9/29/2023

Winter Park Wymore Water Plant

ASHRAE Level II Energy A

15 lightyears

Energy Testing | Solar Power | Green Certification

TLC ENGINEERING SOLUTIONS

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Executive Summary

TLC Engineering Solutions (TLC) and 15 Lightyears performed an ASHRAE Level 2 facility energy audit of the Winter Park Wymore Plant Building as a part of a contract with the City of Winter Park.

This report is related to the energy-consuming systems only and is intended to fulfill the requirements of an ASHRAE Level 2 Energy Audit, per the guidelines set forth by the ASHRAE document "Procedures for Commercial Building Energy Audits." The purpose was to observe existing conditions and gather information that would enable TLC to render an opinion concerning conditions or deficiencies that could affect efficient use of this facility, and to identify potential areas for improvement. Neither the field visits nor this report is intended to uncover hidden defects or the presence of hazardous materials.

TLC reviewed the drawings dated August 2006, current utility bills from January 2021 through December 2022, subsequent project documentation, and visited the site in January 2023 to review the mechanical and electrical equipment, the HVAC and lighting controls systems, and observe each space type and its general energy use intensity. In the course of its work, TLC obtained extensive photo documentation of the conditions of the facility. Several of the photographs are included in Appendix C of this report, and the reader is encouraged to thoroughly review the photographs and descriptions, as they are intended to support and supplement the observations described herein.

After the time on site, TLC developed energy saving spreadsheets to assist with the analysis of recommended Energy Conservation Measures (ECMs), Facility Improvement Measures (FIMs), and evaluated BAS trends. The combination of all the walkthrough and post-walkthrough activities led to the development of the ECM and FIM list. A complete description and analysis of each ECM, as well as a table summarizing estimated cost and savings of each measure, can be found later in this report in the Energy Saving Opportunities section.

Project Information & Contacts

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General Facility Description

The Wymore Plant is a one-story civic building of approximately 630 square feet. An aerial view of the Wymore Plant is shown below.

Figure 1: Aerial View of the Wymore Plant

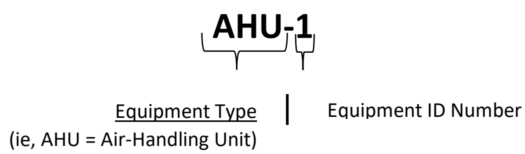
The building consists of an electrical room, a control room, and a restroom.

Mechanical Systems

The Wymore Plant features mechanical systems dated between 2008 and 2018. Building mechanical systems include split-system air handling units and exhaust fans. Mechanical system information came from a combination of resources, including information gathered during TLC's audit walk-through of the building and as-built design drawings provided by the City of Winter Park (dated August 2006). The below breakdown of the mechanical systems and areas they serve is TLC's best attempt to consolidate all avenues of information into one master list.

Equipment Naming Convention

The general naming convention used on the mechanical drawings is shown below. Please note, this convention applies to most of the equipment, but not all equipment.



Air Handling Units

Air conditioning for the majority of the building is provided by two (2) wall-mounted packaged air conditioning units. Each unit serves a single space in the building, with one unit serving the Control Room and the other serving the Electrical Room. Each unit is controlled via a wall-mounted thermostat.

Exhaust Fans

Exhaust fans were observed on the rooftop, providing general exhaust for restrooms located within the building.

Building Controls

The site is not currently controlled by a centralized Building Automation System (BAS). Each system within the Wellness Place, including all lighting, water heating, and HVAC, is a standalone system.

Lighting Systems

Interior lighting throughout the facility is predominantly linear fluorescent fixtures utilizing T8 lamps. The lighting is controlled manually without occupancy controls.

Plumbing Systems

There is one (1) tankless electric water heater, manufactured by Keltech. The heater is located in the control room, and is mounted on the wall.

Building Envelope

The building envelope consists of stucco over tilt-up concrete panels. The roof is a flat, built-up roof construction. No building envelope issues were observed related to the scope of the energy auditing procedure.

Key Operating Parameters

There are some areas that will experience typical office hours, but limited information is known on the occupancy schedule.

Site Visit

The site was audited by TLC engineers and 15 Lightyears personnel in January 2023. A full evaluation of existing energy consuming systems, compliant with ASHRAE Standard 211-2019 was performed. During the audit, TLC personnel were escorted by the City of Winter Park Facilities manager, Leif Bouffard. He, as well as any facility staff that were available for comment, were questioned on system operation, condition, and maintenance of the building systems.

Utility Analysis

Historical Utility Data

The building is currently provided with electrical service by Duke Energy. Electrical utility consumption and demand values, as well as time-of-use breakdowns, were provided for the months of January 2021 through June 2023. The monthly consumption profile appears to vary throughout the year with the usage of the Plant. No specific utility bills were provided, but a blended rate for kWh savings was determined based on the published rates for consumption and time of use (on-peak, off-peak, etc.). Calculation of the blended utility rate takes into account the non-fixed costs associated with electrical utilities use by the facility, including fuel charges, per-kWh cost, demand charges, etc. Table 3 details the components of the blended rate calculation.

Please note that the utility consumption data provided to the audit team appears to include the entire Wymore Plant site, and does not represent the utilization of the control building exclusively.

Table 1: Annual Baseline Energy Consumption

Utility	Total
Annual Electrical Consumption (kWh)	143,965
Annual Electrical Cost	-

The following graph and table show the total consumption per monthly billing period for electricity.

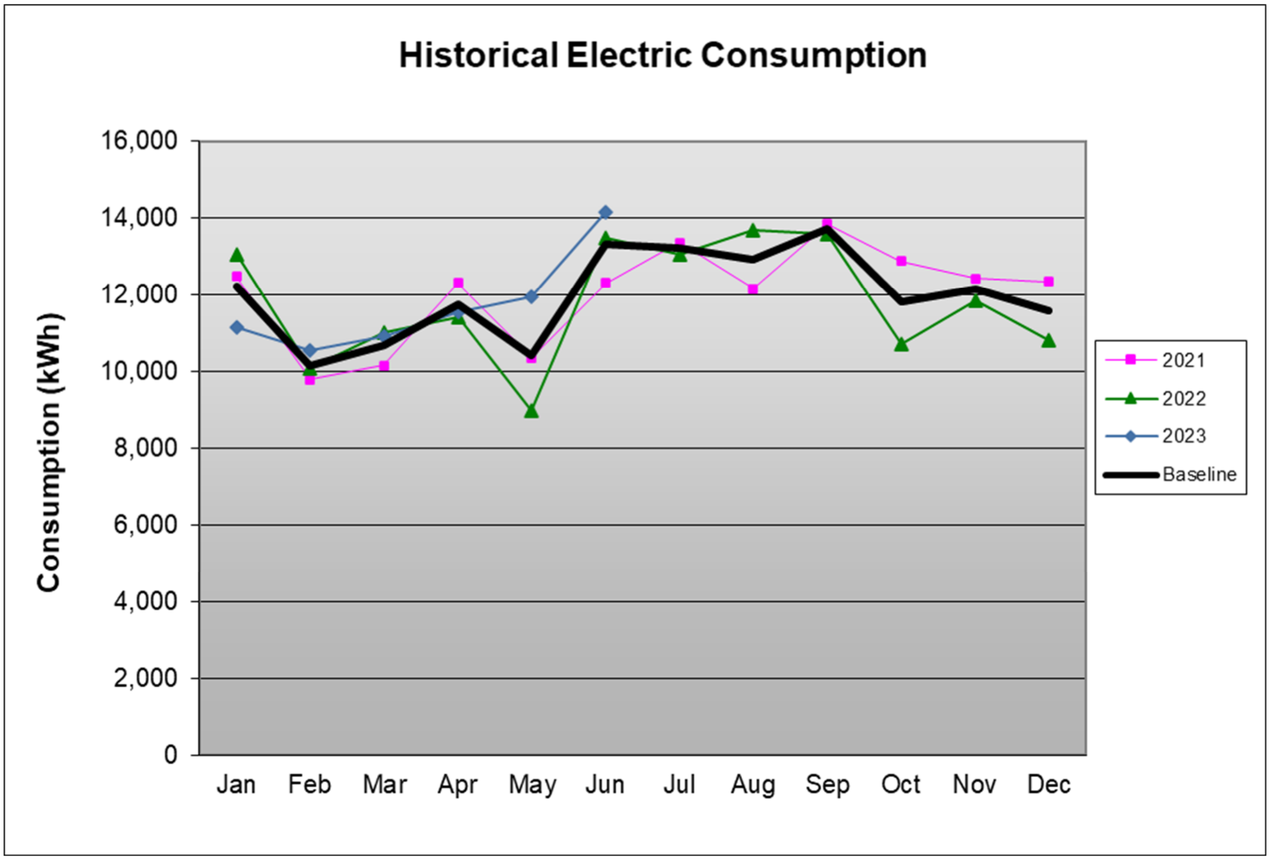


Figure 2: Wymore Plant Building Electric Consumption

Table 2: Wymore Plant Building Electricity Consumption Data

Date	Consumption (kWh)
Jan-21	12,480
Feb-21	9,800
Mar-21	10,160
Apr-21	12,320
May-21	10,360
Jun-21	12,320
Jul-21	13,360
Aug-21	12,160
Sep-21	13,840
Oct-21	12,880
Nov-21	12,436
Dec-21	12,348
Jan-22	13,057
Feb-22	10,092
Mar-22	11,022
Apr-22	11,404
May-22	8,993
Jun-22	13,474

Date	Consumption (kWh)
Jul-22	13,052
Aug-22	13,684
Sep-22	13,589
Oct-22	10,728
Nov-22	11,849
Dec-22	10,805
Jan-23	11,153
Feb-23	10,569
Mar-23	10,926
Apr-23	11,561
May-23	11,952
Jun-23	14,157

Benchmarking

TLC compared energy consumption for the Wymore Plant using common benchmarks to gauge how the site compares to similar ones both regionally and nationally, principally through the use of Energy Star Portfolio Manager. The building's Energy Use Intensity (EUI), which is used by energy engineers to determine overall energy consumption to a common unit of measure, was compared to other similar buildings throughout the United States. The Energy Use Intensity measures annual consumption of electricity per square foot, in kBTU/sf/year.

These benchmark tools were developed by the Department of Energy and are based on feedback from building operators all over the country. Using the utility billing information and observing the system operation allows the energy profiles to be broken down to greater detail. However, due to the nature of the building as a water treatment plant, no baseline for comparison was available.

Based on most recent 24 months of utility data, the calculated EUI of the Wymore Plant is 783.6 kBTU/sf. TLC and 15 Lightyears noted that the utility information provided to the audit team seemed to indicate that the entire Wymore Plant is provided with a single meter, so it was not possible to separate the consumption of the Operations Building. Equipment within other locations on the site significantly impacting the EUI calculation include aeration equipment and large pumps operating 24/7. Additionally, the small area of the lab serves to artificially increase the EUI calculation. However, the energy conservation measures detailed in this report will serve to decrease the EUI of the Operations Building itself through efficiency increases.

Utility Rate Analysis

The building is provided with electricity by Duke Energy, following their Rate Schedule GST-1, General Service – Time of Use. The utility rate charges shown below were used to calculate the costs associated with the provided consumption and demand. Energy savings calculated for this building have been assigned a blended rate of $0.1497/kWh, which is the calculated blended rate not including fixed customer charges.

Table 3: Utility Rate Schedule

Description	Charge
Energy Charges:	
Non-Fuel Energy Charge:	$0.08942 per On-Peak kWh $0.08328 per Off-Peak kWh $0.04666 per Super-Off-Peak kWh
Fuel Energy Charge:	$0.0684 per On-Peak kWh $0.0567 per Off-Peak kWh $0.0416 per Super-Off-Peak kWh
Other Charges:	
Environmental Cost Recovery Charge	$0.00021 per kWh
Asset Securitization Charge	$0.00177 per kWh
Storm Cost Recovery Charge	$0.01299 per kWh

Average Rates

As noted above, a blended cost per kWh has been calculated from the rate schedule. Savings for this building have been calculated using the blended rate. The following table details the average rate over the period of analysis.

Table 4: Average Utility Rate

Utility	Average
Electricity	$0.1497/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Wymore Plant building was observed to offer a few different avenues for improvement. This is to be expected given the age of the equipment itself and how long it has been in service. Improvements can be made by replacing the aging equipment as well as optimizing the control sequences and settings. The following table summarizes the recommended ECMs for this facility that should be considered for future projects. In addition, the table distinguishes between measures specifically intended to save energy (ECMs) and facility improvement measures (FIM) that benefit the overall operation of the facility but may not provide significant energy savings.

Table 5: ECM/FIM Summary

Energy Savings Measure	FIM/ECM	ECM Category	Annual kWh Savings	Annual $ Savings	Cost $	Payback (years)
DX Retrofit	ECM	Moderate Cost	5,661	$847	$14,583	17.2
Lighting Improvements	ECM	Low Cost	1,497	$224	$240	1.1
DHW Retrofit	FIM	Capital Improvement	--	--	$600	--
Totals			**7,158**	**$1,071**	**$14,823**	**13.8**

*ROI calculations exclude capital improvement items, as they are intended more for facility improvement than for energy savings.

The cost and paybacks shown in the table above are estimates based on the information gathered during the auditing process. TLC utilized RSMeans 2023, as well as engineering best practices, to estimate the cost of these suggested measures. Final pricing will vary based on contractors' estimation and final equipment selections. Final payback periods are also dependent on contractor pricing and the facility's negotiated utility price.

DX Retrofit

General Description

This measure proposes replacing existing Bard wall-mounted DX equipment, which is at or nearing the end of its predicted useful life. Direct expansion (DX) air conditioning equipment consists of a refrigerant loop, in which the refrigerant is compressed and expanded at different points of the loop to transfer thermal energy. Typically, a refrigerant coil is placed directly in the supply air stream, where the refrigerant absorbs thermal energy as it evaporates and expands. Thermal energy is rejected at a compressor, where the refrigerant is compressed and condenses, rejecting the heat that was removed from the supply air steam.

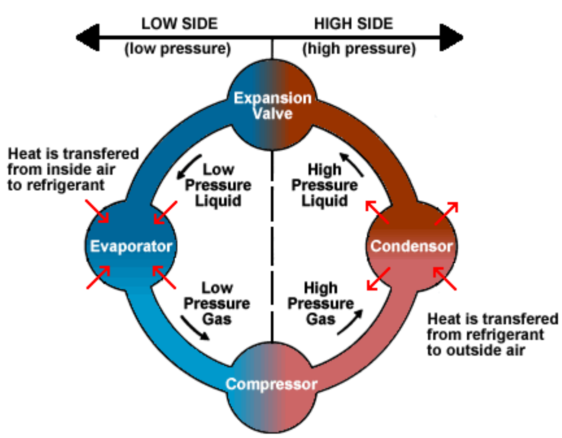


Figure 3: The Refrigeration Cycle

Over time, HVAC units degrade in operational efficiency as coil surfaces oxidize on the exterior and sometimes scale on the interior which reduces heat transfer efficiency. The moving mechanical components also wear, which further reduces the operational efficiency of the equipment. The new equipment will be installed in place of the existing equipment, including providing new refrigerant line sets for all split systems.

Advances in technology and improvements necessitated by energy code updates have led to DX equipment available today with far higher efficiencies than what was used in the past. Replacing the existing systems with new higher efficiency systems will reduce energy consumption and provide improved occupant comfort.

Site Specifics

The 2-ton wall-mounted unit that serves the plant building was observed to be nearing the end of its expected useful life and in need of replacement. Both the 2-ton and 5-ton Bard wall-mounted units were found to be at a low 9 EER efficiency rating. This measure proposes to replace the existing split systems with similarly sized 16 SEER mini split systems. As stated above, the newer systems will be more efficient than the existing system and will result in slight energy savings.

Lighting Improvements

General Description

This measure involves converting older style lighting fixtures, such as fluorescent and incandescent, to modern LED lighting fixtures and lamps. Unless a building has been built or renovated in the past few years, it is common to find extensive use of fluorescent and incandescent fixtures throughout the building. Fluorescent and incandescent lighting technologies are a product of their time and often remain without intentional replacement. Older lighting technologies require more wattage to produce the same amount of light as LED fixtures. This also results in a higher heat output from the lamps which raises HVAC cooling costs.

Existing fluorescent and incandescent lighting fixtures will be replaced/retrofitted with new LED lighting fixtures. This will greatly reduce the energy required to illuminate the building. Additionally, cooling systems will have to run less often to offset the heat generated by the lighting. There are several additional benefits to LED lighting technology. LED lighting has longer burn hour life, faster on/off response time, and easier dimming capabilities compared to fluorescent and incandescent technologies. Because LED light fixtures have longer burn hour life, this will reduce the material and time cost of replacing burned out lamps.

Site Specifics

The facility was observed to have predominantly linear fluorescent fixtures with T8 lamps. Existing non-LED lighting will be replaced with new LED lighting on a one-for-one basis. Existing lighting material waste will be disposed of according to local regulations.

Facility Improvement Measures

TLC identified additional Facility Improvement Measures (FIM) that do not provide energy savings but should be addressed. By implementing the recommended FIM, the facility will experience improved equipment reliability, increased thermal comfort for occupants, and be able to operate as originally designed. While it is possible that these measures may decrease energy consumption, this has not been quantified as their purpose is focused on performance and reliability.

DHW Retrofit

The electric water heater (EWH) was observed to be running at a setpoint of 140F leaving water temperature. Reducing the temperature setpoint to 120F will result in slight energy savings with the equipment not having to run as often or for as long to produce hot water.

Calculation Methodology – Spreadsheet System Models

Savings for this report were evaluated using spreadsheet building models for the lighting and HVAC systems. The methodologies used for each measure are described separately in this section. Industry Standard methods of evaluation were used and are detailed in this section. Additionally, assumptions made to calculate the energy savings are detailed.

DX Unit Retrofits

Savings for this measure have been based on an improvement in the efficiency of the DX equipment. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: DX Unit Retrofit Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Wall Unit 1 Rated Capacity	Wall Unit 1	2 tons	Manufacturer info
Wall Unit 1 Existing Efficiency	Wall Unit 1	9.04 SEER	Mfg. info and typical degradation for age
Wall Unit 1 Proposed Efficiency	Wall Unit 1	16.0 SEER	Engineering judgment
Wall Unit 2 Rated Capacity	Wall Unit 2	5 Tons	Manufacturer info
Wall Unit 2 Existing Efficiency	Wall Unit 2	9.78	Mfg. info and typical degradation for age
Wall Unit 2 Proposed Efficiency	Wall Unit 2	16.0 SEER	Engineering judgment
Effective Full Load Hours	Wall Units 1& 2	1,600 hr./yr.	Estimate based on project location

Calculations:

Savings for this measure were based on calculating the energy consumption of the DX equipment with the existing and proposed efficiencies. The unit's energy consumption in kWh was calculated with the following formula.

$$Energy\ Consumption = Tons \times \left(\frac{12}{SEER}\right) \times Effective\ Full\ Load\ Hours$$

In the formula, the terms in the bracket yield efficiency in kW/ton.

Lighting Improvements

Savings for this measure have been based on a reduction in the lighting energy based on a reduction in lighting installed wattage. The following table shows the major inputs used in the calculation of savings for this measure.

Table 7: Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area	Entire building	315 sf	Provided value
Existing Lighting Power Density	Entire building	1.0 W/sf	Typical value for T8 lamps throughout
Proposed Lighting Power Density	Entire building	0.6 W/sf	Typical value for LED lamps throughout
Annual Burn Hours	Entire building	8,760	Building schedule

Calculations:

Savings for this measure were comprised of energy savings. The energy savings were the difference in the existing and proposed kWh for all the lighting fixtures in the building. The energy usage in kWh for the building was calculated using the following formula.

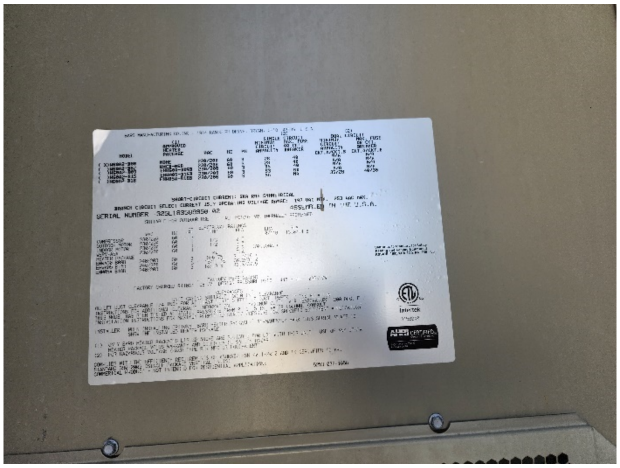
$$Energy\ Usage = \frac{Building\ Area \times LPD \times Hours}{1{,}000}$$

Appendix A – Mechanical Equipment

The following table shows a listing of all recorded major equipment in the building.

Building	Type	Equip	Location Served	Tag	Qty	Capacity	Units	Make	Model	Serial Number	Year
Wymore	Packaged	Packaged Air Conditoning Unit			1	5.0	Ton	Bard	W60A2-B00	325L183589950 0:	2018
Wymore	Packaged	Packaged Air Conditoning Unit			1	2.0	Ton	Bard	WA242-B06	.41B082461600 0	2008
Wymore	EWH	Tankless Water Heater			1		kWh/yr	Keltech			

Appendix B – Site Walkthrough Photos



C-1: Air Conditioning Unit (1)

C-2: Interior Lighting

C-3: Restroom Fixtures

C-4: Air Conditioning Unit (2)

 C-5: Exterior Lighting	 C-6: Tankless Water Heater