Town Facilities Working Group Meeting
Monday, January 13, 2020 at 4:00 pm
Tracy Hall, Conference Room

1. Assign facilitator and secretary roles
2. Review and approve this agenda
3. Review and approve minutes of 12/16/19 meeting
4. Comments from the public
5. Review and approve process document from Mary Layton
6. Review/discuss EEI proposal draft from Mike Davey
7. Discuss and draft materials for SB meeting
8. Review remaining action items if any
9. Adjourn

Memorandum

January 03, 2019

To: Norwich Selectboard
From: John Langhus, Member
Mary Layton, Member

Re: EEI Energy Transformation Proposal

Dear Fellow Selectboard Members,

We have been meeting recently as members of the ad hoc working group (the "Working Group") appointed by the Selectboard to review and develop a proposal by Energy Efficient Investments, Inc. ("EEI") for certain renovations to Town facilities in pursuit of energy efficiency improvements, design benefits for Town employees and elimination of significant percentages of Town fossil fuel usage (the "Project"). This memorandum discusses the outcome of those Working Group deliberations and recommends the inclusion of a ballot question on the 2020 Town Meeting warrant for the approval of the proposal being advanced by the Working Group.

Background and Process

The origin of this proposal and the process by which the Working Group has considered different options for this Project is described in detail in the companion memorandum in this week's Selectboard meeting packet. The ten-member Working Group was comprised of three members of the Energy Committee, two Members of the Finance Committee, two Members of the Selectboard, two EEI representatives, and the Town Manager. The Working Group met three times and over that time evaluated a series of potential improvements to Tracy Hall, the Apparatus Bay at the Public Safety Building, and the Highway Garage at the Department of Public Works. The complete set of potential renovations we considered totaled nearly $4 million.

Components of the Project

The final proposed Project is budgeted at $2,054,569.38, inclusive of a 5% contingency. The structure of the proposal is as a "Performance Contract". Under that structure, the competitive process occurred at the Request for Proposals stage, when several companies were invited to propose a process by which they would undertake a comprehensive energy audit of the Town and then propose work to improve the energy performance of the Town. The original audit and the work that goes into the proposals are uncompensated, but then the ultimate proposal is either approved or not – it is not subject to further bid by other firms. This process is consistent with the Town purchasing policies and is supported by Vermont law which specifically enables and encourages energy Performance Contracts. The logic of these arrangements is that there is relatively little expertise in this type of work, so a Town is unlikely

to know what to request bids for like it would for a standard construction contract where it would have considerably more experience. One feature of a Performance Contract is that the energy efficiency gains/energy savings that are estimated by the proposal become guaranteed by the contract or the costs are adjusted retroactively by a mechanism in the contract. In addition, the Project itself is contracted on a fixed price basis, so that no additional costs are permitted that are not specifically requested by the Town or else agreed to by it.

The Committee ultimately recommended a subset of the total improvements identified by EEI in the audit. The proposed Project includes a total energy and HVAC retrofit of Tracy Hall. One challenge is that Tracy Hall's ventilation is now out of code, so in making the energy changes, the Working Group felt that it would be best to upgrade the ventilation to provide a healthier, more comfortable building for our employees and those who use the spaces on Tracy Hall. Therefore, the project includes approximately $500,000 for such upgrades that are not actually energy related. Other Project components include a full replacement of our oil-burning heating system with a state-of-the-art ground source (geothermal) heat exchanger, LED lighting upgrades and upgrades to controls infrastructure. These improvements will dramatically improve the health and comfort of our employees' space and will completely eliminate the use of fossil fuels at Tracy Hall. For the other facilities, the Committee has elected to propose only the LED lighting and controls retrofits. These retrofits result in rapid savings on electricity expenditures and a modest additional reduction in fossil fuel use. In total, the energy improvements are expected to eliminate 100% of the fuel oil use at Tracy Hall (approximately 5,000 gallons of fuel oil per year) and approximately 870 gallons of liquified propane per year and to eliminate 74,819 kWhs of electricity from our current use. This electricity reduction will be offset, however, by increases coming from the improved HVAC system and the inclusion of central cooling to the building. This additional electricity should be able to be provided by increased use of solar energy, which is currently used for most of the Town's electricity load, so that the added electricity use does not increase our fossil fuel usage. This increase in electrification is, in fact, an expected feature of the transformation of energy systems in response to climate change. If implemented as proposed, we would eliminate roughly 15% of the Town's fossil fuel use and 25% of its annual CO_2 emissions.

Financing the Project

The Committee has considered different financing options for the Project. Importantly, the LED and controls retrofits easily pay for themselves. The remaining retrofits should have useful lives well beyond 20 years. As such, a financing horizon of 15-20 years appears to be reasonable. The Committee is not at this time recommending a specific financing mechanism, recognizing that the Selectboard, Town Manager and Town Treasurer can best consider different options if the Project is approved at Town Meeting. We do note however, that the estimated financial impact of the Project, assuming 15-year financing, would be an additional 2.5 cents on the tax rate, resulting in an approximately $99 addition on the tax bill of a $400,000 home. We find this cost of less than $0.30 per day for an average Norwich family to be an excellent investment for the positive impacts this Project will have for our Town and our employees who work in Tracy Hall.

Climate Impact of the Project

This Project will provide a three-year down payment on the 2019 Town Ballot initiative #36 that directed the Town to seek measures to eliminate at least 5% of the Town's fossil fuel use each year indefinitely. It is a significant step that is being undertaken at a reasonable cost and that will make a meaningful impact on our collective emissions. We expect to have to do more in the coming years to continue to address the climate crisis, but we believe that this is a responsible and effective next step on this journey. By extrapolation, we would set a pace for completely eliminating Town fossil fuel use in the coming years for less than $2.00 per family per day in Norwich.

Proposed Town Meeting Article

With deference to the Town Manager and Town counsel as to drafting, we recommend. Including an article substantially similar to the following be added to the 2020 Norwich Town Meeting ballot:

> **Article XX. Shall the voters of the Town of Norwich authorize the borrowing of up to $2,054,569.38, for up to twenty years, to be used for the first phase of the elimination of fossil fuel use in town operations as directed by the voters in Article 36 of the 2019 ballot, through the renovation and upgrading of HVAC, control, and lighting systems in Tracy Hall, and upgrades of the lighting and controls systems in the Public Safety apparatus bay, and the Public Works Garage?**

We ask for your support and look forward to discussing the proposal on January 8.

Best regards,
John Langhus
Mary Layton

cc: Herb Durfee, Town Manager

Process Description
Energy Efficiency Upgrades to Town of Norwich Municipal Buildings Proposal
December 30, 2019
Mary Layton, John Langhus

The Norwich Town Resolution of 2018 #36 was enacted to take

> *"immediate and sustained efforts to gradually and continually reduce the Town's use of fossil fuels, beginning at a rate of no less than 5% per year starting in the 2019-20 fiscal year and continuing until they are eliminated entirely. The Town Manager shall be charged with monitoring such efforts and reporting on them each year in the annual Town Report. No capital expenditures shall be made that contradict or undermine this direction absent a majority vote of the Select Board."*

In order to support this mandate the Select Board charged the Town Manager in July 2019 to put out an RFP to firms that are qualified to conduct an energy audit for the Town's Municipal Buildings including Tracy Hall, the Apparatus Bay at the Public Safety Building, and the Town Garage.

In particular action seemed urgent to renovate the HVAC systems of Tracy Hall, last renovated in 1994, and known to be nearing the end of their useful life.

A firm was selected by the Town Manager with input from the Norwich Energy Committee:

> *("Town reduction of fossil fuel use: The NEC worked with the Town Manager to select an energy performance company to do an audit of all the Town buildings and make recommendations for energy improvements (such as integrated building controls, changes to heating/cooling, insulation, lighting, solar energy)." Norwich Energy Committee Quarterly Report, third quarter 2019.)*

The firm chosen was EEI Services (www.eeiservices.com, Energy Efficient Investments, located in Merrimack, NH). EEI conducted an audit of the three municipal buildings.

The Norwich Energy Committee submitted a letter for the November 20, 2019 Select Board meeting packet that described the audit and *"attached spreadsheets that reflect the estimated costs of two scenarios: A and B."* Scenario A was included in the packet, and Scenario B was handed out at the Select Board meeting. It was suggested that the Select Board form a working group to evaluate the scenarios. This was done with the inclusion of two Select Board members (Mary Layton and John Langhus), three Energy Committee Members (Linda Gray, Aaron Lamperti, and Charles Lindner), two Finance Committee members (David Barlow and Cheryl

Lindberg), Town Manager Herb Durfee, and EEI representatives Mike Davey and James Harrington.

Two meetings of the Working Group were convened on November 26, 2019 and December 16, 2019. A third meeting was set for January 2, 2020. The agendas and minutes of the first two meetings have been posted on the Town website at (http://norwich.vt.us/town-managers-office/).

The charge for the working group as suggested in the Energy Committee letter in the Select Board Packet of 11/20/19 was:

> *"The working group will consider what package of upgrades will best meet the town energy goals, provide the greatest increase in comfort and function, most effectively anticipate opportune replacement of aging equipment and will provide draft language for the town ballot."*

The working group in its November 26th and December 16th meetings discussed at length the need for upgrades to Tracy Hall, the Apparatus Bay at the Public Safety Building, and the Highway Garage at the Department of Public Works. The "green" infrastructure upgrades were described and there was discussion of whether the public was likely to support minimal upgrades such as LED lighting and digital control of heating and lighting, or whether especially in light of Article 36 that the more expensive geothermal option should be considered. Other needs and expenses of the town were noted, especially the possibility of a sewer extension or other solution to the failing septic system of the school.

The working group recommends acting on geothermal and other upgrades to Tracy Hall, which no longer meets code for heating, electrical systems, or ventilation, and was last renovated in 1994. The EEI representatives were very careful to note that the geothermal proposal would not result in financial savings to the Town. The upgrades required for the code requirements would offset energy savings. If the Town decided to keep the oil fired burner or replace with a propane burner the required code upgrades for ventilation and electrical systems would push the price up so that the geothermal proposal would cost the same as keeping the fossil fuels system. Any renovation to Tracy Hall will require that the most current building codes be followed. The geothermal system would result in an increase in the electric bill. It will be possible to apply for more solar capacity to cover this increase. Completion of this project would reduce total municipal fossil fuel use by 15% and total municipal CO2 emissions by 25% according to an analysis by Aaron Lamperti of the Energy Committee. Upgrades within Tracy Hall would necessitate moving employees out of their offices to complete the work. The scope of work includes added insulation to the attic after duct work is installed. Adding insulation to the walls was deemed too difficult and upgrading the windows not cost effective.

Drilling of 16 wells in the driveway behind Tracy Hall, owned by Cheryl Hermann and Peter Stanzel, would take three weeks and would be very loud. A written recorded easement would need to be established between the Town and these landowners. Below is the comment of Town Manager Herb Durfee regarding this aspect of planning for the project:

> *"Correct. Cheryl Hermann and her husband own the former parsonage (REMAX) and, thus, the portion of the parking lot we're examining for possible geo thermal wells for Tracy Hall. I have had a meeting with both Cheryl and her husband. They are amenable to discussing an "easement" allowing for the installation of the infrastructure should we opt to move forward. Note: if possible, they would like the former parsonage to be considered in the "scoping" for the geo thermal, since they would like to be able to possibly hook-on to the system (whether at the same time or at some point in the future)." Herb Durfee email December 31, 2019.*

The working group recommends LED lighting and DDC systems for the Apparatus Bay and the Town Garage. DDC systems control and monitor heating, ventilation, and lighting from a central point, are programmable, and store data. This decision was based on *"both cost and prioritizing the most important changes to reduce fossil fuel use."* Additionally, *"There was consensus to emphasize to the public that this proposal is the FIRST part of a longer path in eliminating Town fossil fuel use" (Meeting notes December 16, 2019).*

Working group minutes of December 16, 2019 state:

> *"The project would encompass the full geothermal option for Tracy Hall, and lighting and DDC systems for Fire and DPW; the estimated cost would be ~$1.9 million. A quick estimate of the tax impact is + 2.5 cents on the tax rate, and + $99 in the tax bill on a $400,000 property, if the property were financed through a 15-year lease."*

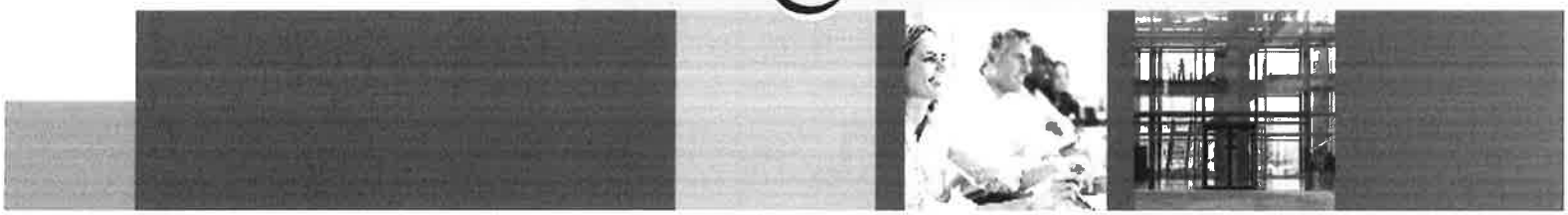
Subsequent to the meeting Herb Durfee provided illustrative Debt Service Schedule rates from the Vermont Bond Bank as of 12/17/2019 for bond issues of 21 year and 16 year terms. The interest on the 21 year term would be $543,057 and $340,606 on the 16 year term. A commercial loan from a bank was also mentioned but not researched.

The working group discussed placing a warrant article at Town Meeting or during the Presidential Primary meeting or on Election Day. Wording for the article was not developed at this time. If an article was passed at Town Meeting it is likely that EEI could complete all work in the summer of 2020.

Questions for the Select Board going forward:

1. If the Select Board decides to employ EEI, Inc to move forward with this proposal, are we engaging in a no-bid contract? Should we waive policy in this case?
2. Should the Select Board do a comparative analysis of financing options?
3. What is the best timing to present a warrant article?
4. What specific language should be in the warrant article and who should draft it?
5. What is the best way to inform the public regarding this proposal?
6. The apparatus bay and DPW garage may be subject to renovation in the future which may give an opportunity for further energy upgrades. A perplexing problem is the need to operate overhead doors to allow snow plows and fire engines egress. No matter how green the energy, opening the doors allows heat to escape in large measure. An innovative solution is needed. What is it?
7. The project cannot move forward until an easement is established between the Town and the owners of the driveway behind Tracy Hall, Cheryl Hermann and Peter Stanzel, that would allow drilling of the geothermal wells. At what point should this easement be negotiated?

ENE/EEI



ENE Systems, Inc./Energy Efficient Investments, Inc.
Energy Audit Report

FOR:

Town of Norwich

Prepared by:

Michael Davey, CEM

Date: January 2, 2020

EEI
ENERGY EFFICIENT INVESTMENTS INC.

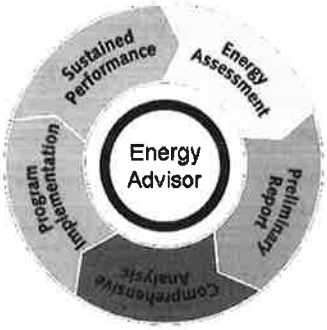
ENE SYSTEMS
REDUCING THE OPERATING AND ENERGY COSTS OF YOUR FACILITY

Executive Summary

EEI is located in Merrimack, NH, and has a proven track record of designing and implementing energy improvements to mechanical systems, building controls systems, insulation, and renewable systems. EEI is also an approved energy management contractor with Better Buildings, Pay for Performance, Eversource, Liberty Utilities, and Unitil in New Hampshire. Recently, EEI has completed comprehensive energy improvement projects for Addison Northwest School District (VT), Bennington School District (VT) and the City of Manchester, New Hampshire.

At the request of the energy committee, EEI looked into the possibility of heating and cooling the buildings without the usage of fossil fuel per the directive recently approved by town voters. The Town of Norwich has three main facilities that are their primary Fossil Fuel Users (excluding transportation) and they include the Tracy Hall, DPW Garage and the Public Safety Complex. After a detailed review of each building it was determined that the best improvement at the current time is a Geothermal heating system at Tracy Hall and more targeted energy improvements at the other two complexes. The reason behind this decision is that the cost for a radiant geo-thermal heating system at DPW and the Public Safety Building was deemed to be too costly as this time.

On the following page, the Energy Conservation Measures Matrix shows the upgrades for Norwich, including conversion of oil to geo-thermal, LED lighting, digital controls and insulation improvements. Approval of this Audit will lead to an **Energy Performance Contract (EPC)** which will clearly define the responsibilities of each party and will include a **Measurement and Verification (M&V)** procedure that will be used to measure the energy performance of the new systems and equipment installed throughout the town.



Utility Data Analysis

Currently the Town of Norwich meets its electric needs through an offsite power purchase agreement with a solar provider. The offsite power purchase energy was not included in the utility analysis below. The Town Hall, DPW garage and Public Safety building garage are heated with oil/propane heating units. The proposed system will include both complete ventilation and central air conditioning for Town Hall.

In order to understand the energy use at the three buildings, we analyzed 12 months of historical natural gas and electricity bills from June 2017 through May 2018. The data shows an average Energy Use Index (EUI) of 77 for Tracey Hall, 56 for the Police/Fire Station, and 67 for the DPW. The energy consumption data was weather normalized using heating (HDD) and cooling degree days (CDD) so that it may be used as a baseline to compare future energy usage and determine energy savings realized by ECM implementation. These savings will be described in semi-annual Measurement & Verification (M&V) Reports.

Measurement And Verification Document

EEI

Prepared by: Energy Efficient Investments, Inc.
19D Star Drive
Merrimack, NH 03054

Prepared for: Norwich School District
Tracey Hall

Contract Number:
Report Date: 01/01/20
Starting Period: 06/01/17
Ending Period: 05/01/18

Contract Rates:

Electricity	$ 0.15	/kWh	**#2 Fuel Oil**	$ 1.78	/gal

Baseline Year

	Month	HDD @ 65F Monthly	CDD @ 65F Monthly	Baseline Electrical Use (kWh)	Baseline #2 Fuel Oil Use (gal)	Baseline Total Energy Use (kBTU)	Actual Electrical Use (kWh)	Actual #2 Fuel Oil Use (gal)	Actual Total Energy Use (kBTU)	Baseline Elec Cost ($)	Baseline Natural Fuel Oil Cost($)	Baseline Total Cost ($)	Actual Elec Cost ($)	Actual Fuel Oil Cost ($)	Actual Total Cost ($)	Savings	Baseline EUI	Actual EUI
Jun	Jun-17	129	148	5,240	-	17,879	5,240	-	17,879	$ 786	$ -	$ 786	$ 786	$ -	$ 786	$ -	18	18
Jul	Jul-17	65	173	5,360	-	18,288	5,360	-	18,288	$ 804	$ -	$ 804	$ 804	$ -	$ 804	$ -	18	18
Aug	Aug-17	112	147	4,960	-	16,924	4,960	-	16,924	$ 744	$ -	$ 744	$ 744	$ -	$ 744	$ -	17	17
Sep	Sep-17	151	98	5,840	5	20,607	5,840	5	20,607	$ 876	$ 9	$ 885	$ 876	$ 9	$ 885	$ -	21	21
Oct	Oct-17	334	37	6,280	191	47,976	6,280	191	47,976	$ 942	$ 340	$ 1,282	$ 942	$ 340	$ 1,282	$ -	48	48
Nov	Nov-17	857	0	6,480	927	150,963	6,480	927	150,963	$ 972	$ 1,650	$ 2,622	$ 972	$ 1,650	$ 2,622	$ -	151	151
Dec	Dec-17	1392	0	6,600	971	157,488	6,600	971	157,488	$ 990	$ 1,728	$ 2,718	$ 990	$ 1,728	$ 2,718	$ -	157	157
Jan	Jan-18	1381	0	5,760	390	73,863	5,760	390	73,863	$ 864	$ 694	$ 1,558	$ 864	$ 694	$ 1,558	$ -	74	74
Feb	Feb-18	1007	0	6,400	853	140,404	6,400	853	140,404	$ 960	$ 1,518	$ 2,478	$ 960	$ 1,518	$ 2,478	$ -	140	140
Mar	Mar-18	1016	0	6,680	866	143,166	6,680	866	143,166	$ 1,002	$ 1,541	$ 2,543	$ 1,002	$ 1,541	$ 2,543	$ -	143	143
Apr	Apr-18	739	2	5,960	487	88,029	5,960	487	88,029	$ 894	$ 867	$ 1,761	$ 894	$ 867	$ 1,761	$ -	88	88
May	May-18	217	100	5,720	220	50,097	5,720	220	50,097	$ 858	$ 392	$ 1,250	$ 858	$ 392	$ 1,250	$ -	50	50
Total	**2017-2018**	**7,400**	**705**	**71,280**	**4,910**	**925,683**	**71,280**	**4,910**	**925,683**	**$ 10,692**	**$ 8,740**	**$ 19,432**	**$ 10,692**	**$ 8,740**	**$ 19,432**	**$ -**	**77**	**77**

Measurement And Verification Document

EEI

Prepared by: Energy Efficient Investments, Inc.
19D Star Drive
Merrimack, NH 03054

Prepared for: Norwich School District
Police & Fire Station

Contract Number:
Report Date: 01/01/20
Starting Period: 06/01/17
Ending Period: 05/01/18

Contract Rates:

Electricity	$ 0.15	/kWh	**#2 Fuel Oil**	$ 1.78	/gal

Baseline Year

	Month	HDD @ 65F Monthly	CDD @ 65F Monthly	Baseline Electrical Use (kWh)	Baseline #2 Fuel Oil Use (gal)	Baseline Total Energy Use (kBTU)	Actual Electrical Use (kWh)	Actual #2 Fuel Oil Use (gal)	Actual Total Energy Use (kBTU)	Baseline Elec Cost ($)	Baseline Fuel Oil Cost ($)	Baseline Total Cost ($)	Actual Elec Cost ($)	Actual Fuel Oil Cost ($)	Actual Total Cost ($)	Savings	Baseline EUI	Actual EUI
Jun	Jun-17	129	148	1,344	-	4,586	1,344	-	4,586	$ 202	$ -	$ 202	$ 202	$ -	$ 202	$ -	9	9
Jul	Jul-17	65	173	1,558	-	5,316	1,558	-	5,316	$ 234	$ -	$ 234	$ 234	$ -	$ 234	$ -	11	11
Aug	Aug-17	112	147	1,620	-	5,527	1,620	-	5,527	$ 243	$ -	$ 243	$ 243	$ -	$ 243	$ -	11	11
Sep	Sep-17	151	98	2,025	50	13,859	2,025	50	13,859	$ 304	$ 89	$ 393	$ 304	$ 89	$ 393	$ -	28	28
Oct	Oct-17	334	37	3,225	100	24,904	3,225	100	24,904	$ 484	$ 178	$ 662	$ 484	$ 178	$ 662	$ -	50	50
Nov	Nov-17	857	0	3,370	220	42,078	3,370	220	42,078	$ 506	$ 392	$ 897	$ 506	$ 392	$ 897	$ -	84	84
Dec	Dec-17	1392	0	5,932	229	52,071	5,932	229	52,071	$ 890	$ 408	$ 1,297	$ 890	$ 408	$ 1,297	$ -	104	104
Jan	Jan-18	1381	0	3,057	429	70,061	3,057	429	70,061	$ 459	$ 764	$ 1,222	$ 459	$ 764	$ 1,222	$ -	140	140
Feb	Feb-18	1007	0	3,496	232	44,176	3,496	232	44,176	$ 524	$ 413	$ 937	$ 524	$ 413	$ 937	$ -	88	88
Mar	Mar-18	1016	0	4,710	174	40,257	4,710	174	40,257	$ 707	$ 310	$ 1,016	$ 707	$ 310	$ 1,016	$ -	81	81
Apr	Apr-18	739	2	3,073	49	17,296	3,073	49	17,296	$ 461	$ 87	$ 548	$ 461	$ 87	$ 548	$ -	35	35
May	May-18	217	100	3,016	40	15,851	3,016	40	15,851	$ 452	$ 71	$ 524	$ 452	$ 71	$ 524	$ -	32	32
Total	**2017-2018**	**7,400**	**705**	**36,426**	**1,523**	**335,983**	**36,426**	**1,523**	**335,983**	**$ 5,464**	**$ 2,711**	**$ 8,175**	**$ 5,464**	**$ 2,711**	**$ 8,175**	**$ -**	**56**	**56**

Measurement And Verification Document

EEI

Prepared by: Energy Efficient Investments, Inc.
19D Star Drive
Merrimack, NH 03054

Prepared for: Norwich School District
DPW

Contract Number:
Report Date: 01/01/20
Starting Period: 06/01/17
Ending Period: 05/01/18

Contract Rates:

Electricity	$ 0.15	/kWh	**Propane**	$ 1.21	/gal

Baseline Year

	Month	HDD @ 65F Monthly	CDD @ 65F Monthly	Baseline Electrical Use (kWh)	Baseline #2 Propane Use (gal)	Baseline Total Energy Use (kBTU)	Actual Electrical Use (kWh)	Actual #2 Propane Use (gal)	Actual Total Energy Use (kBTU)	Baseline Elec Cost ($)	Baseline Propane Cost ($)	Baseline Total Cost ($)	Actual Elec Cost ($)	Actual Propane Cost ($)	Actual Total Cost ($)	Savings	Baseline EUI	Actual EUI
Jun	Jun-17	129	148	516	-	4,586	516	-	4,586	$ 77	$ -	$ 77	$ 77	$ -	$ 77	$ -	11	11
Jul	Jul-17	65	173	889	-	5,316	889	-	5,316	$ 133	$ -	$ 133	$ 133	$ -	$ 133	$ -	13	13
Aug	Aug-17	112	147	820	-	5,527	820	-	5,527	$ 123	$ -	$ 123	$ 123	$ -	$ 123	$ -	13	13
Sep	Sep-17	151	98	960	100	13,859	960	100	13,859	$ 144	$ 121	$ 265	$ 144	$ 121	$ 265	$ -	33	33
Oct	Oct-17	334	37	1,465	177	24,904	1,465	177	24,904	$ 220	$ 214	$ 434	$ 220	$ 214	$ 434	$ -	60	60
Nov	Nov-17	857	0	2,132	600	42,078	2,132	600	42,078	$ 320	$ 726	$ 1,046	$ 320	$ 726	$ 1,046	$ -	101	101
Dec	Dec-17	1392	0	2,667	1,051	52,071	2,667	1,051	52,071	$ 400	$ 1,272	$ 1,672	$ 400	$ 1,272	$ 1,672	$ -	125	125
Jan	Jan-18	1381	0	2,072	1,492	70,061	2,072	1,492	70,061	$ 311	$ 1,805	$ 2,116	$ 311	$ 1,805	$ 2,116	$ -	168	168
Feb	Feb-18	1007	0	1,555	926	44,176	1,555	926	44,176	$ 233	$ 1,120	$ 1,354	$ 233	$ 1,120	$ 1,354	$ -	106	106
Mar	Mar-18	1016	0	1,926	813	40,257	1,926	813	40,257	$ 289	$ 984	$ 1,273	$ 289	$ 984	$ 1,273	$ -	97	97
Apr	Apr-18	739	2	1,275	275	17,296	1,275	275	17,296	$ 191	$ 333	$ 524	$ 191	$ 333	$ 524	$ -	42	42
May	May-18	217	100	1,926	-	15,851	1,926	-	15,851	$ 289	$ -	$ 289	$ 289	$ -	$ 289	$ -	38	38
Total	**2017-2018**	**7,400**	**705**	**18,203**	**5,434**	**335,983**	**18,203**	**5,434**	**335,983**	**$ 2,730**	**$ 6,575**	**$ 9,306**	**$ 2,730**	**$ 6,575**	**$ 9,306**	**$ -**	**67**	**67**

Energy Conservation Measures

In this section of the document we will define the Energy Conservation Measures we have evaluated for this project. Then we will define the measures on a building by building basis. Careful consideration was given to each measure and its interaction with the overall building performance.

ECM #	ECM Matrix		Cost for Installed Measure $	Potential Rebates	Reduction in Electrical Demand	Reduction in Fuel Oil Gallons	Reduction in LP gallons
	Tracey Hall						
TH1	LED Lighting		$61,299.00		-46,875		
TH2	DDC Controls		$133,000.00		-1,000.00		
TH3	Geothermal Excation and Backfill		$402,724.00		0.00		
TH4	Carpentry Allowance		$95,000.00		0.00		
TH5	Weatherization		$30,000.00		-1,000.00	500.00	
TH6	Electrical Upgrades		$158,460.00		0.00		
TH7	Add Ventilation and central cooling to building		$924,350.00		156,250.00	4,500.00	
	Total Tracey Hall		**1,804,833.00**		**107,375.00**	**5,000.00**	
	Public Safety						
FD1	LED Lighting		$25,020.00		19,444.44		
FD2	DDC Controls		$48,650.00		2,000.00		
	Total Public Safety		**73,670.00**		**21,444.44**		
	DPW						
DPW1	LED Lighting		$11,120.00		11,111.11		
DPW2	DDC Controls		$48,650.00		0		870.00
	Total DPW		**$59,770.00**		**11,111.11**		**870.00**
	Total All Buildings		**$1,938,273.00**		**139,930.56**	**5,000.00**	
	Payment and Performance Bond		$19,382.00				
	Contingency 5%		$96,913.65				
	Total		**$2,054,568.65**	**$50,000.00**			

TRACY HALL.

Under this option all the oil heat would be converted over to geothermal heating with a new ventilation system. The existing DX split cooling systems would be removed and replaced with the geothermal cooling option.

The proposed project energy upgrade would consist of the following:

1. LED lighting upgrade throughout: (8) 2x2 LED High bays Install 40 LED recessed can lights, and 92 LED pendant lights. Install LED Tubes and LED drivers to 158 fixtures

2. New DDC building control system. System will be Distech or approved equal
3. Electrical service upgrade note specification attached.
4. Electrical distribution to mechanical equipment.
5. Geothermal wells.
6. Site excavation, back fill and landscaping.
7. Blacktop and parking lot striping.
8. New outside air ventilation systems (4 units)
9. Water to air zone heat pumps (9 units)
10. Water to water heat pumps (6 units)- provide building heat through radiation panels, cabinet unit heaters.
11. Backup electric boiler heating.
12. Backup electric duct mounted heating coils (on HRU's).
13. Pumps and hydronic appurtenances.
14. New domestic water heater-heat pump.
15. General carpentry and finish work, includes all required patching and painting and soffits for new pipe chases
16. Attic insulation. EEI proposes air sealing measures in the attic space including pipe penetrations and wall plates to reduce the air infiltration and exfiltration. Once the attic space is air sealed this ECM includes the installation of blown in cellulose insulation to achieve R-60. The floor of the storage space to be densely packed with cellulose insulation from above. Replacement of existing weather stripping and door sweeps to exterior doors is included.

Excluded in this facilities upgrade would be the following:

1. Window upgrades
2. Wall insulation
3. Door replacements
4. Emergency generator upgrades and replacements

After reviewing the total cost of upgrading the PWD and the PSD apparatus bay heating system, it was determined that focusing on the lighting and DDC controls would be better economical and practical solution on the aging structures.

PUBLIC SAFETY BUILDING

The proposed energy project upgrade would consist of the following:

1. LED lighting upgrade in the apparatus bay.
2. DDC controls in the older part of the facility (Distech or approved Equal).

PUBLIC WORKS DEPARTMENT

The proposed energy project upgrade would consist of the following:

3. DDC controls (Distech or approved Equal).

EXCLUSIONS

The following base budget above does not include emergency generators or upgrades to the emergency power systems.

SUMMARY

The upgrades to the systems as described above utilizes the most current technology for implementing fossil fuel and carbon footprint reduction. Through this strategy lighting and mechanical systems are also upgraded providing energy efficiency and building occupant comfort.

Engineering Services of Vermont, LLC
Mechanical-Electrical Consulting Engineers

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Note (The scope of work for Tracy Hall is included in this project Other buildings were not selected at this time)

Norwich Municipal Buildings
Norwich, Vermont
Electrical Basis of Design
November 13, 2019

DIVISIONS 26 ELECTRICAL

1. General
    a. The work described in this document is to modify electrical services and distribution systems as necessary to allow for mechanical renovations at four municipal buildings in Norwich, Vermont. Along with the service and distribution modifications, the work necessary to disconnect and remove wiring to mechanical equipment being removed, and the connections to the equipment to be installed is included in the electrical scope of work.
        i. Town of Norwich, Tracy Hall
    b. Provide a complete electrical system in accordance with all applicable codes, to include electrical service, electrical distribution and general power as appropriate for the building mentioned in this document. Codes applicable to the electrical work on this project are the Code of Ordinances of the Town of Norwich, Vermont which include, but are not limited to:
        i. State of Vermont, Fire and Building Safety Code
            1. 2015 Fire and Building Safety Code is presently adopted and we expect to adopt a revised Code based on 2018 IBC within 5 months.
        ii. IBC-2018, International Building Code, with State of Vermont amendments
        iii. NFPA 1-2018, Fire Code, with State of Vermont amendments
            1. NFPA 70-2017, National Electrical Code (NEC), with State of Vermont amendments
    c. Coordinate with power utility companies and their requirements as necessary.

d. Coordinate with the Construction Manager and the contractors of other trades (general, civil/site, mechanical, plumbing, temperature control) as necessary to provide an overall professional and complete project.

1. Electrical Service and Distribution

   a. Provide coordination with Green Mountain Power (GMP) for electrical service to the building. All aspects of the service wiring installation shall be as per GMP requirements.

   b. Wiring Methods:

      i. Follow all applicable codes and use good electrical construction practices when determining types of wiring methods and sizing of conductors and conduit. Install all power, control and signal wiring using methods as follows.

         1. Underground Wiring or Beneath Concrete Slab: Individual conductors in schedule 80 PVC rigid non-metallic conduit (RNC) for direct burial; transition to galvanized steel rigid metallic conduit (RMC) where conduit rises to be exposed above grade or concrete slab, from a minimum of 24" below finished grade.

         2. Exposed Exterior Wiring: Individual conductors in galvanized steel rigid metal conduit (RMC).

         3. Exposed Wiring in Utility Areas (Mechanical, Electrical Rooms, etc.): Individual conductors in electrical metallic tubing (EMT) with set screw fittings and metal clad (type MC).

         4. Inaccessible Concealed Wiring: Individual conductors in electrical metallic tubing (EMT) with set screw fittings and metal clad (type MC).

         5. Concealed Wiring above Accessible Ceilings: Individual conductors in electrical metallic tubing (EMT) with set screw fittings.

         6. Final connections to mechanical/vibrating equipment will be maximum 4' flexible metallic conduit (FMC) in dry areas and liquid tight flexible metallic conduit (LFMC) in damp/wet areas.

      ii. All wiring in finished areas will be routed concealed and devices will be flush/recessed mounted. Wiring in the utility areas will be exposed where no wall finish exists. Wiring routed exposed on vertical surfaces will be routed vertically; horizontal wiring will be routed at the ceiling level of these spaces, not on the walls.

      iii. Service and feeder wiring shall be aluminum conductors, XHHW insulation. All branch wiring shall be copper, THHN/THWN-2 insulation.

iv. Provide an insulated equipment ground conductor within all cables and raceways.

v. Where necessary, provide fire-rated putty pads on boxes in fire rated walls that are located in common stud space with boxes from the adjacent space.

2. Mechanical and Building Equipment Connections

a. Provide disconnection and reconnection of all mechanical equipment. Actual connection information will be determined by this Contractor through coordination with the Mechanical Contractor.

i. Provide new local disconnecting means as necessary.

1. Each heating system circulation pump shall have individual disconnecting means.
2. Label all disconnecting devices.

ii. Coordinate 120V power connection to mechanical equipment controls with Mechanical Contractor for all mechanical equipment being provided.

b. Coordinate testing of power connections to all mechanical equipment with Mechanical Contractor to confirm proper operation.

Town of Norwich, Tracy Hall - Scope of Electrical Work

1. Existing Electrical Distribution
    a. Main Electrical Service
        i. Panel "MDP"
            1. 400 Amp MCB, 120/208 Volt, 3 Phase, 4 Wire
    b. Electrical Distribution
        i. Lower Level Treas. Office - Panel "P1":
            1. 200 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 30 Space
        ii. Kitchen - Panel "P2":
            1. 200 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 42 Space
        iii. Entry Level Office - Panel "P3":
            1. 200 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 24 Space
        iv. (Unlabeled) - Panel "P4":
            1. Assumed to be Panel located in gymnasium on stage.
                a. 200 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 42 Space
        v. Top Floor Office - Panel "P5":
            1. 150 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 24 Space
        vi. Mechanical Rm - Panel "P6":
            1. 200 Amp MLO, 120/208 Volt, 3 Phase, 4 Wire – 42 Space
    c. Generator
        i. 100KW 120/208 Volt, 3 Phase, 4 Wire

1. Electrical Distribution Modifications
    a. Disconnect and remove existing electrical service and replace as follows.
    b. Provide upgraded 800 Amp 120/208 Volt, 3 Phase, 4 Wire Service:
        i. Provide new 800 Amp CT meter per GMP specifications
        ii. Provide new 800 Amp MCB, 120/208 Volt, 3 Phase, 4 Wire Distribution panel "MDP"
            1. Disconnect and refeed existing panel MDP from the new MDP
                a. Rename existing panel MDP as "DP1"
            2. Provide multi-section panel as may be necessary to accommodate the feeder to new panel "DP2" from new MDP.
        iii. Provide new 400 Amp 120/208 Volt, 3 Phase, 4 Wire panel "DP2"
    c. Existing Generator and associated distribution shall be disconnected for future replacement.

2. Mechanical and Building Equipment
    a. Refer to Mechanical Equipment Schedule on Sheet EC1.
        i. Provide power connection from new panel DP2 for all new mechanical equipment as indicated.