes
Nassau Co., Bay Park	70	Yes	Yes	Yes	Yes
Nassau Co., Cedar Creek	72	Yes	Yes	Yes	Yes
Westchester Co. Yonkers	120	Yes	Yes	Yes	Yes
Monroe Co. FEV WRRF	135	Yes	Yes	Yes	Yes
BSA Bird Island	180	Yes	Yes	No	Yes

Table 3. WRRFs That May Become Suitable to Perform ICE Planning in the Future

WRRF	Design Flow (MGD)	Capital Plan	Capital Projects with Energy Component	Energy Opportunities	Suitable for ICE
Medina	4.50	Yes	Yes	Yes	Future
Blind Brook	5	Yes	Yes	Yes	Future
Batavia	5.50	Yes	Yes	Yes	Future
Beacon	6.00	Yes	Yes	Yes	Future
Dunkirk	6.00	Yes	Yes	Yes	Future
Colonie	6	Yes	Yes	Yes	Future
Port Chester	6.0	Yes-	Yes	Yes	Future
Herkimer	6.10	No	No	Yes	Future
Ossining	7.00	Yes	Yes	Yes	Future
Middletown	8.50	Yes	No	Yes	Future
Cortland	9.00	No	No	Yes	Future
Glens Falls	9.50	No	Yes	Yes	Future
Amsterdam	10.00	Yes	Yes	Yes	Future
Peekskill	10	Yes	Yes	Yes	Future
Jamestown	12.00	Yes	Yes	Yes	Future
Rome	12.00	Yes	Yes	Yes	Future
Olean	12	Yes	Yes	Yes	Future
Ithaca	13.1	No	Yes	Yes	Future
Niagara County	14	No	Yes	Yes	Future

The Chemung County Lake Street WRRF was deemed not suitable to perform ICE Planning since the plan is to consolidate it with another county-owned WRRF. Should this not occur or doesn't occur for an extended period, the WRRF would be suitable to perform ICE Planning.

Endnotes

1 Large WRRFs are defined as those have average design flow rates equal to or greater than five million gallons per day.

2 A plant was deemed suitable if it had a Capital Improvement Plan or similar and had previously implemented energy projects and/or was interested in implementing energy projects in the near future.

3 The 14 New York City Department of Environmental Protection WRRFs were excluded from consideration for this baselining effort since they were recently evaluated under an Integrated State of Good Repair effort.

4 https://www.dec.ny.gov/docs/water_pdf/descdata2004.pdf

5 A brief summary of the ISOGR effort is included in Section 5.2.

6 Andrews, N., Willis, J., Nascimento, D., Current Energy Position of New York State Wastewater Treatment Facilities, WERF ENER7C13a, 2015. http://www.werf.org/c/KnowledgeAreas/Energy/Products_and_Tools/ENER7C13a_Product.aspx

7 https://www.nyserda.ny.gov/-/media/Files/Programs/SEM/Best-Practices-Guide-Wastewater-Energy-Management.pdf

8 More information on the ISOGR effort can be found in the following presentation: NYWEA 2019 NYCDEP ISOGR Presentation.

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