TOWN COUNCIL – AGENDA REQUEST FORM

THIS FORM WILL BECOME PART OF THE BACKGROUND INFORMATION USED BY THE COUNCIL AND PUBLIC

Please submit Agenda Request Form, **including back up information**, 8 days prior to the requested meeting date. **Public Hearing requests must be submitted 20 days prior to requested meeting date to meet publication deadlines** (exceptions may be authorized by the Town Manager, Chairman/Vice Chair).

MEETING INFORMATION

Date Submitted: January 29, 2018
Submitted by: Town Manager Eileen Cabanel
Department:
Speakers:

Date of Meeting: February 8, 2018

Time Required: 20 minutes
Background Info. Supplied: Yes: ☒ No: ☐

CATEGORY OF BUSINESS (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Appointment:	☐	Recognition/Resignation/ Retirement:	☐
Public Hearing:	☐	Old Business:	☐
New Business:	☒	Consent Agenda:	☐
Nonpublic:	☐	Other:	☐

TITLE OF ITEM

HVAC Presentation

DESCRIPTION OF ITEM

Town Council to be presented with the system options for the East Wing, 1st Floor HVAC Project

REFERENCE (IF KNOWN)

RSA:		Warrant Article:	
Charter Article:		Town Meeting:	
Other:		N/A	

EQUIPMENT REQUIRED (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Projector:	☐	Grant Requirements:	☐
Easel:	☐	Joint Meeting:	☐
Special Seating:	☐	Other:	☐
Laptop:	☐	None:	☐

CONTACT INFORMATION

Name:	**Eileen Cabanel**	Address	**6 Baboosic Lake Road**
Phone Number	**424-2331**	Email Address	ecabanel@merrimacknh.gov

APPROVAL

Town Manager: Yes ☒ No: ☐ Chair/Vice Chair: Yes ☒ No: ☐

Hold for Meeting Date: _____

SYSTEM OPTIONS FOR HVAC RENOVATIONS
MERRIMACK TOWN HALL
MERRIMACK, NEW HAMPSHIRE

Prepared For:
Merrimack DPW
6 Baboosic Lake Road
Merrimack, NH 03054

Prepared By:
The H.L. Turner Group, Inc.
27 Locke Road
Concord, NH 03301

December 1, 2017

The H.L. Turner Group Inc.

ARCHITECTS ▪ ENGINEERS ▪ BUILDING SCIENTISTS ▪ IAQ CONSULTANTS ▪ COMMISSIONING

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1.0 EXISTING MECHANICAL SYSTEMS

1.1 Upper Level File Storage

The upper level file storage area of the Merrimack Town Hall (East Wing) is provided with heating, ventilation, and air conditioning (HVAC) from a Gibson gas-fired furnace with York three ton duct cooling coil. This unit is located in the attic space above the west side of the building. The unit provides ducted supply and return air into the records storage room. This unit does not introduce any outside air into the space.

1.2 Main Level

Perimeter areas of the main level of the Town Hall (East Wing) are provided with HVAC from 17 packaged terminal air conditioning units (PTAC). These units have direct expansion (DX) coils with integral compressors and gas furnaces. The units are located through the wall under most windows. These units do not appear to supply outside air to the perimeter spaces.

The Conference Room at the center east of the main level has an additional 2-1/2 ton Goodman split system DX unit located in the attic to provide supplemental cooling. This unit does not appear to introduce ventilation air to the space.

The Town Clerk's space and main hallway in the center of the main level are provided with HVAC from a Gibson gas fired furnace with a 2-1/2 ton DX coil manufactured by Inter-City Products. This unit provides ducted supply and return air to the Clerk's space. This unit does not introduce outside air into the space.

1.3 Lower Level

The lower level of the Town Hall (East Wing) is provided with HVACX from three Comfortmaker vertical units with gas-fired heating and DX cooling. One unit is located in the DPW Secretary's closet and serves the east side of the lower level. A second unit is located in a closet outside the Kitchen and serves the south side of the lower level. The third unit is located in a closet in the main stack area and serves the east side and center hall of the lower level.

1.3 Automatic Temperature Controls

The temperature controls in the Merrimack Town Hall are local – control is by a room thermostat. There is no central way to observe operation of the system or to troubleshoot problems with temperature control.

2.0 ISSUES WITH EXISTING SYSTEMS

2.1 Equipment Issues

The PTAC units around the perimeter of the main level of the building are reportedly a constant issue. These units have a relatively short life span and are increasingly difficult to replace. It was reported to us that many of the units have been replaced over the years.

The units in the attic space have some useful life remaining, but will need regular maintenance to continue operation.

The lower level furnaces appear in good condition and are reportedly operating well. The only issue with these units is the zoning of the south side unit, since the IT room tends to always need cooling.

2.2 Ventilation Issues

None of the currently installed equipment appears to introduce outside ventilation air into the occupied space.

3.0 OPTIONS FOR REPLACEMENT EQUIPMENT

3.1 Option 1 – Replace PTAC Units In Kind

This option replaces the 17 packaged terminal air conditioners (PTAC) with similar DX units with gas furnaces. In order to meet the ventilation code, an additional energy recovery ventilat6ion unit would be installed in the attic space and ducted to spaces throughout the building.

3.2 Option 2 – Air Handling Units with Variable Air Volume

This option removes the perimeter PTAC units and installs two central air handling units on the lower level. A gas-fired small boiler would be installed to provide hot water for heating in place of the distributed PTAC furnaces. Air would be supplied through variable air volume boxes with heating coils, allowing for space temperature control in both heating and cooling modes. An energy recovery ventilator would be installed in the attic and ducted to all areas of the building for ventilation and exhaust air.

4.0 COST ESTIMATES

The following two pages detail the cost estimates for the two options indicated above. These estimates include the items likely to be included in a complete, stand-alone project to replace the air handling equipment for the main level areas of the Town Hall as indicated in the descriptions above.

Merrimack Town Hall
HVAC Renovations
Merrimack, NH

OPTION 1 - Packaged Terminal Air Conditioning

Section/Description	Renovation	$/sf (lf)	Budget 12/1/17
	5,800 sf		square footage of building
Construction Costs			
Packaged Terminal Air Conditioners			$58,000
Energy Recovery Units			$6,000
Ductwork			$18,000
Demolition			$2,000
General Conditions (15%)			$13,000
Construction Contingency (10%)			$8,000
SUBTOTAL CONSTRUCTION		**$18.10**	**$105,000**
Ancillary Costs			
Architectural and Engineering			$16,000
Construction Administration			$5,000
Moving and Storage			$3,000
Reimburseables			$2,000
Bidding Contingency (5%)			$7,000
Owner's Legal/Advertising/Project Admin			$2,000
SUBTOTAL ANCILLARY COSTS			**$35,000**
TOTAL PROJECT			**$140,000**

Merrimack Town Hall
HVAC Renovations
Merrimack, NH

OPTION 2 - Air Handling Units with Variable Air Volume

Section/Description	Renovation	$/sf (lf)	Budget 12/1/17
	5,800 sf		square footage of building
Construction Costs			
Concrete Pads			$4,000
Ceilings			$1,000
Painting/Infill			$4,000
Condensate Piping/Insulation			$500
Air Handling Units			$40,000
Ductwork			$35,000
Energy Recovery Units			$6,000
VAV/Heating coils			$12,000
Boiler			$8,000
Heating piping			$22,000
Pumps			$1,000
Demolition			$2,000
Electrical Modifications			$14,000
General Conditions (15%)			$22,000
Construction Contingency (10%)			$15,000
SUBTOTAL CONSTRUCTION		**$32.16**	**$186,500**
Ancillary Costs			
Architectural and Engineering			$28,000
Construction Administration			$8,000
Moving and Storage			$3,000
Reimburseables			$2,000
Bidding Contingency (5%)			$11,000
Owner's Legal/Advertising/Project Admin			$3,000
SUBTOTAL ANCILLARY COSTS			**$55,000**
TOTAL PROJECT			**$241,500**

5.0 LIFE CYCLE COSTS

The following pages are an estimate of the life cycle costs for the two HVAC options. These costs include the first cost of equipment, taken from the cost estimates, as well as costs for estimated energy use and maintenance. The PTAC system (Option 1) has a significantly shorter anticipated lifespan than Option 2, so replacement costs are included in the life cycle analysis. The life cycle cost analysis was done using the Building Efficiency System Tool, which includes a simulation of operational costs using local weather data and maintenance estimates provided by contractors throughout North America for the specific types of equipment selected for each system.

System 1 Best Energy Analysis Dec 01, 2017
Packaged Terminal Air Conditioning

Heat Source
Heat Source: PTAC
Heat Sub Type: PTAC - Electric Backup

Cool Source
Cool Source: PTAC
Cooling EER (EER): 10.00
Cooling IEER (EER): 10.00
Cooling IEER Adjusted (EER): 10.00
Cooling Compresser HP: 23.16 Hp
Cooling Condenser Fan HP: 1.78 Hp

Heating Perimeter Terminals
Terminal Type: PTAC Fan Coil
Terminal Fan Horsepower: .38 Hp

Heating Interior Terminals
Terminal Type: PTAC Fan Coil
Terminal Fan Horsepower: .21 Hp

Cooling Perimeter Terminals
Terminal Type: PTAC
Terminal Fan Horsepower: .53 Hp

Cooling Interior Terminals
Terminal Type: PTAC
Terminal Fan Horsepower: 1.26 Hp

Terminal Flow Control
Pump Flow Control: Constant
Fan Flow Control: Constant

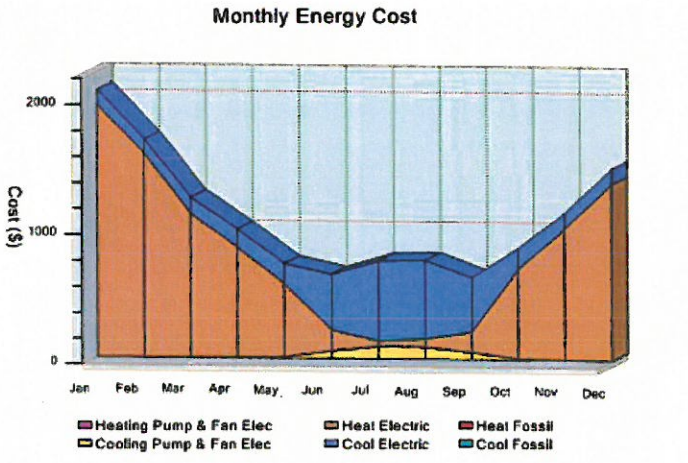
Life Cycle Cost

First Cost:	$104832
Annual Maintenance Cost:	$7027
Replacement Cost:	$73382
Replacement Interval:	10 Years

Annual Energy Cost

Electrical Consumption:	137886 Kw
Electrical Consumption Cost:	$12975
Electrical Demand Cost:	$0
Fossil Consumption:	0Gal
Fossil Cost:	$0
Fossil Cost:	$12975
Life Cycle Cost:	$560335

Total Pump & Fan HP
Total Heating Pump & Fan HP: .70 Hp
Total Cooling Pump & Fan HP: 1.79 Hp
Cooling System COP: 9.58



System 1 Best Energy Analysis Dec 01, 2017
Packaged Terminal Air Conditioning

Monthly Energy Data

	Jan	Feb	Mar	Apr	May	Jun
Heating Pump & Fan Cost($)	0	0	0	0	0	0
Heating Other Electical Cost($)	1944	1576	1110	851	568	162
Heating Fossil Cost($)	0	0	0	0	0	0
Heating Total Cost($)	1944	1576	1110	851	568	162
Cooling Pump & Fan Cost($)	0	0	1	5	8	60
Cooling Other Electical Cost($)	114	103	123	137	156	429
Cooling Fossil Cost($)	0	0	0	0	0	0
Cooling Total Cost($)	114	103	124	142	163	489
Heating Pump & Fan Consumption (Kw)	0	0	0	0	0	0
Heating Other Consumption (Kw)	20664	16744	11792	9042	6031	1717
Heating Consumption Fossil (BtuH)	0	0	0	0	0	0
Cooling Pump & Fan Consumption (Kw)	0	0	15	51	80	637
Cooling Other Consumption (Kw)	1216	1099	1302	1461	1656	4563
Cooling Consumption Fossil (BtuH)	0	0	0	0	0	0
Geothermal Heat Extraction (MMBTU)	0	0	0	0	0	0
Geothermal Heat Rejection (MMBTU)	0	0	0	0	0	0

	Jul	Aug	Sep	Oct	Nov	Dec
Heating Pump & Fan Cost($)	0	0	0	0	0	0
Heating Other Electical Cost($)	43	64	159	695	1013	1360
Heating Fossil Cost($)	0	0	0	0	0	0
Heating Total Cost($)	43	64	159	695	1013	1360
Cooling Pump & Fan Cost($)	97	93	56	8	1	1
Cooling Other Electical Cost($)	617	607	417	159	119	120
Cooling Fossil Cost($)	0	0	0	0	0	0
Cooling Total Cost($)	714	700	473	167	120	121
Heating Pump & Fan Consumption (Kw)	0	0	0	0	0	0
Heating Other Consumption (Kw)	452	681	1690	7389	10763	14449
Heating Consumption Fossil (BtuH)	0	0	0	0	0	0
Cooling Pump & Fan Consumption (Kw)	1028	989	598	84	15	10
Cooling Other Consumption (Kw)	6561	6447	4431	1690	1264	1276
Cooling Consumption Fossil (BtuH)	0	0	0	0	0	0
Geothermal Heat Extraction (MMBTU)	0	0	0	0	0	0
Geothermal Heat Rejection (MMBTU)	0	0	0	0	0	0

System 2 Best Energy Analysis Dec 01, 2017
VAV Hot Water Heating Chilled Water Cooling Air Cooled Chiller - 2 Pipe LoadMatch

Heat Source
Heat Source: Boiler
Heat Type: Natural Gas
Heat Efficiency: 90 %

Cool Source
Cool Source: Condensing Unit
Cool Auxiliary Source: Air Cooled
Cool Type: Air Cooled
Cooling EER (EER): 11.00
Cooling IEER (EER): 11.00
Cooling IEER Adjusted (EER): 11.00
Cooling Compresser HP: 21.05 Hp
Cooling Condenser Fan HP: 1.74 Hp

Hydronic Pipe Systems
Heating Pipe System: Single Pipe LoadMatch
Heat Pipe Flow Control: Delta P
Heat Pipe HP: .10 HP

Air Duct System
System : Single Duct Single Fan
Air Flow Control: On Off
Heating Supply Fan Horsepower: 1.88 Hp
Cooling Supply Fan Horsepower: 10.12 Hp

System Features
Economizer

Heating Perimeter Terminals
Terminal Type: VAV Reheat Coil
Terminal Pump HP: .06 Hp

Heating Interior Terminals
Terminal Type: VAV Reheat Coil
Terminal Pump HP: .04 Hp

Cooling Perimeter Terminals
Terminal Type: VAV Box

Cooling Interior Terminals
Terminal Type: VAV Box

Terminal Flow Control
Pump Flow Control: Constant
Fan Flow Control: Constant

Life Cycle Cost

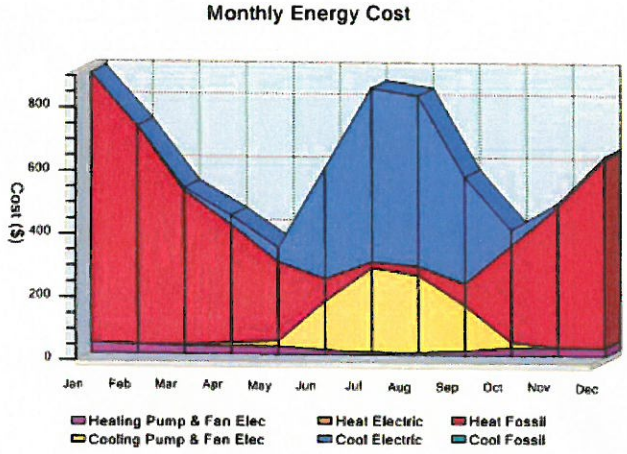
First Cost:	$186509
Annual Maintenance Cost:	$2534
Replacement Cost:	$55953
Replacement Interval:	25 Years

Annual Energy Cost

Electrical Consumption:	32300 Kw
Electrical Consumption Cost:	$3039
Electrical Demand Cost:	$0
Fossil Consumption:	4192
Fossil Cost:	$4192
Fossil Cost:	$7231
Life Cycle Cost:	$370223

Total Pump & Fan HP
Total Heating Pump & Fan HP: 2.08 Hp
Total Cooling Pump & Fan HP: 15.00 Hp
Cooling System COP: 13.09

System 2 Best Energy Analysis Dec 01, 2017
VAV Hot Water Heating Chilled Water Cooling Air Cooled Chiller - 2 Pipe LoadMatch



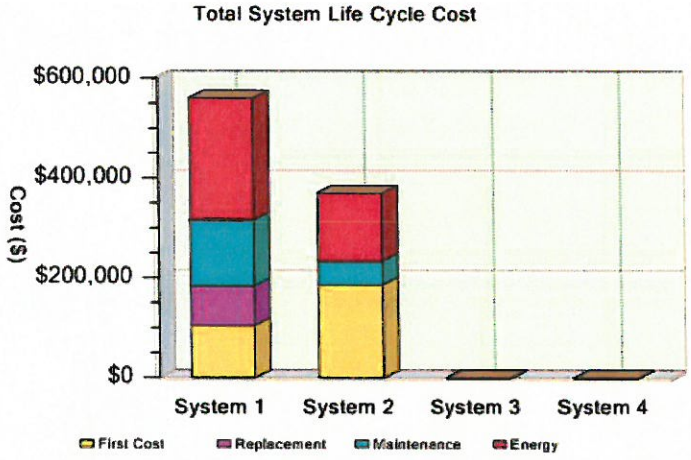
Monthly Energy Data

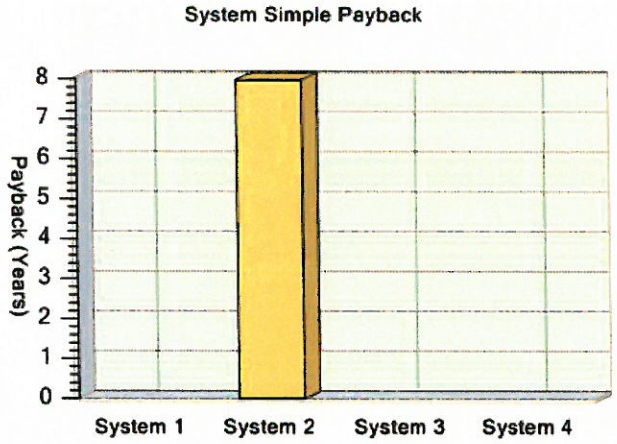
	Jan	Feb	Mar	Apr	May	Jun
Heating Pump & Fan Cost($)	33	28	25	23	23	12
Heating Other Electical Cost($)	0	0	0	0	0	0
Heating Fossil Cost($)	854	692	487	374	249	71
Heating Total Cost($)	887	720	512	396	272	83
Cooling Pump & Fan Cost($)	0	0	3	12	19	157
Cooling Other Electical Cost($)	0	0	9	29	46	350
Cooling Fossil Cost($)	0	0	0	0	0	0
Cooling Total Cost($)	0	0	12	41	64	507
Heating Pump & Fan Consumption (Kw)	349	295	261	241	243	123
Heating Other Consumption (Kw)	0	0	0	0	0	0
Heating Consumption Fossil (BtuH)	854	692	487	374	249	71
Cooling Pump & Fan Consumption (Kw)	0	0	35	125	201	1673
Cooling Other Consumption (Kw)	0	0	96	313	485	3716
Cooling Consumption Fossil (BtuH)	0	0	0	0	0	0
Geothermal Heat Extraction (MMBTU)	0	0	0	0	0	0
Geothermal Heat Rejection (MMBTU)	0	0	0	0	0	0

	Jul	Aug	Sep	Oct	Nov	Dec
Heating Pump & Fan Cost($)	6	6	12	23	24	25
Heating Other Electical Cost($)	0	0	0	0	0	0
Heating Fossil Cost($)	19	28	70	305	445	597
Heating Total Cost($)	24	34	82	328	469	622
Cooling Pump & Fan Cost($)	268	246	145	19	3	2
Cooling Other Electical Cost($)	551	540	337	49	9	6
Cooling Fossil Cost($)	0	0	0	0	0	0
Cooling Total Cost($)	819	786	482	69	12	8
Heating Pump & Fan Consumption (Kw)	61	63	126	242	252	264
Heating Other Consumption (Kw)	0	0	0	0	0	0
Heating Consumption Fossil (BtuH)	19	28	70	305	445	597
Cooling Pump & Fan Consumption (Kw)	2851	2618	1542	204	36	24
Cooling Other Consumption (Kw)	5851	5739	3581	524	96	66
Cooling Consumption Fossil (BtuH)	0	0	0	0	0	0
Geothermal Heat Extraction (MMBTU)	0	0	0	0	0	0

System Life Cycle Cost Comparison Best Energy Analysis Dec 01, 2017

	System 1	System 2	System 3	System 4	
Life Cycle Present Worth:	560,335	370,223	0	0	$
Life Cycle Cost Savings for System 2	190,112				$
Annualized Life Cycle Cost:	48,853	32,278	0	0	$
Annualized Life Cycle Cost Savings for System 2	16,575				$
First Cost:	104,832	186,509	0	0	$
Additional First Cost Against System 1		81,677			$
Annual Energy & Maintenance Cost:	20,002	9,766	0	0	$
Annual Energy & Maintenance Cost Savings Over System 1		10,236			$
SimplePayback:		8			Years





System 1: Packaged Terminal Air Conditioning
System 2: VAV Hot Water Heating Chilled Water Cooling Air Cooled Chiller - 2 Pipe LoadMatch
System 3:
System 4:

6.0 RECOMMENDATION

Based on an economic analysis, Option 2 of replacing the PTAC units with a more centralized air handling system has a higher first cost but a significantly lower life cycle cost than Option 1 – replacing the PTAC units in kind. Our recommendation would be to design and install a system similar to Option 2.