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Eversource Tolland Area Work Center Tolland, CT – SCOPING STUDY

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Executive Summary

QGM Consulting (Padraic Hagan) conducted an energy efficiency scoping study at the Eversource Area Work Center (AWC) located 48 Tolland Stage Road Tolland, CT 06084 on Wednesday May7, 2026. QGM analyzed the buildings' electric use as well as associated Greenhouse Gas (GHG) emissions. Objectives were to identify and quantify potential Energy Efficiency Measures (EEMs) for energy reduction, and estimated GHG reduction potential for any corporate initiatives or targets.

Included in this report is a list of potential EEMs with savings and implementation cost estimates. Please note that the values presented in this report are meant to provide an order of magnitude and are not final values or guarantees for the determination of incentives. A measure summary is provided in the table below.

Eversource Tolland AWC - Scoping Study Measure Summary							
EEM#	Energy Efficiency Measure (EEM)	Estimated Annual Cost Savings	Estimated Annual Energy and GHG Savings		Potential GHG Reduction	Estimated Project Cost	Simple Payback
#	Description	$	kWh	MT CO2e	% Site GHG	$	years
1	Building Shell Gap Remediation	$5,000	35,000	10.2	12%	$50,000	10.0
2	Consider WSHP Loop Pump VFD	$3,000	20,000	5.8	7%	$126,800	42.3
3	Consider WSHP Loop CT Fan VFD	$3,000	19,000	5.5	7%	$4,700	1.6
4	Replace Electric RTU w WSHP	$4,000	28,000	8.1	10%	$37,500	9.4
TOTAL		$15,000	102,000	29.7	36%	$219,000	14.6

These are the measures identified during the assessment walkthrough; additional measures may become evident with more time on site.

General Facility Description

The Tolland site consists of (2) buildings originally constructed in 1962:

- The main building consists of offices, conference rooms, workrooms, repair shop, and warehouse space
- The garage building used for vehicle maintenance

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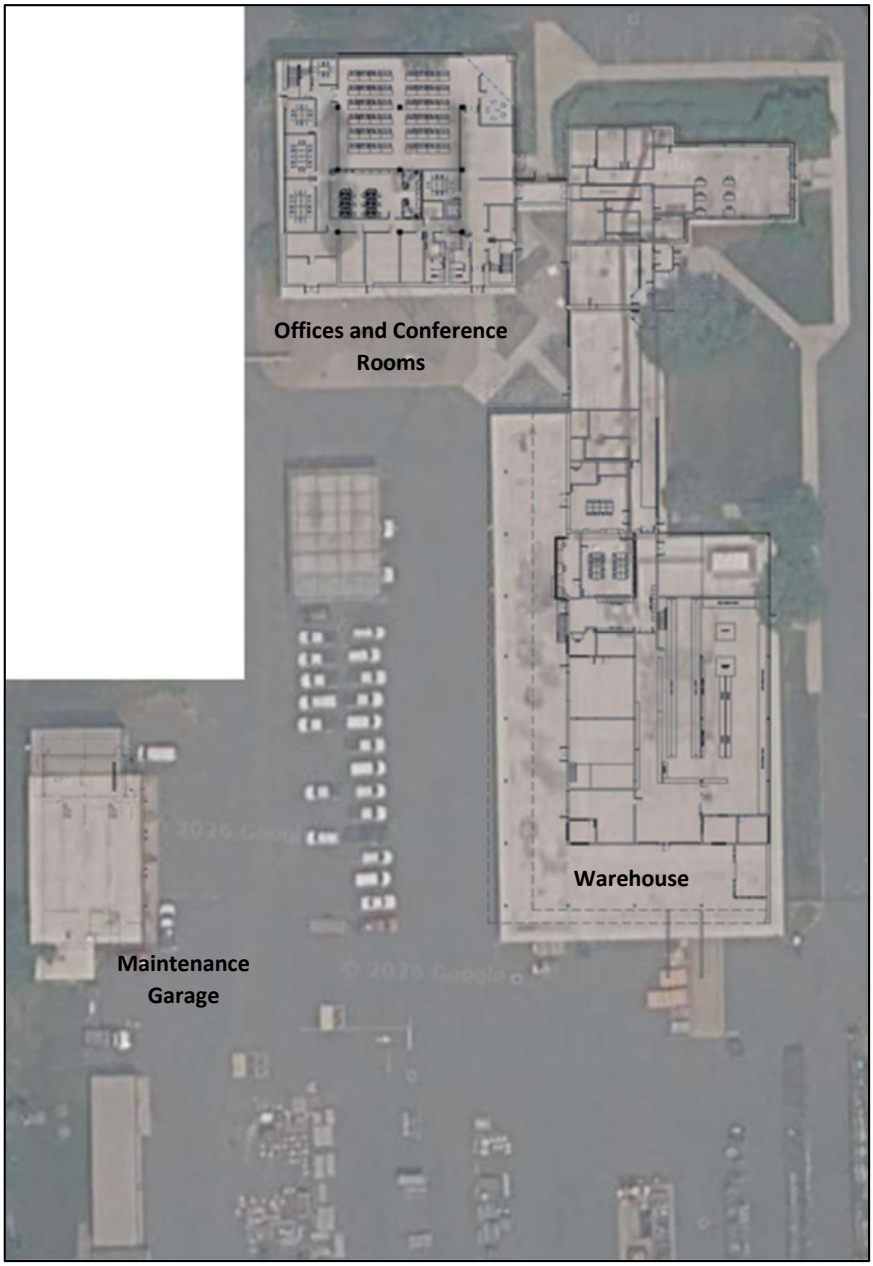
Aerial views of the campus with stie floorplans overlaid are shown below:

First Floor and Garage:



Second Floor and Mezzanine:



Total facility footprint is ~64,600 SF across all buildings. Campus population is 80 people, with variable but high attendance at the site. Typical occupancy is 7:30 AM – 5:00 PM Monday through Friday, with equipment scheduled for occupancy 5:00 AM – 5:00 PM. Additionally, the garage building has a second shift, operating until 11:30 PM, and minor weekend occupancy from storm duty or other projects is frequent. Total site operating hours are estimated to be ~4,600 annually.

Building structures are dated with some HVAC equipment from original construction. HVAC is provided by:

- A water source heat pump (WSHP) heating and cooling loop serving both perimeter units and fresh-air intake core units in the office, conference room, and common areas
    - WSHP loop heat provided by an aged electric resistance boiler
    - WSHP heat rejection provided by a Frick cooling tower
- (1) electric resistance heat/DX cooling packaged rooftop unit (RTU) serving the second floor spaces
- Electric unit heaters (EUHs) throughout the shop areas, garage, and warehouse
- Electric cabinet unit heaters (ECUHs) in foyers and entryways
- Spot cooling and heating by splits systems and air source heat pumps (ASHPs)

HVAC controls consist of digital programmable thermostats (noted to be programmed well-maintained) and dial thermostats. Despite the lack of a DDC building management system, the building is well controlled and adhering to occupancy schedules and manual control of outside air intake.

Lighting systems are modern LED with integrated controls and were observed to be functioning well.

Garage and shop equipment include electric hoists, hand tools, and (2) small compressed air plants with air provided by individual 5hp reciprocating air compressors.

Monthly Billing Analysis

Electric use is metered but not billed at this site with annual use provided; monthly use was modeled based on annual use, the site's footprint, hours of operation, equipment power density and estimated utilization, and example monthly load profiles from similar sites.

Annual Site Summary					
Energy Usage and Costs	Costs	Energy		MT CO2 Emitted	Unit Costs
	$	kWh	mmBTU		
Electric (kWh)	$ 39,367	275,680	941	80.2	$0.14

There is natural gas service at the site, but end uses are noted to be minimal: site emergency generator and a low-utilization pressure washer. $0.1428/kWh was used as an electric rate based upon Eversource Facilities' third-party electric supply costs for similar type facilities. A summary of estimated monthly electric use is shown below:

Monthly Utility Use Summary			
Estimated Monthly Electric			
Month	Electrical Use (kWh)	Estimated Cost ($)	Estimated Blended Rate ($/kWh)
Jan-25	33,348	$4,762	$0.14
Feb-25	26,679	$3,810	$0.14
Mar-25	20,009	$2,857	$0.14
Apr-25	13,339	$1,905	$0.14
May-25	11,116	$1,587	$0.14
Jun-25	24,455	$3,492	$0.14
Jul-25	31,125	$4,445	$0.14
Aug-25	26,679	$3,810	$0.14
Sep-25	22,232	$3,175	$0.14
Oct-25	11,116	$1,587	$0.14
Nov-25	24,455	$3,492	$0.14
Dec-25	31,125	$4,445	$0.14
TOTAL	**275,680**	**$39,367**	**$0.14**

The energy use intensity (EUI) shown below is an indicator of building performance in terms of energy use (kbtu) per building square foot:

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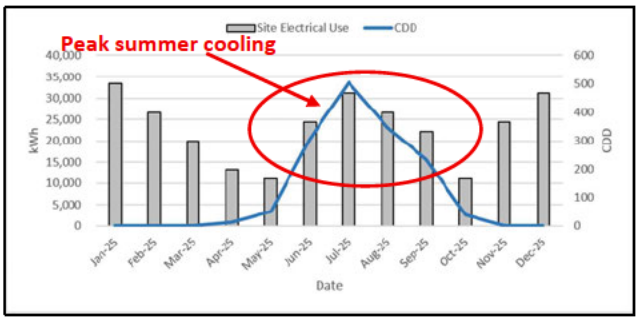
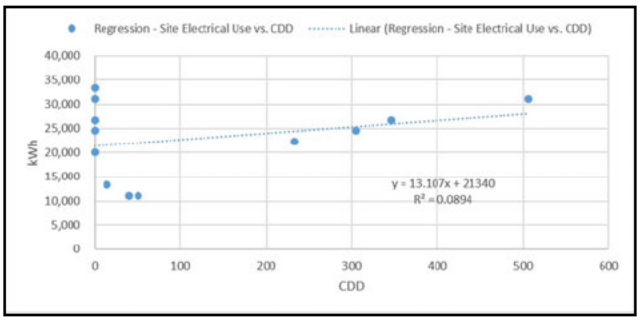
Building Energy Use Intensity (EUI)			
Utility	**Site EUI**	**Source EUI**	**Unit**
Electricity	17	49	kbtu/sf

Source-site ratio per national average, source:
https://portfoliomanager.energystar.gov/pdf/reference/Source%20Energy.pdf

Energy Star publishes median data by building type for overall comparison by general category but does not include this type of building (mixed use: general office space/shop/garage). However, the EUI metric can be used to baseline existing energy use for future comparison or to compare this building to similar buildings of this type.

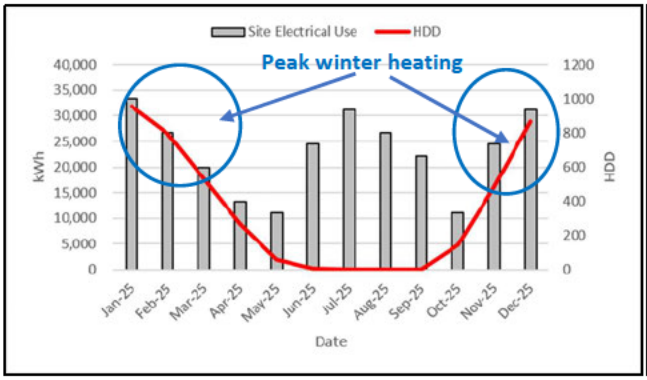
For electrical consumption, weather data for the site was utilized to help generate a monthly site profile. Below are graphs for the estimated monthly site electrical use and cooling degree days:

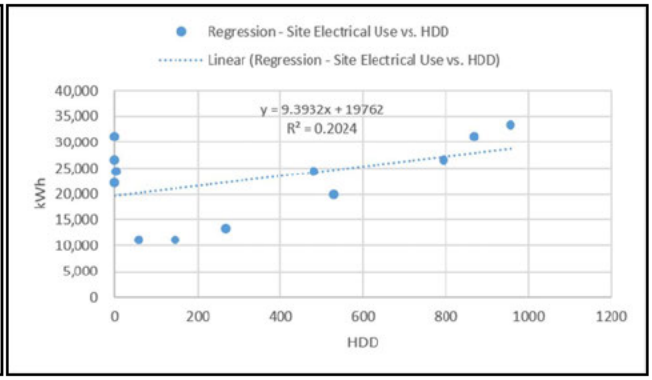




The regression above was developed to help determine monthly building electrical use. This first pass regression does not show a statistically significant relationship to CDD, with an R^2 value of 0.09. The Department of Energy Superior Energy Performance (SEP) program qualifies that a statistical relationship exists with an R^2 value of 0.75.

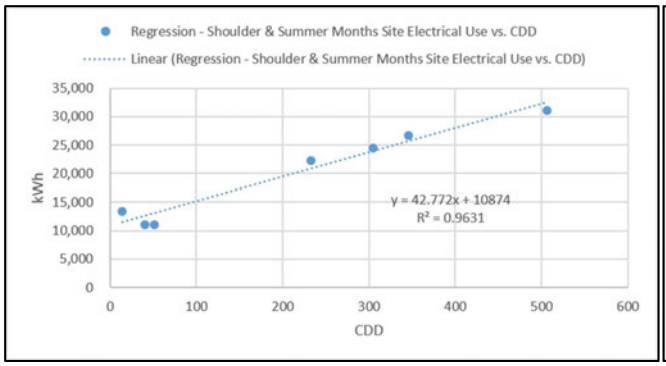
Next, electrical use was compared to heating degree days to investigate any statistical relationship between electrical use and seasonal heating:

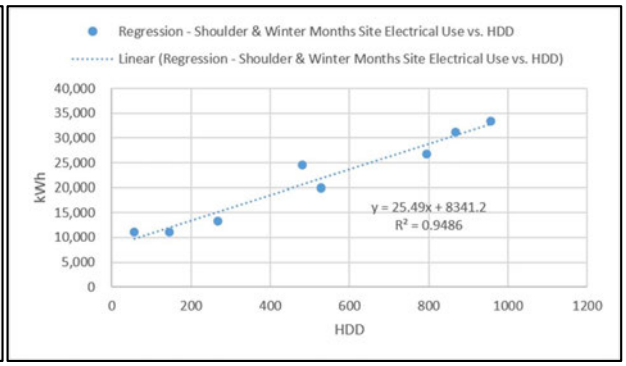




As above for CDD, visual electrical peaks to coincide with increases in HDD; however, the regression indicates no statistical relationship. The combination of two correlations makes initial regression difficult.

As an additional aid to modeling electric use, CDD and HDD were next compared to only the relevant months: summer and shoulder months for CDD and winter and shoulder months for HDD, with the resulting graphs shown below:



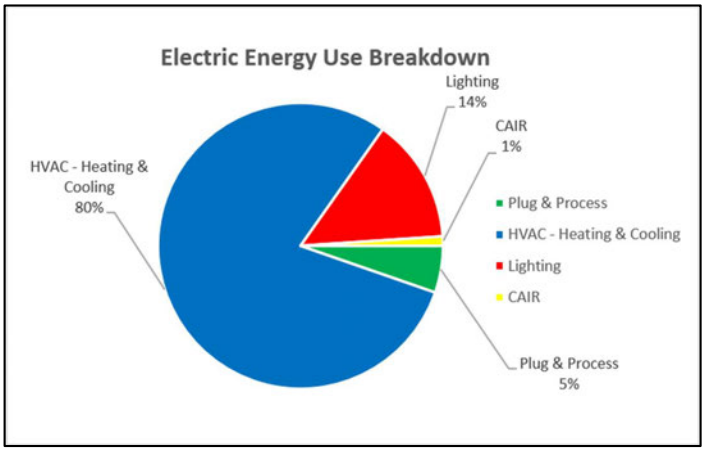


R^2 values of 0.96 for separated cooling electric use and 0.95 for separated heating electric use indicate good model fits for the estimated electric use at this facility.

Mechanical System Energy Use Breakdown

Electric Use

Based on the initial walk-through, the following electric energy use breakdown was developed. These results should be considered high level and were sourced from motor nameplates, typical load factors, and estimated operational hours. Actual data logging is required to confirm these assumptions.



Estimated End Use Breakdown - Electricity	
Electric End Use	**Energy Use (kWh)**
Plug & Process	15,000
HVAC - Heating & Cooling	225,000
Lighting	40,000
CAIR	3,000
TOTAL	**280,000**

Equipment Inventory:

A site equipment inventory was created to catalog the current equipment, as shown below:

Eversource Tolland AWC Equipment Inventory										
Tag	**QTY**	**Type**	**Manufacturer**	**Model**	**Serial #**	**Cooling Ton**	**MBH**	**HP**	**CFM**	**Notes**
RTU	1	Packaged Electric/DX RTU	Trane	THD240G4RRB0SPC	192311044D	20	246	7.5	8,000	72 kW electric coil
Mezz HVAC	1	WSHP core unit	Trane	GEVE03641G01B0TLF0	W19E13324	3	36	1	1,140	Fresh air intake and ERV
	1	WSHP core unit	ClimateMaster	TCV060AFC30CRTS	N13340918	5	60	1	1,950	Fresh air intake
Offices 1st Fl HVAC	1	WSHP core unit	Bosch	EC240-4VTC	2940-176	20	315	4	8,000	Dampered fresh air intake
	1	WSHP core unit	Trane	GEVE1204F0DB0	W20A02811	9.9	134	3	3,500	Fresh air intake
	2	WSHP core unit	ClimateMaster	TCV120		10	120	2	4,000	Fresh air intake
WSHP	~70	Perimeter WSHP	Friedrich / Adirondack Aire	multiple		1	3.4	0.1		
Boiler	1	Electric Boiler	Chromalox	CEW-156	SS-10156 P79		505			148 kW
CT	1	Cooling Tower	Frick		43463-1			20		
WSHP Loop Pumps	1	Pump Motor	Lincoln					15		Throttled to 300 gpm, 254T
CUH	6	Electric Cabinet Unit Heater					3			Dial stat control
EUH	20	Electric Unit Heater	Chromalox/ Federal Pacific	multiple			3			Dial stat control
Data Room	1	WSHP	Bosch	LV030-1VTC	2940-040	2.4	32.6	0.25	950	
Data Room	1	WSHP	ClimateMaster	GCH030BGC30CLSS	314531019	2.5	30	0.25	1,000	2nd Stage/additional cooling
Data Room	1	WSHP	Typhoon							Backup, aged unit
DHW	4	Electric Hot Water Heater	Rheem	ELD52-B	RR 0810D07214		20.5			6 kW
EF	13	Exhaust Fan	Multiple	multiple						Timers and manual controls
Garage DHW	1	Electric Hot Water Heater	Hubbell	S4010SLR	40100		34			5/5 kW
Garage EF	1	Exhaust Fan								W/ bay exhaust, low utilization
Garage Cooling	2	ASHP	Bryant			1.5				
Shop A/C	1	Recip Air Compressor	Ingersoll Rand	2545E10V	212110143			5	35	Low utilization
Garage A/C	1	Recip Air Compressor	Quincy	QR-325				5	35	High utilization
Garage A/C	1	CAIR Dryer	Arrow						35	Non-cycling

Site Energy Efficiency Measures/Recommendations

EEM – 01 – Consider Building Shell Gap Remediation

During the walkthrough of the site, future renovations were discussed such as roof replacement (scheduled for 2027) and exterior façade work. Facility staff may want to consider building shell remediation as part of or in tandem with these efforts.

Insulation and air sealing are understood to be original construction and have likely degraded over time, visible as gap and cracks in door systems and drafts through window systems, and invisible as roof/wall building plane intersections (possibly addressable as a facet of roof replacement). Envelope gaps allow the infiltration/exfiltration of untempered air and increase the load on HVAC equipment. It is recommended that the site perform a comprehensive building and thermal shell survey and remediate any identified gaps. Pictures below detail some of the observed building shell gaps:



Visible daylight through door seals



Example of aged window systems: likely original construction with degraded seals allowing air infiltration

Savings were estimated assuming improvements in thermal envelope as well as a reduction in outdoor air infiltration during both heating and cooling seasons`:

- **Estimated Annual Energy Savings:** 35,000 kWh
- **Estimated Annual Cost Savings:** $5,000
- **Estimated Implementation Costs:** $50,000 including survey costs

Next Steps:

- It is recommended that the site discuss building shell survey and remediation with a specialized vendor.

EEM – 02 – Consider VFD Control of Water Source Heat Pump Loop

Facility WSHP loop water is circulated with an alternating duplex 15hp constant volume pump plant. Pump speed and therefore pump motor energy does not vary according to actual WSHP demand, with existing three-way valves at the heat pumps bypassing loop water as needed to maintain equipment setpoint.

WSHP circulation pumps are seen in the photo below:



15hp constant speed pumps use an estimated 50,000 kWh annually, and retrofitting VFD controls would allow for the pump motor speed to match the demand for hot water and the ability to reduce speed when demand is lower. It should be noted that replacement of existing end-use three-way valves with new two-way valves would be required in order for actual loop flow to be modulated, at significant implementation cost. This measure would likely only make sense as part of an overall equipment or system overhaul, rather than as a standalone energy measure.

Savings are estimated based on an average 40% reduction of the pump's electrical energy:

- **Estimated Annual Energy Savings:** 20,000 kWh
- **Estimated Annual Cost Savings:** $3,000
- **Estimated Implementation Costs:** $127,000

Next Steps:

- Facility staff could discuss future equipment and system design with a mechanical vendor

EEM – 03 – Consider Installing VFD Fan Control on the Cooling Tower Fan

The WSHP loop cooling tower (CT) was noted to be constant speed, regardless of actual loop heat rejection demand. Confined space limitations precluded visual inspection of the fan, but the motor capacity is reasonably estimated to be 20hp, with high utilization during summer and shoulder season hours.

It is recommended that the facility consider retrofitting the existing CT fan with VFD controls, allowing the fan to modulate according to differential temperature between the WSHP loop temperature and wet-bulb outdoor air temperature.

Savings assume an average 40% reduction in CT fan energy across its annual operation:

- **Estimated Annual Energy Savings:** 19,000 kWh
- **Estimated Annual Cost Savings:** $53,000
- **Estimated Implementation Costs:** $5,000

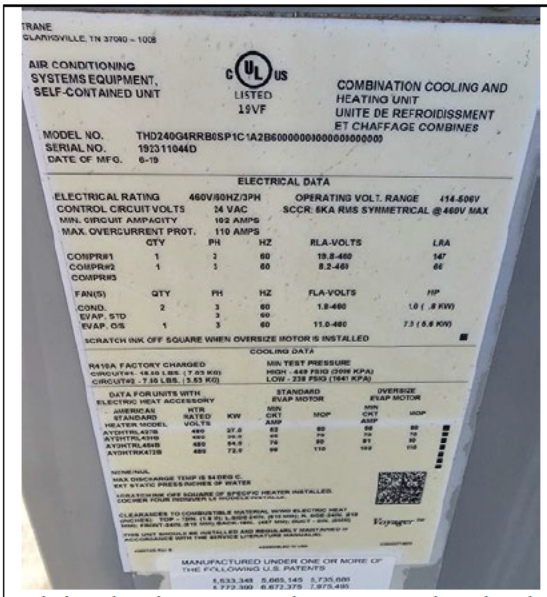
Next Steps:

- Spot readings and fan/motor inspection (following all required confined space protocols) are recommended to confirm equipment loading assumptions and schedules.
- The site is encouraged to discuss potential control upgrades with a reputable mechanical/controls vendor.

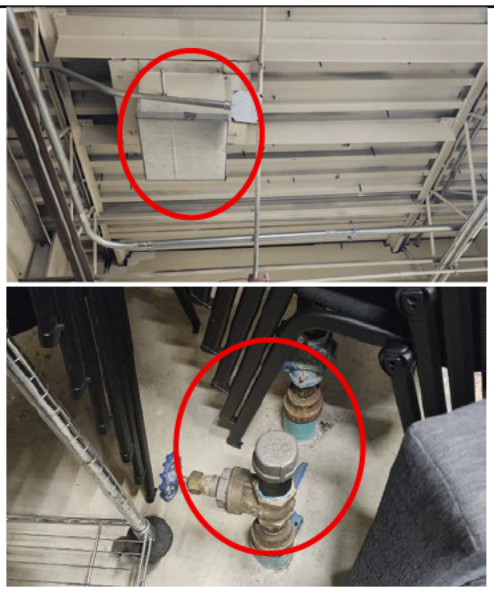
EEM – 04 – Consider Replacing Electric Heat RTU with new WSHP

The second floor of the office/conference room building section closest to the road is primarily heated (core and common areas) with an electric heat/DX cooling RTU. The RTU was installed to replace a previous WSHP serving this area, which was replaced due to sizing and possible repair concerns.

Below are photos of the existing RTU and previous location of the WSHP:



Existing electric RTU nameplate – note 72 kW electric coil providing heat


Capped WSHP loop piping and air ducting remain from previous unit, which would ease installation

WSHP heating delivers on average ~3+ times the heat for the same kWh as electric resistance: ~3.0 – 3.5 Coefficient of Performance (COP) with little variation due to constant loop temperature compared to 0.99 COP for electric heat. It is recommended that site staff consider the installation of a new WSHP, with some design or analysis to ensure equipment sizing, thereby reducing the electric use required to heat this space. The existing electric RTU is about 7 years old and could remain in place as a redundant unit or emergency backup.

Savings are estimated from a modeled load for the space served and equipment COPs as noted above. Installation costs assume ~$2,500 per cooling ton for a 15-ton WSHP core unit – costs may be on the high side.

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- **Estimated Annual Energy Savings:** 28,000 kWh
- **Estimated Annual Cost Savings:** $4,000
- **Estimated Implementation Costs:** $37,500

Next Steps:

- Facility staff should review equipment selection and sizing with a mechanical vendor or local supplier if planning to self-install.

Additional Considerations

Building Management System

Facility HVAC controls were discussed with site operators during the walkthrough. Although this is one of the few such sites without a centralized building management system (BMS), existing tight manual controls reduces the impact of potential controls savings, particularly against a high implementation cost due to the amount of equipment that would need to be integrated.

Controls strategies such as adaptive optimal startup and demand control ventilation would offer some additional energy savings beyond existing control, and there are operational benefits such as remote access and equipment status monitoring that could be beneficial for future consideration.

Sustainability Considerations

Background

Site and portfolio sustainability is best guided by the framework and methodology set forth in ASHRAE Standard 228-2023 *Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance* (available for purchase here: https://www.ashrae.org/technical-resources/bookstore/ansi-ashrae-standard-228-standard-method-of-evaluating-zero-net-energy-and-zero-net-carbon-building-performance). The site is not known to have a present net-zero strategy; however, the ASHRAE standard presents a strong method to:

- Assess current building energy use and carbon emissions
- Establish a baseline
- Develop milestones
- Develop a plan to reach milestones

The data and information shown below are intended to help develop an understanding of where current portfolio sustainability goal aligns with current position.

Emissions Scopes

Emissions reporting is generally addressed across three Emissions Scopes, as seen below:



An important aspect of developing a sustainability plan is the determination of which emissions scopes will be targeted for reduction. The majority of sustainability planning at the time of this report is focused on Scopes 1 and 2, although large corporations with significant supply and delivery chains have begun to address Scope 3 as well. The focus of the sustainability plan in this report is on Scope 1 and 2 emissions.

ASHRAE Standard 228-2023 *Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance*

ASHRAE 228-2023 includes the following diagram illustrating energy flows into, from, and out of a site:

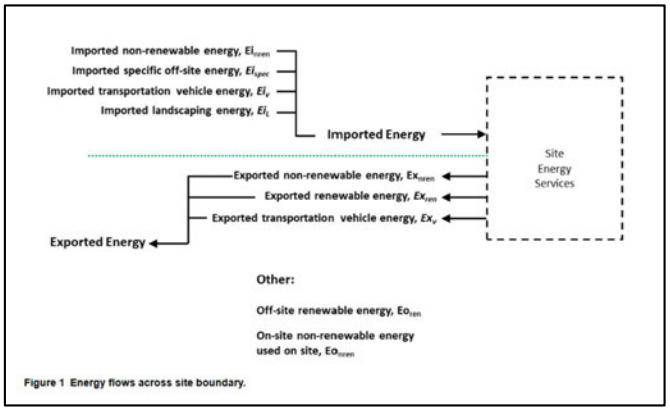

Figure 1 Energy flows across site boundary.

The difference between energy flow into a site, and energy flow out, is site net energy. The primary goal of sustainability is to reduce this net energy, and therefore, net carbon emissions associated with the site and its operation.

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Sustainability Plan

With a carbon baseline established and a goal and timeframe put in place, the next step is to develop a sustainability plan to reduce site net energy and carbon. A four-step plan, as outlined in an article from CBRE (Decarbonizing Commercial Real Estate | CBRE) and shown in the chart below, is recommended:



The table below details the four-step plan with narrative descriptions and progress to date for the target site. Note that the process is by nature to be repeated for continuous improvement and consideration of new technologies:

ESCT Tolland AWC Sustainability Plan			
Step	Description	Progress	Notes
1	Efficiency/Conservation	50%	In process, identifying and determining measures
2	Electrify Remaining Loads	95%	Identify and electrify remaining energy loads
3	Renewable Energy Offset	0%	Onsite or purchased renewable electricity
4	Offset Remaining Loads	0%	Purchase RECs on open market, consider portfolio offsets

Step 1: Efficiency and Conservation

Identify possible efficiency and conservation measures at the target site to reduce energy use and associated carbon. This step is in progress at this site – this study has identified several possible measures for the reduction of energy use. These measures should be considered for implementation.

Step 2: Electrify Remaining Loads

Site net energy loads not able to be reduced should be considered for electrification – substantially complete at this campus, with only the emergency generator and one end-use remaining as natural gas loads.

Step 3: Renewable Energy Offset

Offset of site electrical energy use via renewable energy: either generated onsite or through purchasing of renewable energy from sources such as community solar or solar farms as well as energy brokerage.

Step 4: Offset Remaining Loads

Lastly, the site may consider RECs and/or purchased carbon offsets to meet the remaining site net carbon. ASHRAE 228-2023 rigorously defines each of these categories and is strongly recommended as a guideline for these efforts and associated accounting.

Repeat: Steps 1 – 4

A sustainability plan should be viewed as a process of continuous improvement. The site is encouraged to consider additional opportunities and technologies as they become available and more economical.

Next Steps:

- Site to review suggestions in report and calculation assumptions.
- Most attractive measures in terms of energy savings, operational efficiencies, and potential utility incentives include:
  - CT Fan VFD
  - WSHP replacement of electric heat RTU (RTU could remain as backup)
- QGM would like to have a virtual report-out to discuss this report, answer questions, and review assumptions and findings.
- For those ECMs that require input from designers, site is suggested to initiate the process sooner than later. Site is encouraged to get contractors/vendors to site to review and provide budgetary costs.