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REQUEST FOR PROPOSAL

TO PROVIDE

Tax-Exempt Financing Pursuant to an Energy Performance and Efficiency Project

TO THE

STATE OF NEW HAMPSHIRE

OFFICE OF THE NEW HAMPSHIRE STATE TREASURER

Issued: April 29, 2016

Submission Deadline: May 12, 2016 4:00 p.m. EST

GENERAL INFORMATION

PURPOSE

The State of New Hampshire (the "State"), is seeking financial institutions (Firm) to provide tax-exempt lease financing pursuant to a lease agreement (the "Financing") for an energy efficiency equipment and implementation project to be installed by an Energy Savings Company (the "ESCO") to be selected by the State at Cannon Mountain Aerial Tramway & Ski Area (the "Cannon Project") as further described in **Attachment 1**. The proceeds of the Financing will be used to fund the acquisition of certain equipment and infrastructure improvements pursuant to an Energy Performance Contract (the "Contract"). The Financing will be structured subject to annual appropriation as a Lease Purchase Agreement between the State and the selected financial institution with the equipment and improvements financed serving as collateral. Pursuant to the Contract, the ESCO is expected to guarantee energy savings as a result of the installation of energy efficient equipment and infrastructure improvements of approximately $386,565 each year for five years. The lease payments are subject to annual appropriation by the legislature, and are expected to be provided for through the estimated energy savings for the entire term of the lease. The State reserves the right to reject any or all proposals, to waive irregularities in any proposal, and to negotiate with any Firm.

Audited financial statements for the State are available at the following web address:

http://das.nh.gov/accounting/FY%2015/CAFR%20FY15.pdf

The summary in this request for proposals ("RFP") does not purport nor is it intended to contain all of the information that a respondent to this request may deem essential to making an informed investment decision. **Requests for additional information should be directed to the Contact noted below.**

All inquiries related to this RFP must be addressed in writing and e-mailed to the Chief Deputy State Treasurer at the e-mail address below on or before May 4, 2016. The Treasury will post all inquiries and responses as an Addendum to this RFP on the Administrative Services Bureau of Purchase and Property website by 4:00 p.m. EDT, May 6, 2016. No communication with any other State employee is allowed to take place regarding this RFP during the RFP process. An exception will apply only to individuals of a Firm that currently provide services to the State, but such contacts are limited solely to an existing contract.

Rachel K. Miller
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(603)271-2073 (phone)
Rmiller@treasury.state.nh.us

TIMETABLE

Issue RFP	04/29/2016
Questions due from Firms	05/05/2016
Responses due back to Firms	05/06/2016
Firm responses due **no later than 4:00 p.m. EDT**	05/12/2016

The Treasury is a public agency and its records, including all responses to this RFP, will be deemed a public record and subject to public disclosure under the State's Right-to-Know laws, pursuant to New Hampshire Statute RSA 91-A, after actual award of the contract. Information in the proposals considered by the Firm to be confidential and proprietary should be clearly identified and easily separable. Any requested public disclosure restrictions should be clearly explained.

The State recognizes that without the disclosure of the ESCO under contract for the project, Firms may require their proposals be conditional upon acceptance of the ESCO. If the proposal for Financing requires additional approvals (credit or otherwise) after submission of the response, **please clearly indicate in the response the process by which these additional approvals will be obtained, the timing of receiving these approvals, and any additional information that will need to be provided by the State.** To the extent the proposal requires closing costs or bank legal fees to be paid by the State, please clearly provide a description of such fees and provide not to exceed amounts in the response.

Detailed information on the Cannon Project including but not limited to: scope of work, cost detail and construction schedule, guaranteed energy savings, installation schedule, and energy conservation measures are represented in Attachment 2.

PROJECT INFORMATION

LESSEE:	The State of New Hampshire
LESSOR:	To be determined
ESCO:	To be determined
ENERGY PROJECT(S):	See Attachment 1
CONSTRUCTION TERM:	6 months
FINANCE TERM:	15 and 20 year terms (please provide rates for both terms)
CUSTOMER PAYMENTS:	Semi-annual principal and interest payments beginning on December 1, 2016
PROJECT COST:	$4,986,637
FINANCED AMOUNT:	$4,986,637 plus interest during construction and an estimate for costs of issuance
TAX TREATMENT:	**Fully Tax-Exempt**
BANK QUALIFIED:	**No**
TRANSACTION COSTS:	The proposal should specifically identify all costs associated with the transaction not included in the interest rate, if any, that would be an obligation of the State as either a direct payment or as additional project costs for purpose of determining the funded lease amount and/or ongoing lease payment obligation (i.e. escrow fees, rate lock fee, legal fees, etc.)
ANTICIPATED SOURCE OF REPAYMENT:	Legally available funds, subject to annual appropriation of funds by the legislative/fiscal authority.
FINANCIAL STATEMENTS:	http://das.nh.gov/accounting/FY%2015/CAFR%20FY15.pdf
QUESTIONS:	Please direct all questions to the Contact listed above.
ESCROW ACCOUNT:	For purposes of this proposal submission, the escrow account should be gross-funded.
CLOSING DATE:	For purposes of this proposal submission, please assume a Closing Date on or about **Thursday, June 2, 2016**.

CONDITIONS TO PROPOSAL

FINANCING STRUCTURE:	Tax-Exempt Municipal Lease Purchase Agreement with Escrow Agreement.
INTEREST RATE:	A fixed rate of interest should be proposed for the term of the financing.
RATE LOCK:	The proposal should include interest rates with sixty (60) day rate lock commitment and/or such other rate lock period as Lender may provide in the best interest of the State. If the rate lock cannot be extended sixty days please

indicate a spread over a publicly available index rate with which the interest rate will adjust.

SECURITY: The Financing will be structured as a subject to annual appropriation lease purchase agreement with the equipment purchased and improvements made as collateral.

PREPAYMENT: The Financing must allow for either partial or full early repayment of principal.

REQUIREMENT OF ESCO: The proposal shall specifically identify any requirements to be imposed upon the ESCO as a result of this financing.

CONTRACT: The successful Firm will be required to enter into a tax-exempt lease purchase agreement with the State in a form which should be acceptable to the State.

SUBMISSION OF PROPOSALS: The Firm's proposal, project payment schedule, and signed term sheet shall be received **on or before 4:00 p.m., EDT, Thursday, May 12, 2016** via email addressed to the Contact listed above. Any proposals received after this time will not be considered. Responses should be submitted via e-mail.

SIGNATURE OF PROPOSALS: Each proposal should be signed by an authorized representative.

AWARD: State staff, in consultation with its Financial Advisor, Public Resources Advisory Group and its Bond Counsel, Locke Lord LLP, will determine which bidder offers the most attractive financing cost to the State. State staff will make a recommendation to the Governor and Executive Council, which is expected to make the formal award. The State reserves the right to reject any or all proposals and to waive any irregularity in any proposal or the process.

CONTRACT AWARD TERMS AND CONDITIONS

This RFP does not constitute an offer or a contract with the Treasury or the State. A contract shall not be deemed to exist until proposals are reviewed, the best proposal has been identified, negotiations with the Firm have been authorized, and a contract has been executed by parties and approved by the State of NH Attorney General and Governor and Executive Council.

As a condition of contract award, a Firm must furnish or agree to complete and/or execute the documents listed below. Firms responding to this RFP are expected to have already met the requirements outlined in the documents, be in the process of fulfilling them at the time of response, or prepared to meet them upon selection.

REQUIRED DOCUMENTS

Once a Firm has been selected, the documents below are required to execute a contract between a Firm and the NH State Treasury for services. As part of your response to this RFP please indicate your willingness to furnish all of the following documents:

1. **State of New Hampshire Vendor Application and W-9 Form**

The selected Firm must have a completed Vendor Application and a W-9 Form must be on file with the NH Bureau of Purchase and Property. See the following website for information on obtaining and filing the required forms (no fee):
www.admin.state.nh.us/purchasing/bids.asp

2. **Certificate of Good Standing / New Hampshire Secretary of State Registration**

   Prior to award of a contract, a Firm must be duly registered as authorized to conduct business in the State of New Hampshire and must furnish a current Certificate of Good Standing from the Office of the Secretary of State of New Hampshire. Businesses are classified as 'Domestic' (in-state) or 'Foreign' (out-of-state). Please visit the following website to find out more about the requirements and filing fees:
   http://www.nh.gov/sos/corporate

3. **Certificate of Authority / Signature Authority**

   Typically a corporate resolution indicating the officer(s) of the Firm possessing the authority to enter into contracts with the State of New Hampshire.

OTHER RFP RESPONSE TERMS & CONDITIONS

1. **Debarment Status**

   By submitting their proposals, Firms certify that they are not currently debarred from submitting proposals on contracts by any agency of the State of New Hampshire.

2. **Qualifications of Firms**

   The State may make such reasonable investigations as deemed proper and necessary to determine the ability of the Firm to perform the work/furnish the item(s), and the Firm shall furnish to the State all such information and data for this purpose as may be requested. The State reserves the right to inspect the Firm's physical facilities prior to award to satisfy questions regarding the Firm's capabilities. The State further reserves the right to reject any proposal if the evidence submitted by, or investigations of, such Firm fails to satisfy the State that such Firm is properly qualified to carry out the obligation of the contract and to complete the work/furnish the service(s) contemplated therein.

3. **Assignment of Contract**

   A contract shall not be assignable by the Firm in whole or in part without the written consent of the State.

4. **Right to Reject Proposals**

   The State reserves the right to reject any or all proposals on any basis. Incomplete proposals may be the basis for rejection.

5. **Disclosure**

Firms must disclose to the State any relationship(s) which may be a conflict of interest for the Firm.

6. Termination of Agreement

The obligation to continue services under the contract resulting from this RFP may be terminated for cause by either party upon seven (7) days written notice of substantial failure by the other party to perform in accordance with the terms hereof through no fault of the terminated party. The Treasury shall have the right to terminate the contract or suspend performance thereof without cause for the Treasury's convenience upon fourteen (14) days written notice to the Firm, and the Firm shall terminate or suspend performance of services on a schedule acceptable to the Treasury or at the end of this fourteen (14) day period, at the option of the Treasury. In the event of termination or suspension for the Treasury's convenience, the Treasury shall pay the Firm for all services performed through the date of notice of termination or suspension. These options shall be in addition to any other remedies the State have.

7. Ethics in Public Contracting

By submitting their proposals, Firms certify that their proposals are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other Firm, supplier, manufacturer or subcontractor in connection with their proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised unless consideration of substantially equal or greater value was exchanged.

Attachment 1

Executive Summary

[redacted] is pleased to offer this Detailed Feasibility Study (DFS) that was produced in close partnership with various Cannon staff. The following executive summary is intended to provide a high level overview on the results of the DFS process and fundamentally describe the project to be constructed. Additional information and specific project details are contained within the individual sections of the DFS.

The State of New Hampshire Department of Administrative Services and The Department of Resources and Economic Development, Cannon Mountain issued a Request for Proposal (RFP) to Energy Service Companies (ESCos) to provide for Comprehensive Energy Management Services. [redacted] submitted a proposal on May 30th, 2014 [redacted]

This DFS is a key step in developing a successful energy savings and infrastructure improvement project focusing on the exact needs and desires of Cannon Mountain. The purpose of the DFS is to analyze and quantify the feasibility of installing certain improvements or energy conservation measures (ECMs) throughout Cannon Mountain. The DFS will form the basis for the subsequent Energy Services Agreement (ESA) which will enable the design and construction phase.

The DFS quantifies how Cannon Mountain will be able to reduce utility costs nearly $387,000 annually, through the acquisition of about $5 million dollars in capital improvements. This investment however, will not require any up-front capital by Cannon Mountain. Cannon will achieve these improvements via a Performance Contact designed to extract energy inefficiencies in the current utility operating budgets to self-fund the project from future energy savings. Payment will be made over time utilizing [redacted]'s guaranteed annual energy savings for security.

The DFS performed for Cannon Mountain Aerial Tramway & Ski Area includes eleven (11) buildings throughout the Ski Area, along with Cannon's Snowmaking Infrastructure. The list of the facilities evaluated in the DFS are listed in Table 1 below. Table 1 provides each building's gross floor area and main fuel source for space heating and domestic hot water. The total area of the eleven (11) buildings is approximately 73,131 square feet. Originally, the total building area provided during the proposal phase of the project was 61,700. After review of existing drawings along with onsite building measurements, the calculated square foot of all eleven (11) facilities equaled 73,131 square feet. The calculated building area was used in the development of [redacted]'s baseline model and analysis of energy conservation measures (ECM).

As part of the DFS, [redacted] has developed a baseline model for each facility. The baseline developed for each building listed in Table 1 is based on an average of the fiscal year 2014 (FY14) and 2015 (FY15) utility data, normalized for the thirty-year typical meteorological year (TMY3) weather data for the Franconia, NH area. The total average normalized utility usage for FY14-15 was 10,238,878 kWh for electricity, 17,382 gallons of propane, and 17,873 gallons of #2 fuel oil. The total normalized cost of utilities for the buildings evaluated during the DFS was $1,335,069.

The following executive summary contains various project tables illustrating the overall project economics and brief descriptions of the individual energy conservation measures. Full descriptions of each can be found within the DFS Document for additional information.

Table 1: List of Included Buildings

Building	Building Area (SF)	Space Heating Source	Domestic Hot Water Source
Mt. Station	6,547	Electric	Electric
Valley Station	9,912	#2 Oil	#2 Oil
Park Headquarters	6,322	#2 Oil	Electric
Ernie's Haus	2,412	Electric	Electric
Snowbase	2,400	Propane/Electric	Electric
Maintenance Building	6,000	#2 Oil/Electric	Electric
Notchview Lodge	11,220	#2 Oil	Electric
Peabody Lodge	21,068	Propane/Electric	Propane
Brookside Lodge	5,650	Propane	Propane
Woodshop Storage Building	800	Electric	NA
Ski Museum	800	NA	NA
Totals	**73,131**		

[redacted]

Summary of Project Economics

Ecm #	ECM Name	Annual kW	Peak kWh	Off-Peak kWh	Total kWh	Propane (Gallons)	#2 Fuel Oil (Gallons)	Energy Savings	O&M Savings	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements - Interior	372	36,074	100,879	136,953	(463)	(366)	$ 16,721	$ -	$ 16,721	$ 146,296	8.75
5	Low Voltage Transformer Replacements	75	20,167	34,365	54,533	-	-	$ 6,587	$ -	$ 6,587	$ 95,142	14.44
7	Infiltration Reductions	-	11,901	-	11,901	883	607	$ 4,644	$ -	$ 4,644	$ 37,384	8.05
13	Electrical Upgrades	-	-	-	-	-	-	$ -	$ -	$ -	$ 719,465	-
16	Snow Making System Upgrades	1,790	1,471,994	1,471,994	2,943,987	-	-	$ 330,128	$ -	$ 330,128	$ 3,621,642	10.97
19	High Voltage Transformer Replacements	391	84,437	144,067	228,505	-	-	$ 28,485	$ -	$ 28,485	$ 366,708	12.87
		2,628	**1,624,573**	**1,751,306**	**3,375,879**	**420**	**242**	**$ 386,565**	**$ -**	**$ 386,565**	**$ 4,986,637**	**12.90**

ECM Matrix

New Hampshire RFP 2014-165 Energy Conservation Measures (ECMs)	Lighting System Improvements - Interior	Low Voltage Transformer Replacements	Infiltration Reductions	Electrical Upgrades	Snow Making System Upgrades	High Voltage Transformer Replacements	
Facility	**1**	**5**	**7**	**13**	**16**	**19**	
Mt. Station	X	X	X				
Valley Station	X		X				
Park Headquarters	X	X	X				
Ernie's Haus	X	X	X				
Snowbase	X	X					
Maintenance Building	X	X	X				
Notchview Lodge	X	X	X				
Peabody Lodge	X		X				
Brookside Lodge	X		X				
Woodshop Storage Building	X						
Snowmaking Infrastructure				X	X	X	
Ski Museum	X						
Cold Storage		X					
Beach Bath House		X					

Ecm #	ECM Name	EUL
1	Lighting System Improvements - Interior	15
2	Lighting System Improvements - Exterior	15
3	Integrated Temperature Controls	15
5	Low Voltage Transformer Replacements	50
7	Infiltration Reductions	15
8	Pipe Insulation	20
9	Attic Insulation	50
11	Window Replacement	30
12	Replace Overhead Doors	20
13	Electrical Upgrades	50
14	Steam to Hot Water Conversion	20
15	Install Electric Sub-Meters	20
16	Snow Making System Upgrades	20
18	Wall Insulation	50
19	High Voltage Transformer Replacements	50
20	Rim Joist Sealing-Insulation	50
21	Install Infrared Heaters	20
23	Replace Booster Pump House	30

[redacted]

Project Proforma

New Hampshire RFP 2014-165 - Pro-Forma

Initial Project Costs:		
Implementation costs	$	4,986,637
Total Initial Project Costs	**$**	**4,986,637**
Utility Rebates	**$**	**-**
M&V - Includes 5 years of service	**$**	**114,810**
Net Project Costs after rebates	**$**	**5,101,447**

Financial Assumptions	
Term of Project (yrs)	20.0 yrs
Term of Financing (yrs)	20.0 yrs
Estimated Financing Rate	3.00%
Payments per year (frequency)	2
Discount Rate	3.00%
Average Energy escalation rate (annual)	0.00%
Average Cost escalation rate (annual)	0.00%
Project Simple Payback	12.90

Pro-forma			Year									
		Initial Values	1	2	3	4	5	6	7	8	9	10
1	Annual energy costs without improvements	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617
2	Annual energy costs with improvements	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051
3	Annual energy cost savings (1-2)	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565
4	O&M Savings	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	Total Project Savings	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565
6	Payments for financing equipment		$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053
7	Payments for Ongoing Services	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	Net annual benefits		$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512
9	Cumulative cash flow	**$ 910,243**	$ 45,512	$ 91,024	$ 136,536	$ 182,049	$ 227,561	$ 273,073	$ 318,585	$ 364,097	$ 409,609	$ 455,122
10	**Net Present Value of cash flow**	**$ 677,106**										
11	Interest Rate	3.00%										
12	Discount Rate	3.00%										

Line #	11	12	13	14	15	16	17	18	19	20	Totals
1	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 1,446,617	$ 28,932,335
2	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 1,060,051	$ 21,201,028
3	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 7,731,307
4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 386,565	$ 7,731,307
6	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 341,053	$ 6,821,064
7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 45,512	$ 910,243
9	$ 500,634	$ 546,146	$ 591,658	$ 637,170	$ 682,682	$ 728,195	$ 773,707	$ 819,219	$ 864,731	$ 910,243	
10											
11											
12											

Notes:

1 This Proforma Cash Flow reflects an estimated lending rate of 3%. The actual rate will increase or decrease based on market conditions and customer credit rating at the time of funding.

2 Savings are based on current utility rate structures and usage information provided for purposes of this project.

"Page content is subject to Confidentiality Restrictions"

Summary of Recommended ECMs

ECM 1:
Lighting System Improvements - Interior

[redacted] proposes to install a state-of-the-art lighting system to benefit the guests and staff of Cannon Mountain. Our project replaces or upgrades 926 existing fixtures and will enhance the quality, consistency, and color rendering of the lighting system, while meeting all applicable codes and standards.

In addition, [redacted] proposes to install new lighting controls in a few locations at Cannon Mountain to ensure that lighting does not operate unnecessarily. Energy waste occurs when a fixture is energized but not used, and/or when illuminance exceeds what is necessary for task performance. In general, due to seasonal factors, the facilities at Cannon Mountain operate less than other commercial enterprises. Therefore, control applications with attractive return on investment periods are limited.

ECM 5:
Low Voltage Transformer Replacements

[redacted] proposes to replace or remove thirteen (13) existing step-down transformers throughout the buildings at Cannon Mountain. All of the transformers are dry-type indoor transformers that step-down 480 volt power to 208Y/120 volt power. [redacted] proposes to replace these transformers with new premium efficiency units that will reduce the electric losses and lower the cooling load of some of the equipment rooms.

ECM 7:
Infiltration Reductions

[redacted] assessed all six sides of the buildings, including the attics/ roofs, walls and floors and all of intersections connecting the building's assemblies. Our assessments identify locations of air leakage losses and thermal transfer – the two primary modes of energy loss in buildings. [redacted] proposes weatherization measures that save energy by reducing loads on space conditioning equipment. Tighter and better insulated buildings allow mechanical equipment to run less often and still maintain the desired interior environment. The results of a successful weatherization project are reduced fuel consumption, reduced utility costs and improved occupant comfort.

Weatherization measures identified will have the most significant energy saving impact on the buildings are:

- Air Sealing Measures
  - Attic Bypass Air Sealing
  - Roof-Wall Intersection Air Sealing
  - Exposed Wall Air Sealing
  - Door Weather Stripping
  - Sill Plate Air Sealing/ Insulation

ECM 13:
Electrical Upgrades

[redacted] proposes to replace one of the 35 kilovolt (kV) electrical feeders that serves Cannon Mountain's secondary electrical system. The existing feeder is direct buried and has reached the end of its useful life. [redacted] proposes to trench in parallel to the existing line and install a new 35 kV electrical line. The new line will be placed in conduit and will extend from the riser pole located in the dirt parking lot to the Valley Station Lodge. During construction of the new trench, [redacted] encourages Cannon Mountain to place any additional services (cable, control wiring, etc.) into the new trench prior to back filling. Originally, [redacted] proposed to replace two antiquated S&C switches during the Proposal Phase. One switch is located near Snowbase and the other is located in the Tram parking lot. These two S&C switches are being replaced this year by Cannon and have been removed from the scope.

The proposed electrical upgrade will provide Cannon with an improved main electrical system that will reduce maintenance costs, avoid future capital costs and improve system reliability.

ECM 16:
Snow Making System Upgrades

[redacted] proposes to upgrade the snow making system at Cannon Mountain by replacing most of the existing snow guns with new low energy equipment. The proposed strategy is to replace the existing energy intensive land based air/water guns and other similar models with tower mounted HKD low-energy tower guns. The new tower guns will greatly reduce compressed air energy use as well as the labor required to move the old land guns around the mountain. In addition to the new HKD tower mounted guns, [redacted] proposes to supply Cannon with new HKD portable air/water guns. These sled guns will complement the new HKD tower guns to allow for spot snow making as well as for snow making on trails where tower guns are not practical.

The reduced air usage will allow Cannon to make more snow using the existing air and water infrastructure. It is expected that with the proposed system, Cannon will rarely, if ever, reach the air delivery limit of 21,000 CFM. Due to these reductions, [redacted] is proposing to implement a demand reduction strategy whereby at least one 600-hp Joy compressor is left off during peak periods in order to save nearly 450-kW of peak demand per month, or nearly a total of $20,000 for the four peak snow making months.

[redacted] believes the HKD tower gun design along with the new HKD portable gun complement is the most cost effective strategy for Cannon. Further, we believe this is the simplest and least disruptive approach compared to current operations which was stressed as a key factor for Cannon Mountain.

Further, the air reductions that result from this project should be taken into account for the design of the proposed Mittersill Expansion air compressor.

[redacted] proposes to replace the existing booster pump house located half way up the mountain. The existing structure will be demolished and a new structure will be built in its place. The new structure will be a 20' by 20' building and will contain two new 300 horsepower (HP) pumps with variable frequency drives. The new booster pump house will provide the additional pressure necessary for snow making on higher elevations

of the mountain. In addition, [redacted] will install 73 new low-energy tower snow guns on trails that couldn't be addressed in the Snowmaking ECM due to pressure issues. The trails include the upper part of Profile, Tramway, and Skylight. New air and water piping will be installed on Taft to allow for new low energy snow guns.

ECM 19:
High Voltage Transformer Replacements

[redacted] proposes to replace nine (9) high voltage step-down transformers throughout the Cannon Mountain Ski Area. [redacted] worked with Cannon Mountain's electrician to identify the transformers that are in need of replacement. All of the transformers are outdoor transformers that step-down 34.5 kV volt power to 480, 240, or 4160 volt power. [redacted] proposes to replace these transformers with new premium efficiency units that will reduce electric losses. The new units will meet or exceed DOE standards. The new equipment will provide Cannon Mountain electric energy savings and offset future capital expenditures.

Attachment 2

Section 3:
Energy Conservation Measures

Table 3.1: Recommended Measures Index

ECM No.	Title	Tab
1	Lighting System Improvements - Interior	1
5	Low Voltage Transformer Replacements	5
7	Infiltration Reductions	7
13	Electrical Upgrades	13
16	Snow Making System Upgrades	16
19	High Voltage Transformer Replacements	19

Maintenance Requirements per ECM

For the majority of measures included in this project, O&M is expected to be approximately equal to what the State currently incurs for overall operations and maintenance, therefore O&M can continue to be performed as is. State personnel will receive training on the proper operation and maintenance of the new equipment once equipment commissioning is complete. The State will be expected to perform maintenance on a scheduled basis and repair/replacement of failed components in a timely manner, all in accordance with manufacturer's standards and/or [redacted] O&M manuals for the measures installed under this Performance Contract. If the State is unable to perform these tasks, [redacted] can provide these services for an additional fee and/or the State shall outsource to a qualified service provider. Failure of the State to carry out the aforementioned during the term of the contract, may require [redacted] to adjust the savings guarantee.

The following table describes the general maintenance requirements that will need to be carried out in order to ensure the persistence of savings for the term of the contact. Final operational and maintenance tasks will be developed in detail once these ECMs are commissioned. [redacted] will provide the State with a set of O&M manuals that will detail these tasks.

Energy Conservation Measures	Required Maintenance	State Responsibility	[redacted] Responsibility
ECM-1: Lighting System Improvements - Interior	Replace failed lamps, ballasts and components with the same or similarly rated components.	✓	
ECM-5: Low Voltage Transformer Replacements	N/A	✓	
ECM-7: Infiltration Reduction	Replace or repair failed components.	✓	
ECM-13: Electrical Upgrades	N/A	✓	
ECM-16: Snow Making System Upgrades	Perform preventative maintenance per manufacturer's recommendations.	✓	
ECM-19: High Voltage Transformer Replacements	N/A	✓	

Warranty and Maintenance Response

Warranty

[redacted] will warrant the labor and material for each ECM for a period of one year from the issuance of substantial completion for each ECM. This warranty is for repair of equipment installed by [redacted] only and does not include operation and maintenance unless otherwise included in the table above. After the one year period, any remaining manufacturer's warranties will be passed on to the State.

Maintenance Response

To the extent that any [redacted] maintenance services are included in the final project, all operations and services will be coordinated through the [redacted] corporate office located in [redacted] and through local area contractors. This will provide the State with a local, single point of contact.

[redacted]'s Operations Manager will serve as the single point of contact for the State throughout the entire operations phase of the project.

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[redacted]

Savings Summary

Ecm #	ECM Name	Annual kW	Peak kWh	Off-Peak kWh	Total kWh	Propane (Gallons)	#2 Fuel Oil (Gallons)	Energy Savings	O&M Savings	Total Project Savings	Total Project Costs	SPB
1	Lighting System Improvements - Interior	372	36,074	100,879	136,953	(463)	(366)	$ 16,721	$ -	$ 16,721	$ 146,296	8.75
5	Low Voltage Transformer Replacements	75	20,167	34,365	54,533	-	-	$ 6,587	$ -	$ 6,587	$ 95,142	14.44
7	Infiltration Reductions	-	11,901	-	11,901	883	607	$ 4,644	$ -	$ 4,644	$ 37,384	8.05
13	Electrical Upgrades	-	-	-	-	-	-	$ -	$ -	$ -	$ 719,465	-
16	Snow Making System Upgrades	1,790	1,471,994	1,471,994	2,943,987	-	-	$ 330,128	$ -	$ 330,128	$ 3,621,642	10.97
19	High Voltage Transformer Replacements	391	84,437	144,067	228,505	-	-	$ 28,485	$ -	$ 28,485	$ 366,708	12.87
		2,628	1,624,573	1,751,306	3,375,879	420	242	$ 386,565	$ -	$ 386,565	$ 4,986,637	12.90

ECM Matrix

New Hampshire RFP 2014-165 Energy Conservation Measures (ECMs)	Lighting System Improvements - Interior	Low Voltage Transformer Replacements	Infiltration Reductions	Electrical Upgrades	Snow Making System Upgrades	High Voltage Transformer Replacements	
Facility	**1**	**5**	**7**	**13**	**16**	**19**	
Mt. Station	X	X	X				
Valley Station	X		X				
Park Headquarters	X	X	X				
Ernie's Haus	X	X	X				
Snowbase	X	X					
Maintenance Building	X	X	X				
Notchview Lodge	X	X	X				
Peabody Lodge	X		X				
Brookside Lodge	X		X				
Woodshop Storage Building	X						
Snowmaking Infrastructure				X	X	X	
Ski Museum	X						
Cold Storage		X					
Beach Bath House		X					

"Page content is subject to Confidentiality Restrictions"

ECM 1:
Lighting System Improvements - Interior

ECM Overview

[redacted] proposes to install a state-of-the-art lighting system to benefit the guests and staff of Cannon Mountain. Our project replaces or upgrades 926 existing fixtures and will enhance the quality, consistency, and color rendering of the lighting system, while meeting all applicable codes and standards.

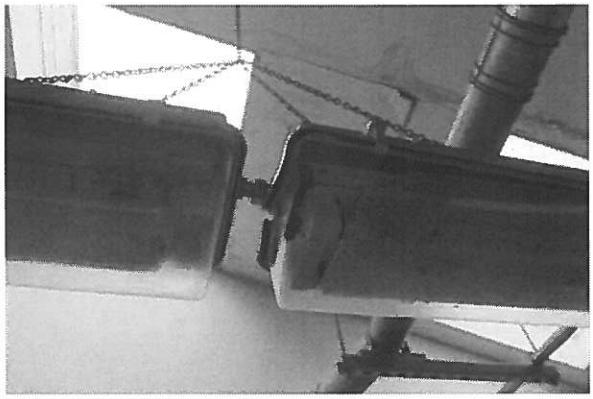

Figure 1.1: Many new fixtures will be installed to replace equipment which has reached the end of its service life.

In addition, [redacted] proposes to install new lighting controls in a few locations at Cannon Mountain to ensure that lighting does not operate unnecessarily. Energy waste occurs when a fixture is energized but not used, and/or when illuminance exceeds what is necessary for task performance. In general, due to seasonal factors, the facilities at Cannon Mountain operate less than other commercial enterprises. Therefore, control applications with attractive return on investment periods are limited.

ECM Detail

Existing System

General Information about the Existing System

We identified over 96 different lamp/ballast/fixture combinations, the majority of which are linear fluorescent, which provide general lighting in key areas such as offices, halls, and bathrooms.

Approximately 31% of linear fluorescent fixtures use standard-grade T8s on electronic ballasts with a mixture of ballast factors. For example, troffers in the guest services office at the Notchview Lodge were found to have a normal ballast factor, while wraps in the lounge at Peabody Lodge have low ballast factor.

The remaining 32% of linear fluorescent fixtures use T12s on magnetic ballasts. For example, the maintenance shop uses T12 VHO, which are not only inefficient, but noisy due to the age of ballast.

Compact fluorescents comprise 22% of the existing fixture total. Many of these are used in recessed cans throughout the Peabody Lodge and Brookside Lodge.

Incandescent lamps are installed in 7% of fixtures, some of which are exit signs which burn 24/7.

LED's are used in 5% of the fixtures.

High-intensity discharge (HID) lamps are used in 3% of the fixtures in shops, café, lounge, and for the exterior. Color rendition is fair to poor depending on lamp quality and age, which unfortunately can be a characteristic of HID lamps. Color variation was noted among groups of fixtures in the same space.

Although the lighting system is generally performing as designed, significant improvements are possible.

Light levels are appropriate in the majority of areas.

Many fixtures are in poor condition, and will be addressed under this project. For example, the vapor tights in Snowbase, which have broken lenses, will be replaced with new vaportights.

Specific Information about the Existing System

The detailed description provided below is representative of our proposed scope, with predominant areas and fixtures mentioned first. We then proceed in descending order, with each subsequent area representing a smaller portion of the scope.

Mountain Station: Cafeterias use LED cans, incandescent cans, and T12 troffers. Baths employ standard T8 vanities. Halls employ standard T8 wraps, troffers, indirects, and T12 troffers. Shops employ standard T8 wraps. Kitchens employ T12 old surface fixtures.

Valley Station: Offices employ T12 old surface fixtures, strips, troffers, compact fluorescent squares, drums, HPS bay fixtures, standard T8 wraps, and incandescent surface fixtures. Halls employ compact fluorescent cans, surface fixtures, T12 wraps, strips, and standard T8 wraps. Retail spaces employ compact fluorescent cans. Shops employ T12 strips, wraps, old surface fixtures, standard T8 troffers, and incandescent surface fixtures. Baths employ T12 wraps, standard T8 wraps, and incandescent drums.

Park Headquarters: Offices employ T12 wraps, compact fluorescent decorative fixtures, sconces, incandescent sconces, and surface fixtures. Halls employ T12 wraps, standard T8 wraps, and compact fluorescent surface fixtures. Baths employ compact fluorescent drums. Kitchens employ incandescent surface fixtures.

Ernie's Haus: Offices employ compact fluorescent cans, surface fixtures, incandescent cans, floods, and T12 strips. Baths employ T12 strips. Halls employ compact fluorescent surface fixtures, and T12 strips. Shops employ T12 strips, and standard T8 strips. Kitchens employ T12 strips, and standard T8 wraps.

Snowbase: Shops employ T12 old surface fixtures. Offices employ T12 wraps, strips, and standard T8 strips. Halls employ incandescent surface fixtures. Baths employ incandescent surface fixtures.

Maintenance: Shops employ inefficient T12 "high-output" old surface fixtures, T12 old surface fixtures, and strips. Baths employ T12 wraps, strips, and incandescent drums. Halls employ T12 strips, and incandescent drums. Offices employ T12 strips, and wraps.

Notchview Lodge: Offices employ standard T8 troffers, T12 troffers, and compact fluorescent decorative fixtures. Cafeterias employ T12 wraps, and compact fluorescent squares. Halls employ T12 wraps, troffers, strips, compact fluorescent drums, and surface fixtures. Baths employ T12 wraps, and troffers. Retail spaces employ T12 wraps. Kitchens employ T12 old surface fixtures, wraps, and incandescent wall mounted fixtures. Shops employ HPS bay fixtures.

Peabody Lodge: Offices employ standard T8 wraps, troffers, compact fluorescent cans, incandescent cans, and T12 wraps. Cafeterias employ compact fluorescent squares, cans, T12 old surface fixtures, and MH boxes. Baths employ standard T8 wraps, strips, T12 old surface fixtures, wraps, and compact fluorescent squares. Kitchens employ standard T8 wraps, troffers, and incandescent wall mounted fixtures. Halls employ T12 old surface fixtures, and standard T8 wraps. Shops employ T12 wraps.

Brookside Lodge: Offices employ standard T8 troffers, and incandescent decorative fixtures. Halls employ compact fluorescent cans, incandescent decorative fixtures, surface fixtures, standard T8 wraps, and troffers. Classrooms employ standard T8 troffers, and wraps. Baths employ standard T8 troffers, wraps, and vanities. Kitchens employ standard T8 troffers.

Woodshop Storage: Shops employ standard T8 wraps.

Ski Museum: Primarily uses incandescent track heads, with a few T12 wrap fixtures.

General Information about the Proposed System

[redacted] proposes to standardize the lighting system where practical, reducing the number of different products Cannon Mountain must purchase, stock and maintain. Most fixtures replaced or retrofitted with 4' T8 lamps will receive 28-watt "energy-efficient" lamps and instant-start ballasts. This premium combination yields maximum energy savings without sacrificing light output or quality. These 28-watt lamps use a superior mix of phosphors that allow them to consume less energy while matching the light output of standard T8's. The 28-watt lamp also maintains light output better than T12 and typical T8 lamps.

Ballast outputs were tailored to deliver optimum light levels in each room. The new lighting system is designed to maintain lighting levels, while meeting IESNA standards in affected areas. All recommendations were made with the intent to optimize energy savings without compromising the quality and the level of light output.

Our project replaces or upgrades 926 existing fixtures. We consider two adjoining fixtures sharing a ballast to be a single fixture. This method provides a more precise assessment of energy consumption and material inventory, but sometimes results in a lower apparent fixture count.

Following are highlights of the proposed scope, with predominant applications presented first. We then proceed in descending order, with each subsequent item representing a smaller portion of the scope. Please refer to the "Lighting System Analysis" in Appendix I, as this is a complete list of work to be performed.

Specific Information about the Proposed System

- 326 existing fixtures will receive new t8 lamps, which are more efficient than the existing lamps.
- 197 existing fixtures will receive t8 lamps and electronic ballasts.
- 122 existing fixtures will receive screw-based LED lamps. They are highly efficient, and with lifetimes up to 50,000 hours, maintenance intervals are greatly extended.
- 76 existing fixtures shall be replaced with new wraps.
- 62 existing fixtures shall be replaced with new industrials.
- 50 existing fixtures will receive t8 lamps, electronic ballasts, and retrofit kits.
- 32 existing fixtures shall be replaced with a new led flood.
- 20 existing fixtures shall be replaced with new LED troffers.
- 15 existing fixtures will receive a customized led conversion kit for troffers which is designed to increase fixture efficiency, save substantial energy, and greatly extend service intervals.
- 14 existing fixtures shall be replaced with new strips.
- 5 existing fixtures shall be replaced with new LED high-bays. These high-performance fixtures will improve light levels & distribution, reduce shadowing and "hot spots", while savings substantial energy. Additional benefits of LED over HID sources are improved color rendition, better lumen maintenance, and reduced color shift over lamp life.
- 4 existing fixtures shall be replaced with a new led wallpack.
- 3 existing fixtures shall be replaced with new LED exit signs.

A brief description of control work to be accomplished is outlined below:

Brookside Lodge: Ceiling mounted sensors will control fixtures in the large common areas such as the nursery and the lounge, in addition to the rental area, a classroom, and an office.

Peabody Lodge: The new LED fixtures in the Lafayette cafeteria will include dimming/occupancy sensors, allowing them to adjust automatically based on occupancy patterns and daylight exposure. Ceiling mounted

dual technology occupancy controls will be installed in bathrooms. Wall mounted occupancy controls will be installed in an office.

Maintenance: A wall mounted occupancy sensor will be installed in the men's bathroom.

Sizing Considerations

The new lighting system is designed to maintain lighting levels, while meeting IESNA standards in affected areas. All recommendations were made with the intent to optimize energy savings without compromising the quality and the level of light output.

Integration of Proposed Equipment with Existing Systems

The new lighting system, and all components thereof, will be fully integrated into the existing lighting systems. We assume the entire lighting and lighting controls systems comply with, but not limited to, the latest codes, the latest standards, local jurisdictions, and work was done in a quality workmanship manner, per NECA, and other applicable recommend best practices universally accepted throughout the electrical industry. Further we assume that all existing devices, which are defined in NEC, which includes but is not limited to switches, outlets, wiring, etc. are in acceptable condition in order to implement our scope as outlined in the contract documents. All existing junction boxes, poles, mounting surfaces and structures are assumed to be in acceptable condition to allow the installation of the products indicated in the scope. Required upgrades to meet safety or other codes, and/or to prepare the location for the installation as described above, can be performed on a time and material basis.

Per the direction of the State, [redacted] reviewed areas where we are proposing to replace ballasts and/or fixtures to verify existing wiring conditions. We did not find anything that would cause concern for additional costs.

The Methodology, Formulae and Analysis, Including all data, that determines the energy unit and cost savings

Please see Appendix I below for the Energy Savings Calculations data.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

Implementation of this measure will result in annual maintenance savings, since installation of new equipment will extend service intervals. This is based on the calculated frequency of equipment replacement of the old system versus the new system. Additional savings would be expected from reduced recycling, disposal, and labor costs. Due to RFP requirements no maintenance savings were calculated for this measure. Going forward the State will maintain maintenance responsibly for the lighting systems.

Special Operating Requirements

N/A

Lead-Time Required to procure the item

Lamps and ballast are well stocked in local warehouses.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. The lighting system audit completed for each facility will be submitted as the basis for construction. The audit will include the existing descriptions, operating hours, and proposed retrofit description. These documents will be submitted for review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions, and submitted in multiple for record.

Impact on Facility Operations and Performance

The installation of the lighting systems will enhance facility operations because of increased reliability and decreased maintenance requirements. The newer equipment will also be more efficient compared to the existing equipment, which will aid in energy savings.

Environmental Impact

There are no potential adverse environmental impacts associated with this lighting upgrade. During construction, [redacted] will remove, package, and recycle all existing lamps that contain mercury and ballasts that contain PCBs or DEHP according to applicable regulations.

Appendix for ECM 1:
Lighting System Improvements - Interior

I. Energy Savings Calculations

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[redacted]

Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	1
Measure Name:	**Lighting System Improvements - Interior**
Measure Location:	
Engineers:	

Site Name:		**Mstation**	**Vstation**	**HQ**	**Ernie**	**Snowbase**	**Maint**	**Nlodge**	**Plodge**	**Blodge**	**Woodshop**	**Snowprocess**	**SkiM**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity														
Energy On-Peak	kWh	470	4,911	1,693	477	4,578	3,210	4,773	6,651	3,504	96	0	3,202	33,564
Energy Off-Peak	kWh	2,481	8,380	2,802	2,514	7,811	16,931	8,144	13,467	5,978	1,665	0	4,734	74,906
Energy Total	kWh	2,951	13,291	4,494	2,990	12,388	20,141	12,917	20,118	9,482	1,761	0	7,936	108,470
Demand On-Peak, Monthly	kW	1.8	7.1	1.9	2.1	2.6	5.7	5.1	8.6	4.5	1.6	0.0	3.1	44.2
Demand On-Peak, Annual	kW	14.2	56.5	22.3	12.8	31.6	68.9	30.8	51.9	27.3	18.9	0.0	36.8	371.9
Demand Off-Peak, Monthly	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fossil Fuel														0
Natural Gas (NG)	Therms	0	0	0	0	0	0	0	0	0	0	0	0	0
Liquid Propane Gas (LPG)	Gallons	0	0	0	0	-141	0	0	-186	-109	0	0	0	-435
Steam	Mlbs	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #2	Gallons	0	-110	-45	0	0	-110	-99	0	0	0	0		-365
Fuel Oil, #4	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #6	Gallons	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	Misc	0	0	0	0	0	0	0	0	0	0	0	0	0
Water														0
Water Savings	kGallons													0
Sewer														0
Sewer Savings	kGallons													0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Interactive Lighting Savings Calculation

	Lighting Savings		Heating Penalty				Cooling Benefit			
	B	C	D	E	F	G	H	I	J	K
Facility	Annual kW	Annual kWh	Heat Gain to Space	Heating Months	Heating System Efficiency	Heating Penalty MMBtu	Total Space Cooled	Cooling Months	Cooling System COP	Cooling Benefit MMBtu
Mt. Station	1.8	3,935	50.0%	6.0	100.0%	(3.4)	0.0%	2.0	2.93	0.0
Valley Station	7.1	13,291	50.0%	6.0	74.0%	(15.3)	0.0%	2.0	2.93	0.0
Park Headquarters	1.9	4,444	50.0%	8.0	81.0%	(6.2)	20.0%	4.0	2.93	0.2
Ernie's Haus	2.1	3,987	50.0%	6.0	100.0%	(3.4)	0.0%	0.0	2.93	0.0
Snowbase	2.6	12,388	50.0%	6.0	82.0%	(12.9)	0.0%	4.0	2.93	0.0
Maintenance Building	5.7	26,854	50.0%	8.0	80.0%	(38.2)	0.0%	4.0	2.93	0.0
Notchview Lodge	5.1	12,917	50.0%	6.0	80.0%	(13.8)	0.0%	0.0	2.93	0.0
Peabody Lodge	8.6	21,360	50.0%	6.0	86.0%	(21.2)	0.0%	0.0	2.93	0.0
Brookside Lodge	4.5	9,482	50.0%	6.0	81.6%	(9.9)	0.0%	0.0	2.93	0.0
Woodshop Storage Building	1.6	2,641	50.0%	8.0	100.0%	(3.0)	0.0%	4.0	2.93	0.0
Ski Museum	3.1	7,509	50.0%	8.0	76.0%	(11.2)	100.0%	4.0	2.93	1.5
Totals	**44.2**	**118,809**				**(138.5)**				**1.6**

Notes:	
A	Applicable building included in comprehensive energy audit
B	Lighting demand savings {kW} associated with lighting retrofit measures
C	Lighting energy savings {kWh} associated with lighting retrofit measures
D	Estimated percentage of lighting energy transmitted to conditioned space
E	Estimated length of heating season
F	Estimated heating system efficiency, interacted with other measures
G	Resulting heating penalty due to lighting upgrades = [col C] x [col D] x 3,413 x ([col E] / 12) / [col F] / 1,000,000
H	Estimated percentage of space cooled
I	Estimated Length of cooling season
J	Estimated cooling system efficiency, interacted with other measures
K	Resulting cooling benefit due to lighting upgrades = [col C] x [col D] x 3,413 x ([col I] / 12) / [col J] / 1,000,000

[redacted]

Cannon Mountain

Interior Lighting Analysis

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
1	Ernie's Haus	Hall Entry	1	23W COMPACT HW/EL	keyless	4	24	0.1	NO RETRO	no change		24	0.1			1,680	NO RETRO		
2	Ernie's Haus	Lounge Lower	1	50W INCANDESCENT	track head	12	50	0.6	8 WATT LED SI	screw in LED par20	12	8	0.1	0.5	847	1,680	NO RETRO		
3	Ernie's Haus	Lounge Lower	1	23W COMPACT HW/EL	can rec	9	24	0.2	NO RETRO	no change		24	0.2			1,680	NO RETRO		
4	Ernie's Haus	Lounge Lower	1	2x200W INCANDESCENTS	flood	2	400	0.8	24 WATT LED/NEW	new LED dual bullet	2	24	0.0	0.8	1,263	1,680	NO RETRO		
5	Ernie's Haus	Hall Lockers	1	2L8' T12 EE/EEMAG	strip	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	67	1,680	NO RETRO		
6	Ernie's Haus	Bath Men	1	1L4' T12 EE/EEMAG	strip	3	40	0.1	1L4' T8 28w/ELEE LO	rlrb LF	3	22	0.1	0.1	91	1,680	NO RETRO		
7	Ernie's Haus	Bath Women	1	1L4' T12 EE/EEMAG	strip	6	40	0.2	1L4' T8 28w/ELEE LO	rlrb LF	6	22	0.1	0.1	181	1,680	NO RETRO		
8	Ernie's Haus	Lounge Microwave	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	47	1,680	NO RETRO		
9	Ernie's Haus	Lounge Microwave	1	23W COMPACT HW/EL	keyless	4	24	0.1	NO RETRO	no change		24	0.1			1,680	NO RETRO		
10	Ernie's Haus	Kitchen	1	2L8' T12 EE/EEMAG	strip	2	123	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.1	134	1,680	NO RETRO		
11	Ernie's Haus	Kitchen	1	2L4' T8 32w/EL	wrap	1	60	0.1	NO RETRO	no change		60	0.1			1,680	NO RETRO		
12	Ernie's Haus	Storage Slop Sink	1	2L4' T12 EE/EEMAG	strip reflector	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	47	1,680	NO RETRO		
13	Ernie's Haus	Lounge Fsc	2	23W COMPACT HW/EL	can rec	8	24	0.2	NO RETRO	no change		24	0.2			1,680	NO RETRO		
14	Ernie's Haus	Shop Fsc	2	2L4' T8 32w/EL	strip reflector	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	13	1,680	NO RETRO		
15	Ernie's Haus	Shop Fsc	2	2L8' T8/EL	strip	1	109	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	44	1,680	NO RETRO		
16	Ernie's Haus	Shop Fsc	2	4L4' T12 EE/EEMAG-8'	strip	3	140	0.4	4L4' T8 28w/ELEE LO-8'	rlrb LF	3	83	0.2	0.2	287	1,680	NO RETRO		
17	Ernie's Haus	Office Spiral	3	90W INCANDESCENT	flood	2	90	0.2	8 WATT LED SI	screw in LED par20	2	8	0.0	0.2	472	2,880	NO RETRO		
18	Ernie's Haus	Office Spiral	3	65W INCANDESCENT	track head	3	65	0.2	8 WATT LED SI	screw in LED par20	3	8	0.0	0.2	492	2,880	NO RETRO		
20.1	Ski Museum	Lobby Museum		90W INCANDESCENT	track head	40	90	3.6	16 WATT LED SI	screw in LED par20	40	16	0.6	3.0	7,252	2,450	NO RETRO		
20.2	Ski Museum	Office & Storage		1L4' T12 STD/STD	old wrap	7	57	0.4	2L4' T8 28w/ELEE LO/NEW	new LF wrap	7	42	0.3	0.1	257	2,450	NO RETRO		
21	Park Headquarters	Lounge Fireplace	1	32W COMPACT SCREWIN	decorative	4	32	0.1	NO RETRO	no change		32	0.1			2,400	NO RETRO		
22	Park Headquarters	Lounge Fireplace	1	15W COMPACT SCREWIN	sconce	3	15	0.0	7 WATT LED SI	screw in LED flame	3	7	0.0	0.0	58	2,400	NO RETRO		
23	Park Headquarters	Lounge Fireplace	1	60W INCANDESCENT	sconce	1	60	0.1	7 WATT LED SI	screw in LED flame	1	7	0.0	0.1	127	2,400	NO RETRO		
23.1	Park Headquarters	Lounge Over Table, Between Fans	1	#N/A	no fixture exists				180 WATT LED/NEW	new cooper DSI-WS-2L40-1D-120-AK120-ST16'-LUT__S	1	180	0.2	-0.2	-432	2,400	NO RETRO		
24	Park Headquarters	Hall Entry	1	4L4' T8 32w/EL	wrap	1	112	0.1	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	98	0.1	0.0	34	2,400	NO RETRO		
25	Park Headquarters	Office 10	2	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
26	Park Headquarters	Office 11	2	4L4' T12 EE/EEMAG	old wrap	1	140	0.1	4L4' T8 28w/ELEE/NEW	new LF wrap	1	94	0.1	0.0	110	2,400	NO RETRO		
27	Park Headquarters	Kitchen	2	100W INCANDESCENT	keyless	1	100	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.1	194	2,400	NO RETRO		
28	Park Headquarters	Hall Offices	2	2L4' T8 32w/EL	wrap	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	38	2,400	NO RETRO		
29	Park Headquarters	Hall Offices	2	32W COMPACT SCREWIN	keyless	1	32	0.0	2L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	42	0.0	0.0	-24	2,400	NO RETRO		
30	Park Headquarters	Office Donations	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	67	2,400	NO RETRO		
31	Park Headquarters	Office Donations	2	60W INCANDESCENT	keyless	1	60	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.0	98	2,400	NO RETRO		
32	Park Headquarters	Office Retail	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	67	2,400	NO RETRO		
33	Park Headquarters	Office Parks Super	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	67	2,400	NO RETRO		
34	Park Headquarters	Storage 11	2	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
35	Park Headquarters	Bath Women & Men	2	20W COMPACT SCREWIN	drum	4	20	0.1	NO RETRO	no change		20	0.1			1,000	NO RETRO		
35.1	Park Headquarters	Bath Women & Men	2	1L2' T12 STD/STD	strip	1	32	0.0	1L2' T8 15w/ELEE LO	rlrb LF	1	14	0.0	0.0	18	1,000	NO RETRO		
36	Park Headquarters	Office Reception	1	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
37	Park Headquarters	Office Accounts	1	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
37.1	Park Headquarters	Office Accounts	1	4L4' T12 EE/EEMAG-8'	wrap	1	140	0.1	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
38	Park Headquarters	Office 12	1	4L4' T12 EE/EEMAG-8'	wrap	1	140	0.1	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
39	Park Headquarters	Office Hr	1	2L4' T12 EE/EEMAG	wrap	3	70	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	202	2,400	NO RETRO		
40	Park Headquarters	Office Break	1	2L4' T12 EE/EEMAG	wrap	5	70	0.4	2L4' T8 28w/ELEE LO	rlrb LF	5	42	0.2	0.1	336	2,400	NO RETRO		
41	Park Headquarters	Office Break	1	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	137	2,400	NO RETRO		
41.1	Park Headquarters	Office Break	1	60W INCANDESCENT	keyless	2	60	0.1	19 WATT LED SI	screw in LED Alamp	2	19	0.0	0.1	197	2,400	NO RETRO		
42	Park Headquarters	Hall 1St Fl	1	2L4' T12 EE/EEMAG	wrap	5	70	0.4	2L4' T8 28w/ELEE LO	rlrb LF	5	42	0.2	0.1	336	2,400	NO RETRO		
43	Park Headquarters	Storage Basement	B	2L4' T12 EE/STD	old wrap	5	80	0.4	2L4' T8 28w/ELEE LO/NEW	new LF strip	5	42	0.2	0.2	456	2,400	NO RETRO		
43.1	Park Headquarters	Storage Basement	B	4L4' T12 EE/STD	old wrap	1	160	0.2	2L4' T8 28w/ELEE LO/NEW	new LF strip	1	42	0.0	0.1	283	2,400	NO RETRO		
43.2	Park Headquarters	Storage Basement	B	2L8' T12 EE/EEMAG	strip	4	123	0.5	2L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	4	42	0.2	0.3	778	2,400	NO RETRO		
43.3	Park Headquarters	Storage Basement	B	3L4' T8 32w/EL	trof acr	3	88	0.3	NO RETRO	no change		88	0.3			500	NO RETRO		
43.4	Park Headquarters	Storage Basement	B	100W INCANDESCENT	keyless	2	100	0.2	19 WATT LED SI	screw in LED Alamp	2	19	0.0	0.2	389	2,400	NO RETRO		
43.4	Park Headquarters	Storage Basement	B	1L2' T12 STD/STD	strip	2	32	0.1	1L2' T8 15w/ELEE LO	rlrb LF	2	14	0.0	0.0	86	2,400	NO RETRO		
46	Snowbase	Bath & Sink	1	100W INCANDESCENT	keyless	1	100	0.1	NO RETRO	no change		100	0.1			100	NO RETRO		
47	Snowbase	Hall Extinguisher	1	100W INCANDESCENT	keyless	1	100	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.1	409	5,052	NO RETRO		
48	Snowbase	Lounge Microwaves	1	2L8' T12 EE/EEMAG	strip	2	123	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.1	80	1,000	NO RETRO		
49	Snowbase	Office Lockers	1	2L4' T8 32w/EL	strip	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	40	5,052	NO RETRO		
50	Snowbase	Office Lockers	1	2L4' T12 EE/EEMAG	old wrap	1	70	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.0	141	5,052	NO RETRO		
51	Snowbase	Shop Snow Making	1	2L8' T12 STD/STD	old industrial	29	173	5.0	4L4' T8 28w/ELEE/NEW-8'	new LF industrial	29	94	2.7	2.3	11,574	5,052	NO RETRO		
52	Snowbase	Mechanical Pumps	1	2L8' T12 STD/STD	old vapor tight	3	173	0.5	4L4' T8 28w/ELEE/NEW-8'	new LF industrial	3	94	0.3	0.2	237	1,000	NO RETRO		
52.1	Snowbase	Mechanical Pumps	1	#N/A	no fixture exists				4L4' T8 28w/ELEE/NEW-8'	new LF industrial	1	94	0.1	-0.1	-94	1,000	NO RETRO		
55	Maintenance	Hall Simplex	1	2L8' T12 STD/STD	strip	1	173	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.1	455	5,052	NO RETRO		
56	Maintenance	Shop Water Heater	1	2L8' T12 STD/STD	strip reflector	3	173	0.5	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	3	83	0.2	0.3	1,364	5,052	NO RETRO		
57	Maintenance	Storage Oil Tanks	1	2L4' T12 STD/STD	old wrap	2	94	0.2	2L4' T8 28w/ELEE LO/NEW	new LF strip	2	42	0.1	0.1	52	500	NO RETRO		
58	Maintenance	Stair To Loft	1	60W INCANDESCENT	drum	1	60	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.0	207	5,052	NO RETRO		
59	Maintenance	Shop Wiper Blades	1	2L8' T12 EE/EEMAG	strip	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	202	5,052	NO RETRO		
60	Maintenance	Hall Eyewash	1	2L4' T12 STD/STD	strip	2	94	0.2	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	525	5,052	NO RETRO		
61	Maintenance	Lounge Staff	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	141	5,052	NO RETRO		
62	Maintenance	Lounge Staff	1	2L8' T12 STD/STD	strip	1	173	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.1	455	5,052	OCC SENSOR WALLSWITCH 1GANG	1	64
63	Maintenance	Bath Men	1	2L4' T12 EE/EEMAG	old wrap	2	70	0.1	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	2	83	0.2	0.0	-131	5,052	NO RETRO		
64	Maintenance	Locker Men	1	2L8' T12 EE/EEMAG	strip	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	202	5,052	NO RETRO		

[redacted]

Cannon Mountain

Interior Lighting Analysis

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
65	Maintenance	Shop Vehicles	1	2L8' T12 HO STD/STD	old industrial	18	257	4.6	4L4' T8 28w/ELEE/NEW-8'	new LF industrial	18	94	1.7	2.9	14,823	5,052	NO RETRO		
66	Maintenance	Shop Vehicles	1	2L8' T12 HO EE/EEMAG	old industrial	6	207	1.2	4L4' T8 28w/ELEE/NEW-8'	new LF industrial	6	94	0.6	0.7	3,425	5,052	NO RETRO		
67	Maintenance	Shop Benches	1	2L8' T12 STD/STD	strip	2	173	0.3	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.2	909	5,052	NO RETRO		
68	Maintenance	Shop Paint	1	2L8' T12 EE/EEMAG	old industrial	6	123	0.7	4L4' T8 28w/ELEE/NEW-8'	new LF industrial	6	94	0.6	0.2	879	5,052	NO RETRO		
68.1	Maintenance	Storage Blue Rm	1	2L8' T12 EE/EEMAG	strip	6	123	0.7	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	6	83	0.5	0.2	1,212	5,052	NO RETRO		
68.2	Maintenance	Office Maint.	1	2L8' T12 EE/EEMAG	strip	6	123	0.7	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	6	83	0.5	0.2	1,212	5,052	NO RETRO		
72	Woodshop Storage	Shop Wood	1	2L4' T8 32w/EL	wrap	14	60	0.8	NO RETRO	no change		60	0.8			1,000	OCC SENSOR WALLSWITCH 1GANG	1	163
72.1	Woodshop Storage	Shop Wood	1	150W INCANDESCENT	dome	12	150	1.8	19 WATT LED SI	screw in LED Alamp	12	19	0.2	1.6	2,641	1,680	NO RETRO		
73	Maintenance	Storage Coolers	Bathous	2L4' T12 STD/STD	wrap	3	94	0.3	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.2	78	500	NO RETRO		
74	Maintenance	Bath Men	Bathous	2L4' T12 EE/EEMAG	wrap	3	70	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	141	1,680	NO RETRO		
75	Maintenance	Office Men	Bathous	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	141	5,052	NO RETRO		
76	Maintenance	Bath Men	Bathous	2x100W INCANDESCENTS	drum	1	200	0.2	19 WATT LED SI	screw in LED Alamp	2	19	0.0	0.2	136	840	OCC SENSOR CEILING	2	523
77	Maintenance	Bath Women	Bathous	2L4' T12 EE/EEMAG	wrap	3	70	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	424	5,052	NO RETRO		
78	Brookside Lodge	Hall Entry	EL Bath	100W INCANDESCENT	rectangular	1	100	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.1	129	1,596	NO RETRO		
79	Brookside Lodge	Hall Entry	1	2x18W COMPACT HW/EL	can rec 10"	10	38	0.4	NO RETRO	no change		38	0.4			2,096	OCC SENSOR WALLSWITCH 1GANG	1	131
80	Brookside Lodge	Hall Entry	1	18W COMPACT HW	can rec 8"	4	20	0.1	NO RETRO	no change		20	0.1			2,096	NO RETRO		
81	Brookside Lodge	Hall Entry	1	4x100W INCANDESCENTS	decorative	4	400	1.6	19 WATT LED SI	screw in LED Alamp	16	19	0.3	1.3	2,716	2,096	NO RETRO		
82	Brookside Lodge	Bath Girls & Boys	1	2L4' T8 32w/EL	trof acr	4	60	0.2	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	4	52	0.2	0.0	67	2,096	NO RETRO		
83	Brookside Lodge	Bath Girls & Boys	1	2L4' T8 32w/EL	vanity	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
84	Brookside Lodge	Lounge Tv	1	4x100W INCANDESCENTS	decorative	8	400	3.2	19 WATT LED SI	screw in LED Alamp	32	19	0.6	2.6	5,433	2,096	NO RETRO		
85	Brookside Lodge	Lounge Cubbies	1	2L4' T8 32w/EL	trof acr	17	60	1.0	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	17	52	0.9	0.1	285	2,096	NO RETRO		
86	Brookside Lodge	Storage Rentals	1	2L4' T8 32w/EL	wrap	5	60	0.3	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	5	52	0.3	0.0	84	2,096	NO RETRO		
87	Brookside Lodge	Hall Kitchen	1	2L4' T8 32w/EL	trof acr	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	17	2,096	NO RETRO		
88	Brookside Lodge	Storage Slop Sink	1	2x13W COMPACT HW	drum	1	30	0.0	NO RETRO	no change		30	0.0			500	NO RETRO		
89	Brookside Lodge	Kitchen	1	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
90	Brookside Lodge	Utility Laundry	1	2L4' T8 32w/EL	trof acr	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	17	2,096	NO RETRO		
91	Brookside Lodge	Classroom Nursery	1	2L4' T8 32w/EL	trof acr	16	60	1.0	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	16	52	0.8	0.1	268	2,096	NO RETRO		
92	Brookside Lodge	Hall Office	1	2L4' T8 32w/EL	old wrap	1	60	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.0	38	2,096	NO RETRO		
93	Brookside Lodge	Hall Office	1	2x13W COMPACT HW	can rec 6"	1	30	0.0	NO RETRO	no change		30	0.0			2,096	NO RETRO		
94	Brookside Lodge	Office	1	2L4' T8 32w/EL	trof acr	4	60	0.2	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	4	52	0.2	0.0	67	2,096	NO RETRO		
95	Brookside Lodge	Bath Girls & Boys	1	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
96	Brookside Lodge	Classroom Water Heater	1	2L4' T8 32w/EL	wrap	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	17	2,096	NO RETRO		
97	Brookside Lodge	Storage Lockers	B	1L4' T8 32w/EL	strip	1	30	0.0	1L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	26	0.0	0.0	8	2,096	OCC SENSOR CEIL DT 1GANG	1	254
98	Brookside Lodge	Storage Lockers	B	2L4' T8 32w/EL-8'	strip	8	60	0.5	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	8	52	0.4	0.1	134	2,096	OCC SENSOR CEIL DT 1GANG	1	254
99	Brookside Lodge	Bath Lockers	B	2L4' T8 32w/EL	wrap	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
100	Brookside Lodge	Bath Lockers	B	2L4' T8 32w/EL	wrap	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
101	Brookside Lodge	Mechanical Furnace	B	2L4' T8 32w/EL-8'	strip	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	34	2,096	NO RETRO		
104	Peabody Lodge	Lounge Tv	1	2L4' T8 32w/ELEE LO	trof acr	23	47	1.1	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	23	42	1.0	0.1	289	2,516	NO RETRO		
105	Peabody Lodge	Office Lift	1	2L4' T8 32w/ELEE LO	wrap	1	47	0.0	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	1	42	0.0	0.0	13	2,516	NO RETRO		
106	Peabody Lodge	Storage Poles	1	2L4' T8 32w/ELEE LO	wrap	1	47	0.0	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	1	42	0.0	0.0	13	2,516	OCC SENSOR WALLSWITCH 1GANG	1	63
107	Peabody Lodge	Mechanical Boiler	1	2L4' T8 32w/ELEE LO	wrap	1	47	0.0	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	1	42	0.0	0.0	13	2,516	NO RETRO		
108	Peabody Lodge	Lounge Rubber Floor	1	2L4' T8 32w/ELEE LO	wrap	48	47	2.3	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	48	42	2.0	0.2	604	2,516	NO RETRO		
109	Peabody Lodge	Lounge Rubber Floor	1	2x50W INCANDESCENTS	track can	3	100	0.3	8 WATT LED SI	screw in LED par20	6	8	0.0	0.3	634	2,516	NO RETRO		
110	Peabody Lodge	Storage Adaptive	1	2L4' T8 32w/ELEE LO	strip	1	47	0.0	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	1	42	0.0	0.0	13	2,516	NO RETRO		
111	Peabody Lodge	Hall Baths	1	2L4' T8 32w/ELEE LO	wrap	4	47	0.2	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	4	42	0.2	0.0	50	2,516	NO RETRO		
112	Peabody Lodge	Bath Men	1	2L4' T8 32w/ELEE LO	wrap	8	47	0.4	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	8	42	0.3	0.0	101	2,516	NO RETRO		
113	Peabody Lodge	Bath Women	1	2L4' T8 32w/ELEE LO	wrap	8	47	0.4	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	8	42	0.3	0.0	101	2,516	NO RETRO		
114	Peabody Lodge	Storage Slop Sink	1	2L4' T8 32w/ELEE LO	wrap	2	47	0.1	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	2	42	0.1	0.0	25	2,516	NO RETRO		
115	Peabody Lodge	Office Food	1	2L4' T8 32w/ELEE LO	trof acr	2	47	0.1	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	2	42	0.1	0.0	25	2,516	NO RETRO		
116	Peabody Lodge	Storage Food	1	4L4' T12 EE/EEMAG-8'	strip	3	140	0.4	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	3	98	0.3	0.1	63	500	NO RETRO		
117	Peabody Lodge	Storage Food	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	14	500	NO RETRO		
118	Peabody Lodge	Storage Food	1	2L4' T8 32w/ELEE LO	wrap	9	47	0.4	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	9	42	0.4	0.0	23	500	NO RETRO		
119	Peabody Lodge	Mechanical Water Heater	1	100W INCANDESCENT	dome	4	100	0.4	19 WATT LED SI	screw in LED Alamp	4	19	0.1	0.3	815	2,516	NO RETRO		
120	Peabody Lodge	Bath Staff	1	2L4' T12 EE/EEMAG	wrap	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	141	2,516	NO RETRO		
121	Peabody Lodge	Office Food	1	2L4' T12 EE/EEMAG-8'	wrap	2	70	0.1	2L4' T8 28w/ELEE LO-8'	rlrb LF	2	42	0.1	0.1	141	2,516	NO RETRO		
122	Peabody Lodge	Utility Laundry	1	4L4' T12 STD/STD-8'	wrap	1	188	0.2	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	264	2,516	NO RETRO		
123	Peabody Lodge	Hall Laundry	1	2L4' T12 EE/EEMAG-8'	wrap	1	70	0.1	2L4' T8 28w/ELEE LO-8'	rlrb LF	1	42	0.0	0.0	70	2,516	NO RETRO		
124	Peabody Lodge	Stair Loading Dock	1	2L4' T12 EE/EEMAG	old wrap	2	70	0.1	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	83	0.1	0.1	143	2,516	NO RETRO		
125	Peabody Lodge	Storage Trash	1	23W COMPACT SCREWIN	dome	1	23	0.0	NO RETRO	no change		23	0.0			2,516	NO RETRO		
126	Peabody Lodge	Kitchen Cafe	2	2L4' T8 32w/EL	wrap	10	60	0.6	4L4' T8 28w/ELEE LO/TW-8'	rlrb LF tw	5	83	0.4	0.2	465	2,516	INSTALL A SWITCH	1	503
127	Peabody Lodge	Kitchen Cafe	2	2L4' T8 32w/EL	trof acr	3	60	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	136	2,516	NO RETRO		
128	Peabody Lodge	Cafeteria Serving	2	3 WATT LED	track head	16	3	0.0	NO RETRO	no change		3	0.0			2,516	NO RETRO		
129	Peabody Lodge	Cafeteria Serving	2	3 WATT LED	track head	4	3	0.0	NO RETRO	no change		3	0.0			2,516	NO RETRO		
130	Peabody Lodge	Cafeteria Serving	2	3 WATT LED	track head	8	3	0.0	NO RETRO	no change		3	0.0			2,516	NO RETRO		
131	Peabody Lodge	Cafeteria Serving	2	3 WATT LED	track head	2	3	0.0	NO RETRO	no change		3	0.0			2,516	NO RETRO		
132	Peabody Lodge	Kitchen Bar	2	2L4' T8 32w/EL	trof acr	3	60	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	136	2,516	NO RETRO		
133	Peabody Lodge	Kitchen Fume Hood	2	100W INCANDESCENT	jar	6	100	0.6	19 WATT LED SI	screw in LED Alamp	6	19	0.1	0.5	1,223	2,516	NO RETRO		
134	Peabody Lodge	Lounge Cannonball	2	32W COMPACT SCREWIN	can dim rec	57	32	1.8	NO RETRO	no change		32	1.8			2,516	NO RETRO		
135	Peabody Lodge	Bath Men	2	4L4' T12 STD/STD-8'	old wrap angle	2	188	0.4	4L4' T8 28w/ELEE LO	rlrb LF	2	83	0.2	0.2	528	2,516	NO RETRO		
136	Peabody Lodge	Bath Men	2	23W COMPACT HW/EL	square surface mt.	1	24	0.0	NO RETRO	no change		24	0.0			2,516	NO RETRO		

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Cannon Mountain

Interior Lighting Analysis

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
137	Peabody Lodge	Bath Women	2	4L4' T12 STD/STD-8'	old wrap angle	2	188	0.4	4L4' T8 28w/ELEE LO	rlrb LF	2	83	0.2	0.2	528	2,516	NO RETRO		
138	Peabody Lodge	Bath Women	2	1L4' T8 32w/EL	strip	1	30	0.0	1L4' T8 28w/ELEE LO	rlrb LF	1	22	0.0	0.0	20	2,516	NO RETRO		
139	Peabody Lodge	Hall Baths	2	2L4' T12 STD/STD-8'	old wrap	2	94	0.2	2L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	2	42	0.1	0.1	262	2,516	NO RETRO		
140	Peabody Lodge	Hall Serving	2	3 WATT LED	track head	4	3	0.0	NO RETRO	no change		3	0.0			2,516	NO RETRO		
141	Peabody Lodge	Cafetena Lafayette	2	250W METAL HALIDE	box acrylic	20	295	5.9	40 WATT LED/NEW	new LED trof 2x2	20	40	0.4	5.5	13,838	2,516	NO RETRO		
142	Peabody Lodge	Cafeteria Lafayette	2	2x15W INCANDESCENTS	exit sign	2	30	0.1	3 WATT LED/NEW EXIT BATTERY	new LED exit bat	2	3	0.0	0.1	136	2,516	NO RETRO		
143	Peabody Lodge	Cafeteria Lafayette	2	23W COMPACT HW/EL	can rec 8"	16	24	0.4	NO RETRO	no change		24	0.4			2,516	NO RETRO		
144	Peabody Lodge	Cafeteria Loft	2	23W COMPACT HW/EL	square recessed	26	24	0.6	NO RETRO	no change		24	0.6			2,516	NO RETRO		
145	Peabody Lodge	Cafeteria Loft	2	2x15W INCANDESCENTS	exit sign	1	30	0.0	3 WATT LED/NEW EXIT BATTERY	new LED exit bat	1	3	0.0	0.0	68	2,516	NO RETRO		
146	Peabody Lodge	Stair Down	2	2L4' T8 32w/ELEE LO	wrap	2	47	0.1	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	2	42	0.1	0.0	25	2,516	NO RETRO		
147	Peabody Lodge	Storage Employee Only	2	2L4' T8 32w/ELEE LO	trof acr	4	47	0.2	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	4	42	0.2	0.0	50	2,516	NO RETRO		
148	Peabody Lodge	Storage Rentals	2	2L4' T8 32w/ELEE LO	trof acr	31	47	1.5	2L4' T8 28w/ELEE LO/RELAMP ONLY	relamp LF	31	42	1.3	0.2	390	2,516	NO RETRO		
153	Notchview Lodge	Hall Entry	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	70	2,516	NO RETRO		
154	Notchview Lodge	Hall Entry	2	4L4' T12 STD/STD-8'	wrap	1	188	0.2	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	264	2,516	NO RETRO		
155	Notchview Lodge	Retail Sports Shop	2	4L4' T12 EE/EEMAG-8'	wrap	12	140	1.7	4L4' T8 28w/ELEE LO-8'	rlrb LF	12	83	1.0	0.7	1,721	2,516	NO RETRO		
156	Notchview Lodge	Retail Sports Shop	2	2L4' T12 EE/EEMAG	wrap	4	70	0.3	2L4' T8 28w/ELEE LO	rlrb LF	4	42	0.2	0.1	282	2,516	NO RETRO		
157	Notchview Lodge	Cafeteria Seating	2	23W COMPACT HW/EL	square recessed	1	24	0.0	NO RETRO	no change		24	0.0			2,516	NO RETRO		
158	Notchview Lodge	Cafeteria Seating	2	2L4' T12 EE/EEMAG	wrap	12	70	0.8	2L4' T8 28w/ELEE LO	rlrb LF	12	42	0.5	0.3	845	2,516	NO RETRO		
159	Notchview Lodge	Cafeteria By Shop	2	4L4' T12 EE/EEMAG-8'	wrap	5	140	0.7	4L4' T8 28w/ELEE LO-8'	rlrb LF	5	83	0.4	0.3	717	2,516	NO RETRO		
160	Notchview Lodge	Stair Down	S	4L4' T12 EE/EEMAG	wrap	2	140	0.3	4L4' T8 28w/ELEE LO	rlrb LF	2	83	0.2	0.1	287	2,516	NO RETRO		
161	Notchview Lodge	Lounge Fireplace	2	23W COMPACT HW/EL	decorative	8	24	0.2	NO RETRO	no change		24	0.2			2,516	NO RETRO		
162	Notchview Lodge	Hall Vestibule	2	23W COMPACT HW/EL	drum	4	24	0.1	NO RETRO	no change		24	0.1			2,516	NO RETRO		
162	Notchview Lodge	Hall Vestibule	2	2L4' T12 EE/EEMAG	valance	6	70	0.4	2L4' T8 28w/ELEE LO	rlrb LF	6	42	0.3	0.2	423	2,516	NO RETRO		
163	Notchview Lodge	Cafeteria Country Kitchen	2	2L4' T12 EE/EEMAG	wrap	10	70	0.7	2L4' T8 28w/ELEE LO	rlrb LF	10	42	0.4	0.3	704	2,516	NO RETRO		
164	Notchview Lodge	Kitchen Country Kitchen	2	2L4' T12 STD/STD	old wrap	2	94	0.2	2L4' T8 28w/ELEE LO/NEW	new LF wrap	2	42	0.1	0.1	262	2,516	NO RETRO		
165	Notchview Lodge	Kitchen Country Kitchen	2	2L4' T12 EE/EEMAG	wrap	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	141	2,516	NO RETRO		
166	Notchview Lodge	Kitchen Range Hood	2	100W INCANDESCENT	jar	1	100	0.1	19 WATT LED SI	screw in LED Alamp	1	19	0.0	0.1	204	2,516	NO RETRO		
167	Notchview Lodge	Locker	2	3L4' T8 32w/EL	trof acr	8	88	0.7	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	8	76	0.6	0.1	242	2,516	NO RETRO		
168	Notchview Lodge	Office First Aid	2	2L4' T8 32w/EL	trof acr	3	60	0.2	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	3	76	0.2	0.0	-121	2,516	NO RETRO		
169	Notchview Lodge	Office First Aid	2	4L4' T8 32w/EL	trof acr	1	112	0.1	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	76	0.1	0.0	91	2,516	NO RETRO		
170	Notchview Lodge	Office First Aid	2	3L4' T8 32w/EL	trof acr	2	88	0.2	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	76	0.2	0.0	60	2,516	NO RETRO		
171	Notchview Lodge	Stair First Aid	S	2L4' T8 32w/EL	strip	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	20	2,516	NO RETRO		
172	Notchview Lodge	Storage First Aid	1	4L4' T12 EE/EEMAG-8'	old wrap	5	140	0.7	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	5	83	0.4	0.3	717	2,516	NO RETRO		
173	Notchview Lodge	Mechanical Electric	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	70	2,516	NO RETRO		
174	Notchview Lodge	Bath	1	2L4' T12 EE/EEMAG	old wrap	1	70	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.0	70	2,516	NO RETRO		
175	Notchview Lodge	Storage Bodyboard	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	70	2,516	NO RETRO		
176	Notchview Lodge	Hall Baths	1	4L4' T12 EE/EEMAG	wrap	5	140	0.7	4L4' T8 28w/ELEE LO	rlrb LF	5	83	0.4	0.3	717	2,516	NO RETRO		
177	Notchview Lodge	Bath Men	1	4L4' T12 STD/STD	wrap	4	188	0.8	4L4' T8 28w/ELEE LO	rlrb LF	4	83	0.3	0.4	1,057	2,516	NO RETRO		
178	Notchview Lodge	Bath Women	1	4L4' T12 EE/EEMAG	wrap	4	140	0.6	4L4' T8 28w/ELEE LO	rlrb LF	4	83	0.3	0.2	574	2,516	NO RETRO		
179	Notchview Lodge	Locker Wood	1	4L4' T12 EE/EEMAG	wrap	2	140	0.3	4L4' T8 28w/ELEE LO	rlrb LF	2	83	0.2	0.1	287	2,516	NO RETRO		
180	Notchview Lodge	Hall Lockers	1	2L8' T12 EE/EEMAG	strip reflector	2	123	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.1	201	2,516	NO RETRO		
181	Notchview Lodge	Storage Water Heater	1	4L4' T12 EE/EEMAG	wrap	2	140	0.3	4L4' T8 28w/ELEE LO	rlrb LF	2	83	0.2	0.1	287	2,516	NO RETRO		
182	Notchview Lodge	Mechanical Boiler	1	100W INCANDESCENT	keyless	2	100	0.2	NO RETRO	no change		100	0.2			2,516	NO RETRO		
183	Notchview Lodge	Hall Guest Service	1	2L4' T12 EE/EEMAG	old wrap	1	70	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.0	70	2,516	NO RETRO		
184	Notchview Lodge	Hall Guest Service	1	4L4' T12 EE/EEMAG-8'	old wrap	1	140	0.1	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	83	0.1	0.1	143	2,516	NO RETRO		
185	Notchview Lodge	Hall Guest Service	1	3L4' T12 EE/EEMAG	trof parabolic	1	110	0.1	3L4' T8 28w/ELEE LO	rlrb LF	1	63	0.1	0.0	118	2,516	NO RETRO		
186	Notchview Lodge	Office Open Guest Service	1	4L4' T8 32w/EL	trof acr	24	112	2.7	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	24	98	2.4	0.3	845	2,516	NO RETRO		
187	Notchview Lodge	Office Small Window	1	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	40	2,516	NO RETRO		
188	Notchview Lodge	Office Employees Only	1	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	40	2,516	NO RETRO		
189	Notchview Lodge	Office By E.O.	1	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	40	2,516	NO RETRO		
190	Notchview Lodge	Lounge Staff	1	4L4' T8 32w/EL	trof acr	6	112	0.7	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	6	98	0.6	0.1	211	2,516	NO RETRO		
191	Notchview Lodge	Office By Lounge	1	3L4' T12 EE/EEMAG	trof acr	3	110	0.3	3L4' T8 28w/ELEE LO	rlrb LF	3	63	0.2	0.1	355	2,516	NO RETRO		
192	Notchview Lodge	Office Gareth	1	4L4' T8 32w/EL	trof acr	1	112	0.1	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	98	0.1	0.0	35	2,516	NO RETRO		
193	Notchview Lodge	Office John	1	3L4' T8 32w/EL	trof acr	2	88	0.2	3L4' T8 28w/ELEE LO	rlrb LF	2	63	0.1	0.1	126	2,516	NO RETRO		
194	Notchview Lodge	Office Greg	1	3L4' T8 32w/EL	trof acr	3	88	0.3	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	3	76	0.2	0.0	91	2,516	NO RETRO		
195	Notchview Lodge	Hall Employees Only	1	3L4' T12 EE/EEMAG	trof parabolic	2	110	0.2	3L4' T8 28w/ELEE LO	rlrb LF	2	63	0.1	0.1	237	2,516	NO RETRO		
196	Notchview Lodge	Office Tickets	1	3L4' T8 32w/EL	trof acr	4	88	0.4	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	4	76	0.3	0.0	121	2,516	NO RETRO		
197	Notchview Lodge	Office Private	1	3L4' T8 32w/EL	trof acr	4	88	0.4	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	4	76	0.3	0.0	121	2,516	NO RETRO		
198	Notchview Lodge	Office Ski The East	1	3L4' T8 32w/EL	trof acr	2	88	0.2	3L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	76	0.2	0.0	60	2,516	NO RETRO		
199	Notchview Lodge	Stair Up	S	23W COMPACT HW/EL	keyless	1	24	0.0	NO RETRO	no change		24	0.0			2,516	NO RETRO		
210	Notchview Lodge	Shop Compressor	1	400W HPS	lowbay	3	460	1.4	NO RETRO	no change		460	1.4			500	NO RETRO		
213	Valley Station	Mechanical Tram Motor	2	400W HPS	high bay	4	460	1.8	214 WATT LED/NEW	new LED 40' high	4	214	0.9	1.0	984	1,000	NO RETRO		
214	Valley Station	Mechanical Tram Motor	2	150W HPS	wallpack	4	190	0.8	74 WATT LED/NEW	new LED wallpack	4	74	0.3	0.5	1,080	2,328	NO RETRO		
215	Valley Station	Mechanical Tram Motor	2	150W INCANDESCENT	flood	2	150	0.3	37 WATT LED/NEW	new LED flood	2	37	0.1	0.2	526	2,328	NO RETRO		
216	Valley Station	Mechanical Operator	3	2L8' T12 STD/STD	old wrap	1	173	0.2	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	83	0.1	0.1	210	2,328	NO RETRO		
218	Valley Station	Lounge Loading Area	2	100W INCANDESCENT	dome	2	100	0.2	19 WATT LED SI	screw in LED Alamp	2	19	0.0	0.2	377	2,328	NO RETRO		
219	Valley Station	Lounge Loading Area	2	250W HPS	high bay	1	295	0.3	107 WATT LED/NEW	new LED 20' high	1	107	0.1	0.2	188	1,000	NO RETRO		
220	Valley Station	Office Tickets	2	2L4' T8 32w/EL	trof acr	2	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	2	52	0.1	0.0	37	2,328	NO RETRO		
221	Valley Station	Lounge Tram Lobby	2	4L4' T12 STD/STD	old wrap	12	188	2.3	2L4' T8 28w/ELEE LO/NEW	new LF wrap wide	12	42	0.5	1.8	4,079	2,328	NO RETRO		
222	Valley Station	Hall Entry	2	23W COMPACT HW/EL	can rec	3	24	0.1	NO RETRO	no change		24	0.1			2,328	NO RETRO		

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Cannon Mountain

Interior Lighting Analysis

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
223	Valley Station	Hall Old Man Museum	2	2L4' T8 32w/EL	wrap	1	60	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	42	2,328	NO RETRO		
224	Valley Station	Hall Old Man Museum	2	2L4' T12 EE/EEMAG	wrap	3	70	0.2	2L4' T8 28w/ELEE LO	rlrb LF	3	42	0.1	0.1	196	2,328	NO RETRO		
225	Valley Station	Hall Old Man Museum	2	23W COMPACT HW/EL	can rec	20	24	0.5	NO RETRO	no change		24	0.5			2,328	NO RETRO		
226	Valley Station	Bath Women	2	4L4' T12 EE/EEMAG-8'	wrap	1	140	0.1	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	133	2,328	NO RETRO		
227	Valley Station	Bath Women	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
228	Valley Station	Bath Men	2	4L4' T12 EE/EEMAG-8'	wrap	1	140	0.1	4L4' T8 28w/ELEE LO-8'	rlrb LF	1	83	0.1	0.1	133	2,328	NO RETRO		
229	Valley Station	Bath Men	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
230	Valley Station	Hall Baths	2	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
231	Valley Station	Lounge By Store	2	23W COMPACT HW/EL	square recessed	6	24	0.1	19 WATT LED SI	screw in LED Alamp	6	19	0.1	0.0	70	2,328	NO RETRO		
232	Valley Station	Lounge By Store	2	32W & 40W CIRCLELINE HW	drum	1	80	0.1	4L4' T8 28w/ELEE/NEW	new LF wrap wide	1	94	0.1	0.0	-33	2,328	NO RETRO		
233	Valley Station	Retail Tram Gift Shop	2	23W COMPACT HW/EL	can rec	28	24	0.7	24 WATT LED/NEW	new LED dual bullet	14	24	0.3	0.3	782	2,328	NO RETRO		
233	Valley Station	Office Kitchen/3 Hole Sink	2	2L4' T12 EE/STD	old strip	1	80	0.1	2L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	42	0.0	0.0	88	2,328	NO RETRO		
234	Valley Station	Stair By Baths	S	23W COMPACT HW/EL	keyless	3	24	0.1	NO RETRO	no change		24	0.1			2,328	NO RETRO		
234	Valley Station	Storage Retail	S	4L4' T12 EE/EEMAG	strip	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	29	500	NO RETRO		
235	Valley Station	Office Jeff	1	2L8' T12 EE/EL	strip	2	109	0.2	2L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	42	0.1	0.1	312	2,328	NO RETRO		
236	Valley Station	Office Jeff	1	2L4' T12 EE/EEMAG	trof acr	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	130	2,328	NO RETRO		
237	Valley Station	Hall White Boards	1	2L4' T12 EE/EEMAG	wrap	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	130	2,328	NO RETRO		
238	Valley Station	Shop Nuts & Bolts	1	60W INCANDESCENT	dome	3	60	0.2	19 WATT LED SI	screw in LED Alamp	3	19	0.1	0.1	286	2,328	NO RETRO		
239	Valley Station	Shop Nuts & Bolts	1	2L4' T12 EE/EEMAG	wrap	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
240	Valley Station	Storage Skis	1	2L4' T12 STD/STD	strip	1	94	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.1	26	500	NO RETRO		
241	Valley Station	Mechanical Boiler	1	2L4' T12 EE/EEMAG	wrap	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	130	2,328	NO RETRO		
242	Valley Station	Mechanical Boiler	1	23W COMPACT HW/EL	dome	2	24	0.0	NO RETRO	no change		24	0.0			2,328	NO RETRO		
242	Valley Station	Shop Riggers	1	2L4' T12 EE/EEMAG	old strip	1	70	0.1	2L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	1	42	0.0	0.0	65	2,328	NO RETRO		
242	Valley Station	Shop Riggers	1	60W INCANDESCENT	keyless	1	60	0.1	REMOVE FIXTURE	fixture no longer needed	1			0.1	140	2,328	NO RETRO		
243	Valley Station	Office First Aid	1	2L4' T8 32w/EL	wrap	4	60	0.2	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	4	52	0.2	0.0	16	500	NO RETRO		
244	Valley Station	Locker Ski Patrol	1	2L4' T8 32w/EL	wrap	3	60	0.2	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	3	52	0.2	0.0	12	500	NO RETRO		
245	Valley Station	Shop Electrical	1	4L4' T8 32w/EL	trof acr	8	112	0.9	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	8	98	0.8	0.1	261	2,328	NO RETRO		
246	Valley Station	Storage Electrical	1	2L8' T12 EE/EEMAG	strip	2	123	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.1	186	2,328	NO RETRO		
247	Valley Station	Storage Electrical	1	60W INCANDESCENT	keyless	2	60	0.1	NO RETRO	no change		60	0.1			100	NO RETRO		
248	Valley Station	Shop Lift Pulleys	1	2L8' T12 EE/EEMAG	strip	2	123	0.2	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	2	83	0.2	0.1	186	2,328	NO RETRO		
249	Valley Station	Shop Lift Maint.	1	2L8' T12 EE/EEMAG	strip reflector	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	93	2,328	NO RETRO		
250	Valley Station	Shop Lift Maint.	1	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
251	Valley Station	Shop Lift Maint.	1	2L8' T12 EE/EEMAG	strip	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	93	2,328	NO RETRO		
252	Valley Station	Shop Lift Maint.	1	60W INCANDESCENT	dome	1	60	0.1	NO RETRO	no change		60	0.1			2,328	NO RETRO		
253	Valley Station	Shop Lift Maint.	1	2L4' T12 STD/STD	old industrial	1	94	0.1	2L4' T8 28w/ELEE LO/NEW	new LF strip	1	42	0.0	0.1	121	2,328	NO RETRO		
254	Valley Station	Shop Lift Maint.	1	2L4' T12 EE/EEMAG	strip reflector	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328	NO RETRO		
255	Valley Station	Shop Lift Maint.	1	2L4' T12 EE/EEMAG	wrap	2	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	130	2,328	NO RETRO		
256	Valley Station	Bath Men	1	4L4' T12 EE/EEMAG	wrap	1	140	0.1	4L4' T8 28w/ELEE LO	rlrb LF	1	83	0.1	0.1	133	2,328	NO RETRO		
257	Valley Station	Hall Bath	1	2L8' T12 EE/EEMAG	strip	1	123	0.1	4L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	1	83	0.1	0.0	93	2,328	NO RETRO		
258	Valley Station	Bath Ladies	1	100W INCANDESCENT	drum	2	100	0.2	19 WATT LED SI	screw in LED Alamp	2	19	0.0	0.2	377	2,328	NO RETRO		
258	Valley Station	Bath Ladies & Men	1	#N/A	no fixture exists				4L4' T8 28w/ELEE LO/NEW-8'	new LF strip	2	83	0.2	-0.2	-386	2,328	NO RETRO		
259	Valley Station	Lounge Red Tables	1	2L4' T12 EE/EEMAG	old strip	3	70	0.2	1L4' T8 28w/ELEE LO/NEW	new LF strip	3	22	0.1	0.1	335	2,328	NO RETRO		
260	Valley Station	Lounge Red Tables	1	2L8' T12 EE/EEMAG	strip	4	123	0.5	2L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	4	42	0.2	0.3	754	2,328	NO RETRO		
260	Valley Station	Storage Retail	1	2L8' T12 EE/EEMAG	strip	4	123	0.5	2L4' T8 28w/ELEE LO/STRIP KIT-8'	rlrb LF strip kit	4	42	0.2	0.3	162	500	NO RETRO		
261	Valley Station	Storage Tables	1	2L4' T12 STD/STD	strip	2	94	0.2	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	52	500	NO RETRO		
261	Valley Station	Storage Centerplate	1	2L4' T12 STD/STD	wrap	1	94	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.1	26	500	NO RETRO		
262	Valley Station	Storage Lockers	1	2L4' T12 STD/STD	wrap	2	94	0.2	2L4' T8 28w/ELEE LO	rlrb LF	2	42	0.1	0.1	52	500	NO RETRO		
262	Valley Station	Storage Lockers	1	60W INCANDESCENT	keyless	1	60	0.1	2L4' T8 28w/ELEE LO/NEW-8'	new LF strip	1	42	0.0	0.0	9	500	NO RETRO		
262	Valley Station	Storage Trash Garage	1	150W INCANDESCENT	keyless	1	150	0.2	2L4' T8 28w/ELEE LO/NEW	new LF strip	1	42	0.0	0.1	54	500			
268	Mt. Station	Hall Entry	1	4L4' T8 32w/EL	trof minicube	5	112	0.6	4L4' T8 28w/EL/RELAMP ONLY	relamp LF	5	98	0.5	0.1	163	2,328			
269	Mt. Station	Cafeteria Seating	1	3 WATT LED	track head	60	3	0.2	NO RETRO	no change		3	0.2			2,328			
270	Mt. Station	Cafeteria	1	3 WATT LED	track head	14	3	0.0	NO RETRO	no change		3	0.0			2,328			
270	Mt. Station	Storage Janitor	1	2L4' T12 EE/STD	old wrap	1	80	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.0	88	2,328			
271	Mt. Station	Kitchen	1	2L4' T12 STD/STD	old vapor tight	8	94	0.8	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	4	83	0.3	0.4	978	2,328			
271	Mt. Station	Kitchen	1	2L4' T12 STD/STD	old vapor tight	1	94	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	1	42	0.0	0.1	121	2,328			
272	Mt. Station	Storage Dry Goods	1	23W COMPACT HW/EL	keyless	3	24	0.1	NO RETRO	no change		24	0.1			2,328			
273	Mt. Station	Storage Dry Goods	1	90W INCANDESCENT	keyless	1	90	0.1	NO RETRO	no change		90	0.1			100			
274	Mt. Station	Hall Near Baths	1	2L4' T8 32w/EL	troffer indirect	1	60	0.1	2L4' T8 28w/EL/RELAMP ONLY	relamp LF	1	52	0.1	0.0	19	2,328			
275	Mt. Station	Bath Men	1	1L3' T8 25w/EL	vanity	6	24	0.1	1L3' T8 21w/ELEE/RELAMP ONLY	relamp LF	6	24	0.1			2,328			
276	Mt. Station	Bath Women	1	1L4' T8 32w/EL	vanity	8	30	0.2	1L4' T8 28w/EL/RELAMP ONLY	relamp LF	8	26	0.2	0.0	74	2,328			
277	Mt. Station	Cafeteria Bar	1	2L4' T12 EE/EEMAG	trof acr 1' wide	12	70	0.8	44 WATT LED/KIT	trof kit LED	12	44	0.5	0.3	726	2,328			
278	Mt. Station	Hall	B	2L4' T8 32w/EL	old wrap	4	60	0.2	2L4' T8 28w/ELEE LO/NEW	new LF wrap	4	42	0.2	0.1	168	2,328			
278	Mt. Station	Hall	B	2L4' T8 32w/EL	wrap	1	60	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	42	2,328			
279	Mt. Station	Hall	B	2L4' T12 EE/EEMAG	trof acr 1' wide	3	70	0.2	44 WATT LED/KIT	trof kit LED	3	44	0.1	0.1	182	2,328			
280	Mt. Station	Shop Ski Repair & Patrol	B	2L4' T8 32w/EL	old wrap	9	60	0.5	2L4' T8 28w/ELEE LO/NEW	new LF wrap	9	42	0.4	0.2	377	2,328			
280	Mt. Station	Storage 1St Aid	B	2L4' T12 EE/EEMAG	old wrap	2	70	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	2	42	0.1	0.1	130	2,328			
280	Mt. Station	Bath Men & Women	B	2L4' T12 EE/EEMAG	vanity	4	70	0.3	2L4' T8 28w/ELEE LO	rlrb LF	4	42	0.2	0.1	261	2,328			
280	Mt. Station	Storage Men & Women	B	2L4' T12 EE/STD	old wrap	4	80	0.3	4L4' T8 28w/ELEE LO/NEW-8'	new LF wrap	2	83	0.2	0.2	359	2,328			
280	Mt. Station	Storage Men & Women	B	2L4' T12 EE/EEMAG	old wrap	2	70	0.1	2L4' T8 28w/ELEE LO/NEW	new LF wrap	2	42	0.1	0.1	130	2,328			
281	Mt. Station	Mechanical Water Heater	B	23W COMPACT HW/EL	keyless	13	24	0.3	NO RETRO	no change		24	0.3			2,328			

[redacted]

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
281	Mt. Station	Storage Food	B	2L4' T12 EE/EEMAG	strip	1	70	0.1	2L4' T8 28w/ELEE LO	rlrb LF	1	42	0.0	0.0	65	2,328			
281	Mt. Station	Storage Under Tram	B	2L8' T12 STD/STD	vapor tight	3	173	0.5	NO RETRO	no change		173	0.5			100			
282	Mt. Station	Storage Janitor	B	2L4' T12 STD/STD	old industrial	2	94	0.2	2L4' T8 28w/ELEE LO/NEW	new LF wrap	2	42	0.1	0.1	52	500			
Totals						1,273		102			944		57	44	118,809			9	1,955

[redacted]

Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	**1**
Measure Name:	**Lighting Controls**
Measure Location:	
Engineers:	

Site Name:		**Mstation**	**Vstation**	**HQ**	**Ernie**	**Snowbase**	**Maint**	**Nlodge**	**Plodge**	**Blodge**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity											
Energy On-Peak	kWh	0	0	0	0	0	64	0	1,074	1,373	2,511
Energy Off-Peak	kWh	0	0	0	0	0	0	0	0	0	0
Energy Total	kWh	0	0	0	0	0	64	0	1,074	1,373	2,511
Demand On-Peak, Monthly	kW										0.0
Demand On-Peak, Annual	kW										0.0
Demand Off-Peak, Monthly	kW										0.0
Demand Off-Peak, Annual	kW										0.0
Fossil Fuel											0
Natural Gas (NG)	Therms	0	0	0	0	0	0	0	0	0	0
Liquid Propane Gas (LPG)	Gallons	0	0	0	0	0	0	0	-12	-16	-27
Steam	Mlbs	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #2	Gallons	0	0	0	0	0	-1	0	0	0	-1
Fuel Oil, #4	Gallons	0	0	0	0	0	0	0	0	0	0
Fuel Oil, #6	Gallons	0	0	0	0	0	0	0	0	0	0
Miscellaneous	Misc	0	0	0	0	0	0	0	0	0	0
Water											0
Water Savings	kGallons										0
Sewer											0
Sewer Savings	kGallons										0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Interactive Lighting Savings Calculation

	Lighting Savings		Heating Penalty				Cooling Benefit			
A	B	C	D	E	F	G	H	I	J	K
Facility	Annual kW	Annual kWh	Heat Gain to Space	Heating Months	Heating System Efficiency	Heating Penalty MMBtu	Total Space Cooled	Cooling Months	Cooling System COP	Cooling Benefit MMBtu
Maintenance Building	0.0	64	50.0%	8.0	80.0%	(0.1)	0.0%	4.0	2.93	0.0
Peabody Lodge	0.0	1,074	50.0%	6.0	86.0%	(1.1)	0.0%	0.0	2.93	0.0
Brookside Lodge	0.0	1,373	50.0%	6.0	81.6%	(1.4)	0.0%	0.0	2.93	0.0
Totals	**0.0**	**2,511**				**(2.6)**				**0.0**

Notes:	
A	Applicable building included in comprehensive energy audit
B	Lighting demand savings {kW} associated with lighting retrofit measures
C	Lighting energy savings {kWh} associated with lighting retrofit measures
D	Estimated percentage of lighting energy transmitted to conditioned space
E	Estimated length of heating season
F	Estimated heating system efficiency, interacted with other measures
G	Resulting heating penalty due to lighting upgrades = [col C] x [col D] x 3,413 x ([col E] / 12) / [col F] / 1,000,000
H	Estimated percentage of space cooled
I	Estimated Length of cooling season
J	Estimated cooling system efficiency, interacted with other measures
K	Resulting cooling benefit due to lighting upgrades = [col C] x [col D] x 3,413 x ([col I] / 12) / [col J] / 1,000,000

ECM 1:
Lighting System Improvements - Exterior

ECM Overview

[redacted] proposes to install an exterior lighting system to benefit the guests and staff of Cannon Mountain. Our project replaces or upgrades 59 exterior fixtures and will enhance the quality of Cannon's lighting. Several locations were noted to be troublesome, or in need of an upgrade.

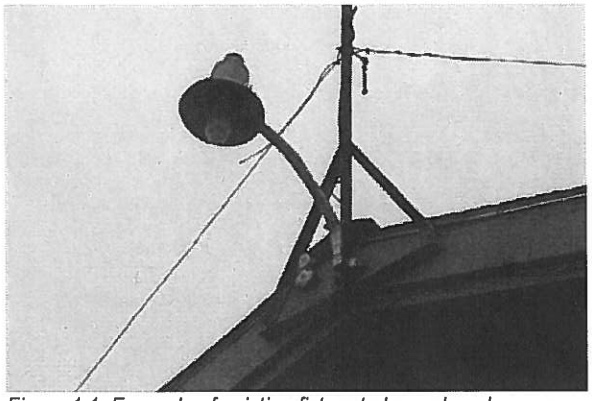


Figure 1.1: Example of existing fixture to be replaced.

ECM Detail

Existing System

General Information about the Existing System

[redacted] identified 26 different exterior lamp/ballast/fixture combinations. Incandescent lamps are installed in 32% of fixtures. High Pressure Sodium (HPS) lamps are also used in 29% of the fixtures. Metal Halide (MH) lamps are used in 26% of the fixtures. All of these HID fixtures use standard magnetic ballasts. Compact fluorescent lamps are used in the remaining 13% of the fixtures.

Mt. Station: Perimeters use HPS floods & bay fixtures.

Valley Station: Perimeters employ HPS squares & lowbays, exterior fixtures, floods, incandescent cans. The plant manager mentioned the incandescent fixtures in the overhang are very troublesome, requiring frequent maintennece. Therefore we are replacing them with a custom LED solution.

Park Headquarters: Perimeters employ HPS exterior fixtures & compact fluorescent wall mounted fixtures.

Ernie's Haus: Perimeters employ compact fluorescent cans & incandescent floods.

Snowbase: Perimeters employ incandescent floods, HPS old parking/roadway fixtures.

Maintenance: Perimeters employ MH exterior fixtures, HPS explosion proof fixtures, floods.

Notchview Lodge: Perimeters employ incandescent floods, decorative fixtures, exterior fixtures, HPS exterior fixtures, floods, squares, compact fluorescent wall mounted fixtures, old wall mounted fixtures.

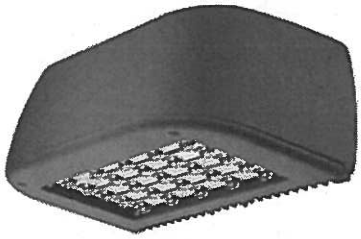
Peabody Lodge: Perimeters employ MH exterior fixtures, floods, incandescent floods, compact fluorescent cans.

Brookside Lodge: Perimeters employ MH exterior fixtures & compact fluorescent wall mounted fixtures.

Proposed System

General Information about the Proposed System

[redacted] proposes to replace existing exterior HID fixtures with latest LED fixtures, which offer vastly improved product lifetimes, while providing optimum light levels with minimal wasted light & trespass. LED fixtures produce light efficiently, and then effectively direct that light onto the target areas.



Considering lifetime ratings of LED fixtures are 2 to 3 times greater than the HID's they replace, service intervals are greatly extended. Where HPS lamps exist, the change from "yellow" to "white" light will make the exterior appear much brighter.

Specific Information about the Proposed System

Below is a brief description of some of the work to be accomplished. Please refer to the "Lighting System Analysis" in Appendix I, as this is a complete list of work to be performed.

26 existing fixtures shall be replaced with a new led wallpack.

20 existing fixtures shall be replaced with a new led flood.

8 existing fixtures shall be replaced with new LED high-bays.

5 existing fixtures shall be replaced with a new led canopies.

Sizing Considerations

The new lighting system is designed to maintain lighting levels, while meeting IESNA standards in affected areas. All recommendations were made with the intent to optimize energy savings without compromising the quality and the level of light output.

Integration of Proposed Equipment with Existing Systems

The new lighting system, and all components thereof, will be fully integrated into the existing lighting systems. We assume the entire lighting and lighting controls systems comply with, but not limited to, the latest codes, the latest standards, local jurisdictions, and work was done in a quality workmanship manner, per NECA, and other applicable recommend best practices universally accepted throughout the electrical industry. Further we assume that all existing devices, which are defined in NEC, which includes but is not limited to switches, outlets, wiring, etc. are in acceptable condition in order to implement our scope as

outlined in the contract documents. All existing junction boxes, poles, mounting surfaces and structures are assumed to be in acceptable condition to allow the installation of the products indicated in the scope. Required upgrades to meet safety or other codes, and/or to prepare the location for the installation as described above, can be performed on a time and material basis.

Per the direction of the State, [redacted] reviewed areas where we are proposing to replace ballasts and/or fixtures to verify existing wiring conditions. We did not find anything that would cause concern for additional costs.

The Methodology, Formulae and Analysis, Including all data, that determines the energy unit and cost savings

Please see Appendix I below for the Energy Savings Calculations data.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

Implementation of this measure will result in annual maintenance savings, since installation of new equipment will extend service intervals. This is based on the calculated frequency of equipment replacement of the old system versus the new system. Additional savings would be expected from reduced recycling, disposal, and labor costs. Due to RFP requirements no maintenance savings were calculated for this measure. Going forward the State will maintain maintenance responsibly for the lighting systems.

Special Operating Requirements

N/A

Lead-Time Required to procure the item

Lamps and ballast are well stocked in local warehouses.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. The lighting system audit completed for each facility will be submitted as the basis for construction. The audit will include the existing descriptions, operating hours, and proposed retrofit description. These documents will be submitted for review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions, and submitted in multiple for record.

Impact on Facility Operations and Performance

The installation of the lighting systems will enhance facility operations because of increased reliability and decreased maintenance requirements. The newer equipment will also be more efficient compared to the existing equipment, which will aid in energy savings.

Environmental Impact

There are no potential adverse environmental impacts associated with this lighting upgrade. During construction, [redacted] will remove, package, and recycle all existing lamps that contain mercury and ballasts that contain PCBs or DEHP according to applicable regulations.

Appendix for ECM 1:
Lighting System Improvements - Exterior

I. Energy Savings Calculations

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[redacted]

Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	**2**
Measure Name:	**Lighting System Improvements - Exterior**
Measure Location:	
Engineers:	

Site Name:		**Mstation**	**Vstation**	**HQ**	**Ernie**	**Snowbase**	**Maint**	**Nlodge**	**Plodge**	**Blodge**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity											
Energy On-Peak	kWh	0	0	0	0	0	0	0	0	0	0
Energy Off-Peak	kWh	5,335	5,413	1,016	2,085	2,164	2,733	2,558	2,895	1,774	25,973
Energy Total	kWh	5,335	5,413	1,016	2,085	2,164	2,733	2,558	2,895	1,774	25,973
Demand On-Peak, Monthly	kW	1.2	2.5	0.2	0.5	0.5	0.6	0.6	0.7	0.4	7.2
Demand On-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Monthly	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Demand Off-Peak, Annual	kW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fossil Fuel											0
Natural Gas (NG)	Therms										0
Liquid Propane Gas (LPG)	Gallons										0
Steam	Mlbs										0
Fuel Oil, #2	Gallons										0
Fuel Oil, #4	Gallons										0
Fuel Oil, #6	Gallons										0
Miscellaneous	Misc										0
Water											0
Water Savings	kGallons										0
Sewer											0
Sewer Savings	kGallons										0

[redacted]

Cannon Mountain

Interior Lighting Analysis

Line	Building Name	Location	Fl	Pre Fixture Description	Pre Fixture Style	Pre Qty	Pre Watts	Pre kW	Post Fixture Description	Post Fixture Style	Post Qty	Post Watts	Post kW	kW Saved	kWH Saved	Annual Hours	*Control Description*	*Control Qty*	Control kWH Saved
19	Ernie's Haus	Bldg Mt	Ext	500W INCANDESCENT	flood	1	500	0.5	24 WATT LED/NEW	new LED dual bullet	1	24	0.0	0.5	2,085	4,380	NO RETRO		
20	Ernie's Haus	Bldg Mt	Ext	23W COMPACT HW/EL	can rec	2	24	0.0	NO RETRO	no change		24	0.0			4,380	NO RETRO		
44	Park Headquarters	Bldg Mt Flag	Ext	150W HPS	wallpack	2	190	0.4	74 WATT LED/NEW	new LED wallpack	2	74	0.1	0.2	1,016	4,380	NO RETRO		
45	Park Headquarters	Bldg Mt Entry	Ext	15W COMPACT SCREWIN	jar	2	15	0.0	NO RETRO	no change		15	0.0			4,380	NO RETRO		
53	Snowbase	Bldg Mt	Ext	150W HPS	old area light	1	190	0.2	26 WATT LED/NEW	new LED barn light	1	26	0.0	0.2	718	4,380	NO RETRO		
54	Snowbase	Bldg Mt	Ext	90W INCANDESCENT	flood	5	90	0.5	24 WATT LED/NEW	new LED dual bullet	5	24	0.1	0.3	1,445	4,380	NO RETRO		
69	Maintenance	Bldg Mt	Ext	70W METAL HALIDE	wallpack	4	95	0.4	NO RETRO	no change		95	0.4			4,380	NO RETRO		
70	Maintenance	Bldg Mt Fuel Pumps	Ext	70W HPS	explosion	2	90	0.2	NO RETRO	no change		90	0.2			4,380	NO RETRO		
71	Maintenance	Parking Lot	Ext	400W HPS	flood	2	460	0.9	148 WATT LED/NEW	new LED flood	2	148	0.3	0.6	2,733	4,380	OCC SENSOR CEILING	4	556
102	Brookside Lodge	Bldg Mt	Ext	50W METAL HALIDE	wallpack	9	65	0.6	20 WATT LED/NEW	new LED wallpack	9	20	0.2	0.4	1,774	4,380	NO RETRO		
103	Brookside Lodge	Bldg Mt	Ext	15W COMPACT SCREWIN	jar	1	15	0.0	NO RETRO	no change		15	0.0			4,380	NO RETRO		
149	Peabody Lodge	Bldg Mt	Ext	50W METAL HALIDE	wallpack	11	65	0.7	20 WATT LED/NEW	new LED wallpack	11	20	0.2	0.5	2,168	4,380	NO RETRO		
150	Peabody Lodge	Bldg Mt	Ext	5W INCANDESCENT	flood	12	5	0.1	NO RETRO	no change		5	0.1			4,380	NO RETRO		
151	Peabody Lodge	Bldg Mt	Ext	23W COMPACT HW/EL	can rec	3	24	0.1	NO RETRO	no change		24	0.1			4,380	NO RETRO		
152	Peabody Lodge	Bldg Mt Cannon Sign	Ext	100W METAL HALIDE	flood	2	120	0.2	37 WATT LED/NEW	new LED flood	2	37	0.1	0.2	727	4,380	NO RETRO		
200	Notchview Lodge	Bldg Mt Parking	Ext	100W INCANDESCENT	decorative	2	100	0.2	NO RETRO	no change		100	0.2			4,380	NO RETRO		
201	Notchview Lodge	Bldg Mt Parking	Ext	50W HPS	wallpack	1	65	0.1	20 WATT LED/NEW	new LED wallpack	1	20	0.0	0.0	197	4,380	NO RETRO		
202	Notchview Lodge	Bldg Mt Parking	Ext	50W HPS	canopy	1	65	0.1	26 WATT LED/NEW	new LED canopy	1	26	0.0	0.0	171	4,380	NO RETRO		
203	Notchview Lodge	Bldg Mt Cannon Sign	Ext	150W HPS	wallpack	1	190	0.2	74 WATT LED/NEW	new LED wallpack	1	74	0.1	0.1	508	4,380	NO RETRO		
204	Notchview Lodge	Bldg Mt	Ext	90W INCANDESCENT	flood	1	90	0.1	24 WATT LED/NEW	new LED dual bullet	1	24	0.0	0.1	289	4,380	NO RETRO		
205	Notchview Lodge	Bldg Mt	Ext	2x90W INCANDESCENTS	flood	2	180	0.4	24 WATT LED/NEW	new LED dual bullet	2	24	0.0	0.3	1,367	4,380	NO RETRO		
206	Notchview Lodge	Bldg Mt	Ext	23W COMPACT HW/EL	old jar	1	24	0.0	NO RETRO	no change		24	0.0			4,380	NO RETRO		
207	Notchview Lodge	Bldg Mt	Ext	23W COMPACT HW/EL	jar	2	24	0.0	NO RETRO	no change		24	0.0			4,380	NO RETRO		
208	Notchview Lodge	Bldg Mt Stair	Ext	28W COMPACT HW	wallpack	1	30	0.0	24 WATT LED/NEW	new LED dual bullet	1	24	0.0	0.0	26	4,380	NO RETRO		
209	Notchview Lodge	Bldg Mt Stair	Ext	23W COMPACT HW/EL	jar	2	24	0.0	24 WATT LED/NEW	new LED dual bullet	2	24	0.0			4,380	NO RETRO		
211	Notchview Lodge	Bldg Mt Compressor	Ext	250W HPS	flood	2	295	0.6	NO RETRO	no change		295	0.6			500	NO RETRO		
212	Notchview Lodge	Bldg Mt Compressor	Ext	400W HPS	wallpack	1	460	0.5	NO RETRO	no change		460	0.5			500	NO RETRO		
217	Valley Station	Walkway New Tram Slip	Ext	400W HPS	high bay	4	460	1.8	214 WATT LED/NEW	new LED 40' high	4	214	0.9	1.0	984	1,000	NO RETRO		
217	Valley Station	Walkway New Tram Slip	Ext	400W HPS	high bay	2	460	0.9	107 WATT LED/NEW	new LED 20' high	2	107	0.2	0.7	706	1,000	NO RETRO		
263	Valley Station	Bldg Mt Tram Sign	Ext	150W INCANDESCENT	can rec	6	150	0.9	NO RETRO	no change		150	0.9			4,380			
264	Valley Station	Bldg Mt Under Tram	Ext	150W HPS	canopy	3	190	0.6	26 WATT LED/NEW	new LED canopy	3	26	0.1	0.5	2,155	4,380			
265	Valley Station	Bldg Mt Under Tram	Ext	100W MERCURY VAPOR	wallpack	1	120	0.1	74 WATT LED/NEW	new LED wallpack	1	74	0.1	0.0	201	4,380			
266	Valley Station	Bldg Mt Front	Ext	400W HPS	flood	1	460	0.5	148 WATT LED/NEW	new LED flood	1	148	0.1	0.3	1,367	4,380			
267	Valley Station	Bldg Mt Back	Ext	50W HPS	wallpack	1	65	0.1	NO RETRO	no change		65	0.1			4,380			
283	Mt. Station	Bldg Mt Summit Slip	Ext	400W HPS	flood	3	460	1.4	148 WATT LED/NEW	new LED flood	3	148	0.4	0.9	4,100	4,380			
283	Mt. Station	Bldg Mt Summit Slip	Ext	150W HPS	wallpack	1	190	0.2	74 WATT LED/NEW	new LED wallpack	1	74	0.1	0.1	508	4,380			
284	Mt. Station	Bldg Mt Old Tram Slip	Ext	150W HPS	high bay	2	190	0.4	107 WATT LED/NEW	new LED 20' high	2	107	0.2	0.2	727	4,380			
Totals						100		14			59		7	7	25,973			4	556

8/6/15

ECM 5:
Low Voltage Transformer Replacements

ECM Overview

[redacted] proposes to replace twelve (12) existing step-down transformers throughout the buildings at Cannon Mountain. All of the transformers are dry-type indoor transformers that step-down 480 volt power to 208Y/120 volt power. [redacted] proposes to replace these transformers with new premium efficiency units that will reduce the electric losses and lower the cooling load of some of the equipment rooms.

Figure 5.1: The existing transformers located at several building at Cannon Mountain will be replaced with energy efficient units.

ECM Detail

Existing System

[redacted] performed an on-site audit of the dry-type transformers at each building on Cannon Mountain. The low voltage distribution systems typically serve lighting, convenience wall outlets and other like loads. Plugged loads often include personal computers, electric heaters and refrigerators. Unlike lighting, computers impose non-linear, harmonic loads back on the transformer. Most of the transformers in operation are not selected nor designed to operate under such conditions. The resulting effect of these types of loads is an increase in transformer electrical energy losses, dissipated in the form of heat. These losses result in unnecessary electrical energy consumption, and occasionally, transformer overheating and failure. Most of the transformers identified are estimated to be loaded between 5% - 20% of their total capacity. These transformers are designed to be able to transform the electricity up to design ratings and are most efficient at or around the design rating. Operating at low levels for normal transformers is inefficient. The percent loads of each of the transformers identified during the audit are listed in the following table.

Building	Designation	Location	Existing Size (KVA)	Special Enclosure
Mt. Station	T11	Electric Room	75	No
Mt. Station	T12	Main Electric Room	45	No
Mt. Station	T10	Main Electric Room	25	No
Mt. Station	T13	Main Electric Room	25	No
Mt. Station	T14	Main Electric Room	25	No
Parks HQ	T6	Basement Electric Area	37.5	No
Ernie's Haus	T4	Electric Closet	37.5	Yes
Maintenance Bldg	T2	Break-room	75	Yes
Notchview	T5	Main Electric Room	150	Yes
Cold Storage	T7	Electric Room	15	No
Snowbase	T3	Electric Room	50	Yes
Beach House	T9	Main Electric Room	37.5	Yes

Proposed Systems

[redacted] proposes to replace twelve (12) existing step-down transformers with new Powersmiths E-SAVER model C-3 transformers. All of the transformers are dry-type indoor transformers that step-down 480 volt power to 208Y/120 volt power. Tie-ins to the existing primary and secondary power feeds will be required. Some of the new transformers will require a special enclosure to current code requirements. In addition, the indoor transformer (480/208Y 120) at Valley Station will not be needed due to the work performed in ECM 19 and will be removed.

Figure 5.2: New Low Voltage Transformer Replacements will be installed in place of existing standard efficiency transformers.

The Powersmiths E-SAVER model C3 transformers proposed for this measure are designed to increase efficiency of the electricity transformation. They have been independently validated at Oak Ridge National Lab, a US DOE test facility, to run at 98% efficiency under single-phase nonlinear load profile, a dramatic improvement over traditional transformers.

[redacted] assumes the installation of this ECM will occur during normal business hours. [redacted] will coordinate with Cannon to schedule shutdowns of the affected areas. Transformers that would require after hours installation if done during the normal operating hours will be scheduled during off season periods. Installation of the measure will require isolation of each of the affected transformers and the associated distribution panels that are fed by the transformer while the transformer is removed and the new transformer installed. The existing wiring is expected to be reused. Repair of any damaged wiring discovered after removal of the transformers is not included.

During the replacement power will be cut to the loads served by the transformers. Some electrical equipment including fire alarm systems, computer systems, and clock systems may require a manual reset or testing after power is resumed. [redacted] has not included any allowance for any such resets or testing. [redacted] assumes existing breakers, fuses, switches, wiring, and disconnects will re-energize after the shutdown. No allowance is included for replacements of these electrical components. The scope of work excludes the removal and disposal of hazardous materials beyond the transformer itself.

Typical installation sequence of the transformers would be as follows:

- Lockout/tagout panel feeding step-down transformer
- Disconnect primary and secondary feeds into transformer
- Remove and dispose of existing transformer, recycling where possible
- Install new transformer on same pad or floor footprint
- Reconnect primary and secondary feeds into transformer

Implementation of this measure will also provide the Cannon with a valuable capital upgrade that will improve the reliability of the electrical distribution system and reduce the likelihood of failure that can occur with overheated transformers. The proposed measure will significantly reduce electric energy costs.

The measure assumes the following:

- The new transformers will be installed in the same location as existing.
- The existing feeders are assumed to be reused
- Removal or remediation of any hazardous materials is not included.
- [redacted] is not responsible for reprogramming of the fire alarm, security alarms, computer servers or computer systems that may be required for the shutdown of the electric circuits affected by the measure.
- Repair or upgrade of any feeders, breakers or disconnects are not included.
- The typical shut down for a conversion is 1 to 2 hours per transformer.

Equipment Sizing Considerations

New transformers will be sized to have the equivalent kVA of the units being replaced. In many instances, the actual maximum load on a transformer can be significantly lower than its rated capacity. As a result, two adjoining transformers can be replaced with a single unit. During the next phase, [redacted] will perform spot metering to ensure proper sizing of replacement transformers.

Integration of Proposed Equipment with Existing Systems

The existing wiring is expected to be reused. Repair of any damaged wiring discovered after removal of the transformers is not included. During the replacement power will be cut to the loads served by the transformers. Some electrical equipment including fire alarm systems, computer systems, and clock systems may require a manual reset or testing after power is resumed which will need to be facilitated by the State.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

There are no additional maintenance responsibilities with this equipment.

Special Operating Requirements

N/A

Lead-Time required to procure the item

Lead time is expected to be between 4 and 8 weeks.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the Town's facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple to the State for record.

Impact on Facility Operations and Performance

The new transformers will operate in the same manner as the units they replace. There will be no difference in the power supplied from the transformers. The only difference will be the amount of power lost through the transformation process.

Appendix for ECM 5:
Low Voltage Transformer Replacements

I. *Energy Savings Calculations*

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Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	5
Measure Name:	**Low Voltage Transformer Replacements**
Measure Location:	
Engineers:	

Site Name:		**Mstation**	**Vstation**	**HQ**	**Ernie**	**Snowbase**	**Maint**	**Nlodge**	**Cstore**	**BathHse**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity											
Energy On-Peak	kWh	7,569		1,558	1,560	1,724	2,109	3,257	833	1,558	20,167
Energy Off-Peak	kWh	12,916		2,663	2,663	2,936	3,592	5,524	1,406	2,663	34,365
Energy Total	kWh	20,486		4,221	4,223	4,660	5,701	8,781	2,239	4,221	54,533
Demand On-Peak, Monthly	kW	2.3		0.5	0.5	0.5	0.7	1.0	0.3	0.5	6.2
Demand On-Peak, Annual	kW	28.1		5.8	5.8	6.4	7.8	12.1	3.1	5.8	74.8
Demand Off-Peak, Monthly	kW										0.0
Demand Off-Peak, Annual	kW										0.0
Fossil Fuel											0
Natural Gas (NG)	Therms										0
Liquid Propane Gas (LPG)	Gallons										0
Steam	Mlbs										0
Fuel Oil, #2	Gallons										0
Fuel Oil, #4	Gallons										0
Fuel Oil, #6	Gallons										0
Miscellaneous	Misc										0
Water											0
Water Savings	kGallons										0
Sewer											0
Sewer Savings	kGallons										0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Mt. Station
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Main Elec Room (Square D)	25.0	15.0%	10.0%	2,286	951	0	5,523	100.0%	89.0%	84.7%	0.46	0.45	1,490	2,492	98.0%	97.5%	0.08	0.06	238	356	0.39	1,251	2,136
Main Elec Room (Federal P)	25.0	15.0%	10.0%	2,286	951	0	5,523	100.0%	89.0%	84.7%	0.46	0.45	1,490	2,492	98.0%	97.5%	0.08	0.06	238	356	0.39	1,251	2,136
Elec Room	25.0	15.0%	10.0%	2,286	951	0	5,523	100.0%	89.0%	84.7%	0.46	0.45	1,490	2,492	98.0%	97.5%	0.08	0.06	238	356	0.39	1,251	2,136
Elec Room	45.0	15.0%	10.0%	2,286	951	0	5,523	100.0%	91.2%	87.8%	0.65	0.63	2,078	3,468	98.2%	97.8%	0.12	0.10	371	551	0.53	1,707	2,917
Elec Room	75.0	15.0%	10.0%	2,286	951	0	5,523	100.0%	93.1%	90.4%	0.83	0.80	2,650	4,395	98.5%	98.1%	0.18	0.15	542	804	0.65	2,108	3,591
Totals	**195.0**	**15.0%**	**10.0%**								**2.87**	**2.78**	**9,197**	**15,339**			**0.53**	**0.44**	**1,627**	**2,423**	**2.34**	**7,569**	**12,916**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E] 2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	[col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER Core Losses - lb		
kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard Amorphous Core		
kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Park Headquarters
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Basement (Based on Drawings 37.5 kVa)	37.5	15.0%	10.0%	2,868	369	0	5,523	100.0%	90.6%	86.8%	0.59	0.57	1,892	3,143	98.2%	97.7%	0.11	0.09	334	479	0.48	1,558	2,663
Totals	**37.5**	**15.0%**	**10.0%**								**0.59**	**0.57**	**1,892**	**3,143**			**0.11**	**0.09**	**334**	**479**	**0.48**	**1,558**	**2,663**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] + [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER Cost Data

kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard Cost Data

kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Ernie's Haus
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Elec Closet (37 5 kVa)	37.5	15.0%	10.0%	1,173	2,064	0	5,523	100.0%	90.6%	86.8%	0.59	0.57	1,862	3,143	98.2%	97.7%	0.11	0.09	303	479	0 48	1,560	2,663
Totals	**37.5**	**15.0%**	**10.0%**								**0.59**	**0.57**	**1,862**	**3,143**			**0.11**	**0.09**	**303**	**479**	**0.48**	**1,560**	**2,663**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	[col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	[col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table		
kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table		
kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Maintenance Building
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Main Elec Room (Federal P)	75.0	15.0%	10.0%	3,237	0	1,143	4,380	100.0%	93.1%	90.4%	0.83	0.80	2,680	4,432	98.5%	98.1%	0.18	0.15	571	840	0.65	2,109	3,592
Totals	**75.0**	**15.0%**	**10.0%**								**0.83**	**0.80**	**2,680**	**4,432**			**0.18**	**0.15**	**571**	**840**	**0.65**	**2,109**	**3,592**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	([col B] x [col D] x [col J] [col Q] - [col B] x [col D] x [col J])
S	([col B] x [col E] x [col J] · [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

esAVER-CSL Loss table

kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Notchview Lodge
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Main Elec Room (Square D)	150.0	15.0%	10.0%	2,920	317	0	5,523	100.0%	94.6%	92.4%	1.29	1.24	4,165	6,835	98.7%	98.4%	0.29	0.24	908	1,310	1.01	3,257	5,524
Totals	**150.0**	**15.0%**	**10.0%**								**1.29**	**1.24**	**4,165**	**6,835**			**0.29**	**0.24**	**908**	**1,310**	**1.01**	**3,257**	**5,524**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] - [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] + [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] - [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] + [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table		
kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table		
kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Cold Storage
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Cold Storage	15.0	15.0%	10.0%	2,607	630	0	5,523	100.0%	87.8%	83.2%	0.31	0.30	1,006	1,667	97.6%	96.9%	0.06	0.05	174	261	0.26	833	1,406
Totals	**15.0**	**15.0%**	**10.0%**								**0.31**	**0.30**	**1,006**	**1,667**			**0.06**	**0.05**	**174**	**261**	**0.26**	**833**	**1,406**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-CL loss table		
kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table		
kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Beach Bath House
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Main Elec Room (Assumed)	37.5	15.0%	10.0%	2,874	363	0	5,523	100.0%	90.6%	86.8%	0.59	0.57	1,892	3,143	98.2%	97.7%	0.11	0.09	334	479	0.48	1,558	2,663
Totals	**37.5**	**15.0%**	**10.0%**								**0.59**	**0.57**	**1,892**	**3,143**			**0.11**	**0.09**	**334**	**479**	**0.48**	**1,558**	**2,663**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	[col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	([col B] x [col D] x [col J] [col K] - [col B] x [col D] x [col J])
M	([col B] x [col E] x [col J] ÷ [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	[col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	([col B] x [col D] x [col J] + [col Q] - [col B] x [col D] x [col J])
S	([col B] x [col E] x [col J] + [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER-C3L loss table

kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Snowbase
Low Voltage Transformer Replacements

	Existing Transformer Details														Proposed Transformer Details						Savings		
Location	Unit Size (kVA)	Occ. Hours % Load	UnOcc. Hours % Load	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Load Power Factor	Existing Occ. Efficiency	Existing UnOcc. Efficiency	Existing Occ. kW Losses	Existing UnOcc. kW Losses	Existing Annual Peak Losses (kWh)	Existing Annual Off Peak Losses (kWh)	Proposed Occ. Efficiency	Proposed UnOcc. Efficiency	Proposed Occ. kW Losses	Proposed UnOcc. kW Losses	Proposed Annual Peak Losses (kWh)	Proposed Annual Off Peak Losses (kWh)	Monthly Demand Savings (kW)	Annual Peak Electric Energy Savings (kWh)	Annual Off Peak Electric Energy Savings (kWh)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Basement (Based on Drawings 37.5 kVa)	50.0	15.0%	10.0%	2,933	304	0	5,523	100.0%	91.9%	88.7%	0.66	0.64	2,130	3,526	98.3%	97.9%	0.13	0.11	407	589	0.53	1,724	2,936
Totals	**50.0**	**15.0%**	**10.0%**								**0.66**	**0.64**	**2,130**	**3,526**			**0.13**	**0.11**	**407**	**589**	**0.53**	**1,724**	**2,936**

Cell Ref.	Comment
A	Location of Transformer
B	Transformer Nameplate Rating - kVA
C - D	Estimated existing transformer loading as a percent of nameplate rating
E - H	Facility operating hours from EMS calculation
I	Estimated load powerfactor seen at the transformer - output
J	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (standard no load losses) + [col D]^2 x (standard full load losses minus standard no load losses))
K	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (standard no load losses) + [col E]^2 x (standard full load losses minus standard no load losses))
L	= ([col B] x [col D] x [col J] ÷ [col K] - [col B] x [col D] x [col J])
M	= ([col B] x [col E] x [col J] + [col L] - [col B] x [col E] x [col J])
N	= [col M] x [col F] + [col N] x [col G]
O	= [col M] x [col H] + [col N] x [col I]
P	= [col B] x [col D] x 1,000 ÷ ([col B] x [col D] x 1,000 + (esaver no load losses) + [col D]^2 x (esaver full load losses minus esaver no load losses))
Q	= [col B] x [col E] x 1,000 ÷ ([col B] x [col E] x 1,000 + (esaver no load losses) + [col E]^2 x (esaver full load losses minus esaver no load losses))
R	= ([col B] x [col D] x [col J] ÷ [col Q] - [col B] x [col D] x [col J])
S	= ([col B] x [col E] x [col J] ÷ [col R] - [col B] x [col E] x [col J])
T	= [col S] x [col F] + [col T] x [col G]
U	= [col S] x [col H] + [col T] x [col I]
V	= [col M] - [col S]
W	= [col N] - [col T]
X	= [col O] -[col U]

ESAVER CSL loss table

kVA	No Load (W)	Full load (W)
15	41	669
25	54	1097
30	60	1311
37.5	72	1551
45	83	1755
50	90	1761
75	121	2585
100	156	2808
112.5	174	2919
150	199	4023

Standard AL 115C loss table

kVA	No Load (W)	Full load (W)
15	293	1182
25	441	1462
30	441	1462
37.5	555	1955
45	612	2202
50	621	2360
75	770	3347
100	941	4271
112.5	941	4271
150	1194	5544

ECM 7:
Infiltration Reductions

ECM Overview

[redacted] assessed all six sides of the buildings, including the attics/ roofs, walls and floors and all of intersections connecting the building's assemblies. Our assessments identify locations of air leakage losses and thermal transfer – the two primary modes of energy loss in buildings. [redacted] proposes weatherization measures that save energy by reducing loads on space conditioning equipment. Tighter and better insulated buildings allow mechanical equipment to run less often and still maintain the desired interior environment. The results of a successful weatherization project are reduced fuel consumption, reduced utility costs and improved occupant comfort.

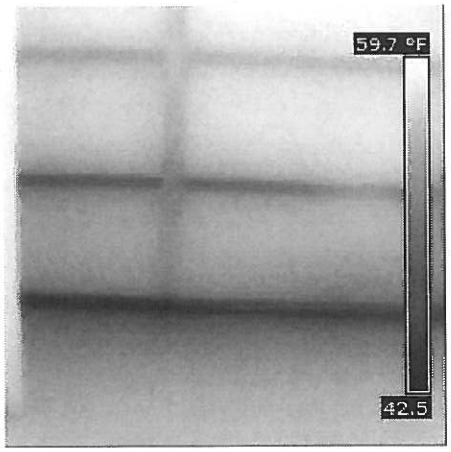

Figure 7.1: Auto Maintenance - Cold air washing on the concrete surface (violet extending to the foreground from the door surface) is clear in the infrared image.

Weatherization measures identified will have the most significant energy saving impact on the buildings are:

- Air Sealing Measures
  - Attic Bypass Air Sealing
  - Roof-Wall Intersection Air Sealing
  - Exposed Wall Air Sealing
  - Door Weather Stripping
  - Sill Plate Air Sealing/ Insulation

ECM Detail

Existing System

[redacted] conducted a detailed weatherization audit of each building and identified several common problem locations that allow the infiltration outdoor into conditioned building space. The following is a list of weakness found in the existing building envelope by building.

Auto Maintenance

- Doors – deteriorated door weather stripping materials and daylight showing at the perimeter of door systems are direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*
- Overhead Doors – there are large gaps at the perimeter of the doors where daylight is clear. These gaps are major areas of unwanted air leakage. *Improvement recommended*

Brookside Learning Center

- Attic Air Barrier Retrofit – the assembly at the pitched roof sections with a drop ceiling below are insulated with fiberglass batt insulation and use polyethylene sheeting as the air barrier/ vapor barrier in the assembly. This system does not control air and heat loss effectively. The staple punctures, joints in the sheeting and duct/ electrical service penetrations are weak points in the air barrier that are allowing unwanted air leakage and are degrading the value of the fiberglass insulation. *Improvement recommended*
- Wall Air Sealing/ Insulation – the air barrier is not continuous at the exterior wall of the flat roof addition section of the building; the existing construction is fiberglass batt exposed to the interior of the building which allows air leakage through the air permeable fiberglass. This air leakage also degrades the thermal performance of fiberglass. *Improvement recommended*
- Sill Plate Air Sealing – the framing at the lower-level locker room space creates a weak point in the building envelope at the sill plate; the cobwebs above the concrete foundation wall and the underside of the 1st story floor are signs of unwanted infiltration/ exfiltration. *Improvement recommended*
- Door Weather Stripping – doors without weather stripping and daylight showing at the perimeter of door systems are direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*

Ernie's Haus

- Roof and Wall Insulation – infrared imaging and hands-on inspection around electrical outlets identified that fiberglass batt insulation is in place at the cathedral roof surfaces and walls. The dimension of the fiberglass batt insulation is not determinable without further disruption of interior or exterior surfaces. *No recommended improvement on Roof and Wall Insulation at this time.*
- Windows – the exterior wood casings are rotting at a number of windows. Seals at the perimeter of the slope-top fixed windows are failing. One window has an approximately ½ inch gap at the top between the glass and the frame. Windows are beyond repair and should be replaced. *No recommendation at this time.*
- Door Weather Stripping – weak door weather stripping materials are creating direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*

Headquarters – Administrative Building

- Attic Bypass Air Sealing and Insulation – the attic flat above the 2-story section of the building is insulated with 3" – 6" of blown-in cellulose; the effective insulation value can be improved by air sealing bypasses and adding insulation. The eaves of the 2-story section of the building are vented. Cold air is washing across the interior finish surfaces because the outdoor air is not directed above the level of the insulation or blocked completely. *Improvement recommended under ECM 9 – Attic Insulation*
- Wall Insulation – the walls in the building were reported as being un-insulated by the Cannon Mountain staff members. Infrared imaging from the interior supports this. The joints between the interior wood panel finish are pathways for infiltration. These joints will need to be sealed prior to retrofit insulation being installed from the outside. The un-insulated walls are a large surface area of

the building allowing unwanted air leakage and heat loss. *Improvement recommended under ECM 18 – Wall Insulation*

- Sill Plate Air Sealing/ Insulation – the connection between the foundation and the wood-framed above grade wall is an area of unwanted air leakage and excessive heat loss. *Improvement recommended under ECM 20 – Rim Joist Sealing-Insulation*
- Doors – weak door weather stripping materials are creating direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*

Mountain Station

- Attic Air Barrier Retrofit – the attic above the drop ceiling at the tram entry addition is insulated with fiberglass batt insulation and polyethylene sheeting is used as the air barrier/ vapor barrier in the assembly. This system does not control air movement or heat loss effectively. The staple punctures, joints in the sheeting and duct/ electrical service penetrations are weak points in the air barrier that are allowing unwanted air leakage and are degrading the value of the fiberglass insulation. *Improvement recommended under ECM 9 – Attic Insulation*
- Attic Bypass Air Sealing and Insulation – the attic space above the main section of the building is under-insulated. The existing insulation in place is a layer of fiberglass batt and a layer of a material that appears to be urea formaldehyde. The urea formaldehyde in place must be confirmed to be safe to work around by an expert prior to additional work. *Improvement recommended under ECM 9 – Attic Insulation*
- Roof Insulation – the roof line above the drop ceilings at the bathrooms is an original tin roof that is below the level of the exterior roof line. There was a pipe freeze-up at an interior wall at the bathrooms which is likely the result of cold air entering from above. The existing insulation in this area is fiberglass batt installed above a drop ceiling. The fiberglass batt material is air permeable and will only slow the infiltration of cold air; it will not prevent cold air penetration. The shed roof bump-out above the Kitchen has a cathedral ceiling and is not effectively insulated, allowing unwanted air leakage and heat transfer. *Improvement recommended under ECM 9 – Attic Insulation*
- Wall Insulation – the wall surface separating both the old and new tram areas from the conditioned space at the lower level of the building was extremely cold during the inspection and is an area of unwanted heat loss from the conditioned space. *Improvement recommended under ECM 18 – Wall Insulation*
- Sill Plate Insulation – the exterior wall at the crawl space area below the kitchen is an area of unwanted heat transfer, especially at the connection between the foundation assembly and the above grade cavity wall. *Improvement recommended under ECM 18 – Wall Insulation*
- Doors – weak door weather stripping materials are creating direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*

Notchview Lodge

- Attic Bypass Air Sealing and Attic/ Roof Insulation *Improvement recommended under ECM 9 – Attic Insulation*

- Rear, Mountain-Side Addition – the attic space at the rear-addition is insulated with 10" fiberglass batt; there are air leakage bypasses at wall top plates and services that should be sealed.
- Original Building above 1'x1' Tiles – the 1'x1' tiles at the original section of the building are failing; the attic space above is at least partially insulated with 2" – 3" of vermiculite, a potentially asbestos-containing material. This is an area of excessive heat loss due to poor performance of the air barrier and the insulation. This material will need to be tested and/ or removed prior to installation work. The weaknesses in the existing 1'x1' ceiling surface may require the installation of a new gypsum board ceiling.
- Right-Side of Cathedral Ceiling, Kitchen and Staff Area (view from Mountain) – the section of the building to the right of the cathedral ceiling area is insulated with fiberglass batt above a drop ceiling or a 1'x1' tile ceiling; there is no effective air barrier in this assembly which results in excessive air/ heat loss. This assembly where there is no effective separation between the unconditioned attic and the occupied spaces is likely a major contributor to the large concentration of flies/ bugs in this area. In the newest addition-section of the building with a gypsum board surface between the attic and the occupied spaces, there are very few flies.

- Doors Weather Stripping – weak door weather stripping materials are creating direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*
- Wall Insulation – infrared imaging shows that the walls at the original section of the building are not insulated. *Improvement recommended under ECM 18 – Wall Insulation*
- Sill Plate Air Sealing/ Insulation – the sill plate at the front wall of the basement ticket office area is a location for heat loss and unwanted infiltration as there is no existing insulation in place. *Improvement recommended under ECM 20 – Rim Joist Sealing-Insulation*

Peabody Lodge

- Wall Air Sealing/ Insulation – the roof-wall intersection in the center section of the building is a source of unwanted infiltration/ exfiltration in the building. The intersection of the two assemblies is not sealed properly at the interior and the result is a weakness in the building envelope. The existing construction allows air leakage through the air permeable fiberglass. Areas of the assembly are so leaky that daylight is clear at the plane of the exterior wall when inspecting above the mezzanine drop ceiling. This air leakage also degrades the thermal performance of fiberglass. *Improvement recommended under ECM 18 – Wall Insulation*
- Doors – the existing weather stripping is weak at many of the door systems in the building. *Improvement recommended*

Valley Station

- Roof Insulation – the roof surface above the mezzanine sitting area is poorly insulated with only 2" fiberglass batt insulation above a failing 1'x1' tile cathedral ceiling; this area is allowing excessive heat loss through the roof. The shed roof addition at the museum is partially insulated with spray polyurethane foam. The foam was installed poorly and does not wrap the conditioned space; exterior louvers pull outdoor air below the level of the insulation, reducing its value. The cavity above the

boiler room area was the original tram loading surface. This cavity – between the ceiling of the boiler room and the original tin roof surface – is not insulated and is a pathway for unwanted heat loss from the building. This cavity terminates at the interior wall of the ski patrol and storage areas. The roof surface above these areas is an exposed cavity and is completely un-insulated; the area above this roof is unconditioned and as a result there is excessive heat loss through this surface. *Improvement recommended under ECM 9 – Attic Insulation*

- Attic Insulation – the underside of the roof surface is partially insulated with closed-cell spray polyurethane foam. The attic space is vented by gable louvers, rooftop-whirligig vents and an open hatch door to the Tram Loading area. This completely undermines the value of the spray foam insulation at the underside of the roof by pulling cold air in below the insulation and exhausting the warm building air from the heated spaces. The spray polyurethane foam insulation was done so poorly it is recommended to be abandoned in place. The ceiling surfaces throughout the Lobby and the Rear Bathrooms are failing. As a result of the failing air barrier of the 1'x1' tile ceilings, the value of the cellulose insulation in place at the flat is degraded. Verticals that separate the attic space from the cathedral ceiling areas of the conditioned spaces below were not effectively insulated and are allowing unwanted heat transfer between the attic and the conditioned spaces below. *Improvement recommended under ECM 9 – Attic Insulation*
- Wall Insulation – the exterior concrete walls at the plumbing cavity below the rear bathrooms are poorly insulated and are allowing unwanted heat loss. There is a partial kneewall that separates the mezzanine space at the storage room off of the boiler room from the cavity between the original tin roof and the floor of the new tram loading area that is not insulated and is allowing unwanted air and heat transfer between the unconditioned space above the tin roof and the interior spaces. *Improvement recommended under ECM 18 – Wall Insulation*
- Roof-Wall Intersection Air Sealing – the roof-wall intersection is a pathway for unwanted infiltration at the eaves at the museum addition and the front wall below the tram loading area. The eaves at the museum addition were not sealed effectively as part of the roof insulation work; as a result, outdoor air is flowing below the insulation and is degrading its insulation value. The front wall below the tram loading area is a roof-wall intersection to the outside because the space above is unconditioned. There is excessive air infiltration at this vulnerable joint in the building envelope. *Improvement recommended*
- Door Weather Stripping – weak door weather stripping materials are creating direct pathways for unwanted infiltration/ exfiltration. *Improvement recommended*

Proposed System

Based on the detailed weatherization report, [redacted] expects to achieve a reduction in energy lost due to outside air infiltration by sealing these leaks. Locations by building where air sealing and weatherstripping will be implemented are shown in the following table. Additional air sealing scope for the buildings was proposed under ECM 9 –Attic Insulation, ECM 18 – Wall Insulation, and *ECM 20 – Rim Joist Sealing-Insulation, however, these are not included in the final project.*

Table 7.1: Weatherization Scope of Work by Building

Building	Door Weather-stripping	Attic Air Barrier	Wall Air Sealing	Sill Plate Air Sealing	Roof/Wall Intersection	Retrofit Attic Hatch
Maintenance	X					
Brookside Lodge	X	X	X	X		
Ernie's House	X					
Park Headquarters	X					X
Mountain Station	X					
Notchview Lodge	X					X
Peabody Lodge	X					
Valley Station	X				X	

Details of each weatherization improvement described below.

Air Sealing Measures

Door Weather Stripping –

Installation Specifications:

- Ensure door operates and closes appropriately. Notify prime contractor and/or client when doors are damaged.
- Install heavy duty weather stripping with aluminum carrier at door sides and top jamb. Install for
- 40% - 60% weather strip compression. Caulk behind weather strip carrier for air-tight seal.
- Cut aluminum carrier weather strip at locks, swing arms or any other hardware where necessary.
- Install door bottom sweep with aluminum carrier.
- For double doors install astragal at center meeting.

□□Note: weather stripping materials are selected from the options included below to best fit the existing conditions of the door system.

Materials:

- Visco Weatherseal Products – Sides and Tops – DS050 or DX1000: aluminum carrier; soft-cell foam insert with thermoplastic cover. OBS296: aluminum carrier; offset nylon brush strip insert.
- Visco Weatherseal Products – Astragals – FS325: aluminum carrier; wool pile brush with fin seal.
- Visco Weatherseal Products – Sweeps – FS300: aluminum carrier; wool pile brush with fin seal. TS100 and TS150: aluminum carrier; triple vinyl strip. BS196: aluminum carrier; nylon brush strip.
- Schlegel Surface Mount Weather Stripping (PF102, PF114, PF512, QDS375).

Overhead Door Weather Stripping –

Installation Specifications:

- Install heavy-duty aluminum carrier with an oversized insert gasket at side and top. Install heavy-duty aluminum carrier with an oversized bottom U-style gasket at bottom.
- The side and top weather stripping may be pinned in place with a nail gun, not fastened with screws due to the exterior casing construction.

Attic Air Barrier Retrofit -

Installation Specifications

- Seal Air Barrier – seal service penetrations through the polyethylene and joints in the polyethylene sheeting with polyurethane foam and sheathing tape to improve the effectiveness of the air barrier that separates the unconditioned attic from the conditioned space below.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Forth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering) at the roof-wall intersection.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathway that require the precision of a gun foam product.
- Caulk, drywall and other standard building materials.

Exposed Wall Air Sealing -

Installation Specifications

- Fasten Dow Thermax poly-isocyanurate rigid insulation to create air barrier and insulation continuity over the wall system.
- Seal the perimeter and seams of the rigid insulation board with foam sealant or sheathing tape.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Forth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering).
- Dow Thermax Rigid Sheathing – Thermax is rigid insulation product with an R-value of 6.5 per inch. Thermax is building code compliant to be left without a fire protection covering.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathway that require the precision of a gun foam product.
- Screws, screw plates and sheathing tape.

Sill Plate Air Sealing -

Installation Specifications

- Seal the joint between the top of the lower-level wall system and the underside of the 1st story floor system with 2-part spray polyurethane foam for an air-tight seal.
- Fasten Dow Thermax poly-isocyanurate rigid insulation to create air barrier and insulation continuity over the wall system.
- Seal the perimeter and seams of the rigid insulation board with foam sealant or sheathing tape.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Forth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering).
- Dow Thermax Rigid Sheathing – Thermax is rigid insulation product with an R-value of 6.5 per inch. Thermax is building code compliant to be left without a fire protection covering.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathway that require the precision of a gun foam product.
- Screws, screw plates and sheathing tape.

Retrofit Attic Hatch –

Installation Specifications

- install gasket material at the perimeter of the hatch and insulate the hatch.

Materials

- Dow Thermax Rigid Insulation Board Stock – Thermax is rigid insulation product.
- Schlegel Surface Mount Weather Stripping (PF102, PF114, PF512, QDS375).

Roof-Wall Intersection Air Sealing

Installation Specifications

- Drape a protective sheet over furnishings and the wall below the drop ceiling.
- Remove ceiling tiles as necessary to access the roof-wall intersection.
- Install an approximately 4 inch – 6 inch wide and 2 inch deep bead of high-density spray polyurethane foam at the air leakage pathway.
- Replace the drop ceiling tiles and clean the area.

Materials

- Dow Froth-Pak – Froth-Pak is 2-part high density closed cell spray polyurethane foam. Dow Forth-Pak is NFPA 286 compliant and is approved to be left exposed (without a fire protection covering) at the roof-wall intersection.
- Dow Thermax Rigid Insulation Board Stock – Thermax is rigid insulation product. In oversized
- pathways at the roof-wall intersection Themax board is used as a block to seal in place. Thermax is building code compliant to be left without a fire protection covering.
- Touch 'n Seal All Seasons Gun Foam – 1-part polyurethane foam is used at leakage pathways thatrequire the precision of a gun foam product.

Table 7.2 & 7.3 below contain the quantity of improvements for each location.

Table 7.2: Proposed quantity of doors to air seal

Building	Quantity of Single Doors	Quantity of Double Doors
Maintenance Building	4	0
Brookside Lodge	6	2
Ernie's House	3	0
Park Headquarters	3	0
Mountain Station	5	3
Notchview Lodge	11	5
Peabody Lodge	3	11
Valley Station	3	1
Total	**38**	**22**

Table 7.3: Proposed air sealing measures

Building	Roof/Wall Junction Area (LF)	Retrofit Attic Hatch (LF)	Overhead Door Weather Stripping (LF)	Attic Air Barrier (SF)	Exposed Wall Air Sealing (SF)	Sill Plate Air Sealing (LF)
Maintenance Building	0	0	314	0	0	0
Brookside Lodge	0	0	0	1,872	675	68
Park Headquarters	0	6	0	0	0	0
Notchview Lodge	0	8	0	0	0	0
Valley Station	68	0	0	0	0	0
Total	**68**	**14**	**314**	**1,872**	**675**	**68**

Exclusions

- Work performed for this measure excludes repair to damaged building infrastructure, including mortar, brick, paint, and wood.
- Work performed for this measure excludes hazardous waste removal or remediation.
- Work performed for this measure excludes adjustments to doors and windows.

Equipment Sizing Considerations

The proposed weatherization materials will be sized according to door size and roof/wall intersection linear feet.

Integration of Proposed Equipment with Existing Systems

All new weatherization shall be installed as to not affect the proper operation of any doors or windows.

The Methodology, Formulae and Analysis, Including all data, that determines the energy unit and cost savings

Please see Appendix I below for the Energy Savings Calculations data.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

Little maintenance is required for this measure. Annual or biennial inspections of the installed weather stripping are recommended.

Special Operating Requirements

N/A

Lead-Time required to procure the item

Weather stripping materials are typically readily available.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

Impact on Facility Operations and Performance

The new weather-stripping and air sealing will enhance facility operations by reducing infiltration that causes drafts during the winter. Employees and guests will notice a more comfortable environment.

[redacted]

Appendix for ECM 7: Infiltration Reductions

I. *Energy Savings Calculations*

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Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	**7**
Measure Name:	**Infiltration Reductions**
Measure Location:	
Engineers:	

Site Name:		**Mstation**	**Vstation**	**HQ**	**Ernie**	**Maint**	**Nlodge**	**Plodge**	**Blodge**	**Summary**
Item	Units	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity										
Energy On-Peak	kWh	2,263			1,161	8,476				11,901
Energy Off-Peak	kWh									0
Energy Total	kWh	2,263	0	0	1,161	8,476	0	0	0	11,901
Demand On-Peak, Monthly	kW									0.0
Demand On-Peak, Annual	kW									0.0
Demand Off-Peak, Monthly	kW									0.0
Demand Off-Peak, Annual	kW									0.0
Fossil Fuel										0
Natural Gas (NG)	Therms									0
Liquid Propane Gas (LPG)	Gallons							417	466	883
Steam	Mlbs									0
Fuel Oil, #2	Gallons		120	39		209	240			607
Fuel Oil, #4	Gallons									0
Fuel Oil, #6	Gallons									0
Miscellaneous	Misc									0
Water										0
Water Savings	kGallons									0
Sewer										0
Sewer Savings	kGallons									0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Mt. Station
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	20.0	33	1	1	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	20.0	33	1	1	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	20.0	33	1	1	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	0.1	20.0	33	1	1	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	1	0	6	0.1	20.0	33	1	1	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	23	10	0	57	0.1	20.0	33	0	0	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	65	27	0	157	0.1	20.0	33	0	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	86	36	0	208	0.1	20.0	33	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	140	58	0	339	0.1	20.0	33	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	198	82	0	477	0.1	20.0	33	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	157	65	0	380	0.1	20.0	33	1	0			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	184	76	0	444	0.1	20.0	33	1	0			0	0
45 to 50	47.5	42.2	0.0	223	182	178	583	152	63	0	368	0.1	20.0	33	1	1			0	0
40 to 45	42.5	37.7	0.0	229	216	231	676	176	73	0	426	0.1	20.0	33	1	1			0	0
35 to 40	37.5	33.8	0.0	326	265	262	853	223	93	0	538	0.1	20.0	33	1	1			0	1
30 to 35	32.5	29.4	0.0	272	217	325	814	212	88	0	513	0.1	20.0	33	1	1			0	1
25 to 30	27.5	24.6	0.0	201	177	195	573	150	62	0	361	0.1	20.0	33	2	1			0	1
20 to 25	22.5	20.1	0.0	230	183	218	631	165	69	0	398	0.1	20.0	33	2	1			0	1
15 to 20	17.5	15.7	0.0	179	150	152	481	125	52	0	303	0.1	20.0	33	2	2			0	1
10 to 15	12.5	10.9	0.0	98	85	104	287	75	31	0	181	0.1	20.0	33	2	2			0	0
5 to 10	7.5	6.4	0.0	134	30	79	243	63	26	0	153	0.1	20.0	33	2	2			0	0
0 to 5	2.5	2.2	0.0	73	14	34	121	32	13	0	76	0.1	20.0	33	3	2			0	0
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	25	10	0	61	0.1	20.0	33	3	2			0	0
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	23	9	0	55	0.1	20.0	33	3	3			0	0
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	8	3	0	20	0.1	20.0	33	3	3			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	0.1	20.0	33	3	3			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0.1	20.0	33	3	3			0	0
				2,920	2,920	2,920	8,760	2,286	951	0	5,523						0	0	2	5

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.00	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.13	SF	P45	
Existing Boiler Plant Efficiency	100.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	20.0	MPH	P49	
Average Summer Wind Speed	20.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	72.0	Q55	average temperature for all areas
UnOccupied	72.0	O56	63.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Valley Station
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.4	10.0	55	2	2	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0.4	10.0	55	2	2	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0.4	10.0	55	2	2	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	0.4	10.0	55	1	1	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	0	0	6	0.4	10.0	55	1	1	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	30	4	0	57	0.4	10.0	55	1	1	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	82	10	0	157	0.4	10.0	55	0	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	108	14	0	208	0.4	10.0	55	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	176	22	0	339	0.4	10.0	55	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	248	31	0	477	0.4	10.0	55	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	198	25	0	380	0.4	10.0	55	1	0			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	231	29	0	444	0.4	10.0	55	1	1			0	0
45 to 50	47.5	42.2	0.0	223	182	178	583	191	24	0	368	0.4	10.0	55	1	1			0	0
40 to 45	42.5	37.7	0.0	229	216	231	676	222	28	0	426	0.4	10.0	55	1	1			0	1
35 to 40	37.5	33.8	0.0	326	265	262	853	280	35	0	538	0.4	10.0	55	2	2			1	1
30 to 35	32.5	29.4	0.0	272	217	325	814	267	34	0	513	0.4	10.0	55	2	2			1	1
25 to 30	27.5	24.6	0.0	201	177	195	573	188	24	0	361	0.4	10.0	55	2	2			1	1
20 to 25	22.5	20.1	0.0	230	183	218	631	207	26	0	398	0.4	10.0	55	3	2			1	1
15 to 20	17.5	15.7	0.0	179	150	152	481	158	20	0	303	0.4	10.0	55	3	3			1	1
10 to 15	12.5	10.9	0.0	98	85	104	287	94	12	0	181	0.4	10.0	55	3	3			0	1
5 to 10	7.5	6.4	0.0	134	30	79	243	80	10	0	153	0.4	10.0	55	4	3			0	1
0 to 5	2.5	2.2	0.0	73	14	34	121	40	5	0	76	0.4	10.0	55	4	4			0	0
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	32	4	0	61	0.4	10.0	55	4	4			0	0
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	29	4	0	55	0.4	10.0	55	4	4			0	0
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	11	1	0	20	0.4	10.0	55	5	4			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	0.4	10.0	55	5	5			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0.4	10.0	55	5	5			0	0
				2,920	2,920	2,920	8,760	2,874	363	0	5,523						0	0	6	11

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.26	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.16	SF	P45	
Existing Boiler Plant Efficiency	74.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	67.0	Q55	average temperature for all areas
UnOccupied	72.0	O56	63.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Park Headquarters
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.2	10.0	22	1	1	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0.2	10.0	22	1	1	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0.2	10.0	22	1	0	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	0.2	10.0	22	0	0	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	0	0	6	0.2	10.0	22	0	0	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	29	4	0	57	0.2	10.0	22	0	0	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	82	10	0	157	0.2	10.0	22	0	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	108	14	0	208	0.2	10.0	22	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	176	23	0	339	0.2	10.0	22	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	248	32	0	477	0.2	10.0	22	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	197	25	0	380	0.2	10.0	22	0	0			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	230	30	0	444	0.2	10.0	22	0	0			0	0
45 to 50	47.5	42.2	0.0	223	182	178	583	191	25	0	368	0.2	10.0	22	0	0			0	0
40 to 45	42.5	37.7	0.0	229	216	231	676	221	28	0	426	0.2	10.0	22	1	0			0	0
35 to 40	37.5	33.8	0.0	326	265	262	853	279	36	0	538	0.2	10.0	22	1	1			0	0
30 to 35	32.5	29.4	0.0	272	217	325	814	266	34	0	513	0.2	10.0	22	1	1			0	0
25 to 30	27.5	24.6	0.0	201	177	195	573	188	24	0	361	0.2	10.0	22	1	1			0	0
20 to 25	22.5	20.1	0.0	230	183	218	631	207	27	0	398	0.2	10.0	22	1	1			0	0
15 to 20	17.5	15.7	0.0	179	150	152	481	157	20	0	303	0.2	10.0	22	1	1			0	0
10 to 15	12.5	10.9	0.0	98	85	104	287	94	12	0	181	0.2	10.0	22	1	1			0	0
5 to 10	7.5	6.4	0.0	134	30	79	243	80	10	0	153	0.2	10.0	22	1	1			0	0
0 to 5	2.5	2.2	0.0	73	14	34	121	40	5	0	76	0.2	10.0	22	1	1			0	0
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	31	4	0	61	0.2	10.0	22	2	1			0	0
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	28	4	0	55	0.2	10.0	22	2	2			0	0
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	10	1	0	20	0.2	10.0	22	2	2			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	0.2	10.0	22	2	2			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0.2	10.0	22	2	2			0	0
				2,920	2,920	2,920	8,760	2,868	369	0	5,523						0	0	2	3

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.02	SF	P43	Doors, Attic Hatch, Sill Plate, Etc.
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.15	SF	P45	
Existing Boiler Plant Efficiency	81.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	20.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	64.2	Q55	average temperature for all areas
UnOccupied	78.0	O56	60.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Ernie's Haus
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	10.0	20	1	1	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	10.0	20	1	1	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0.1	10.0	20	1	0	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	0.1	10.0	20	0	0	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	1	2	0	6	0.1	10.0	20	0	0	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	12	21	0	57	0.1	10.0	20	0	0	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	33	59	0	157	0.1	10.0	20	0	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	44	78	0	208	0.1	10.0	20	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	72	127	0	339	0.1	10.0	20	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	101	178	0	477	0.1	10.0	20	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	81	142	0	380	0.1	10.0	20	0	0			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	94	166	0	444	0.1	10.0	20	0	0			0	0
45 to 50	47.5	42.2	0.0	223	182	178	583	78	137	0	368	0.1	10.0	20	0	0			0	0
40 to 45	42.5	37.7	0.0	229	216	231	676	91	159	0	426	0.1	10.0	20	1	0			0	0
35 to 40	37.5	33.8	0.0	326	265	262	853	114	201	0	538	0.1	10.0	20	1	0			0	0
30 to 35	32.5	29.4	0.0	272	217	325	814	109	192	0	513	0.1	10.0	20	1	1			0	0
25 to 30	27.5	24.6	0.0	201	177	195	573	77	135	0	361	0.1	10.0	20	1	1			0	0
20 to 25	22.5	20.1	0.0	230	183	218	631	85	149	0	398	0.1	10.0	20	1	1			0	0
15 to 20	17.5	15.7	0.0	179	150	152	481	64	113	0	303	0.1	10.0	20	1	1			0	0
10 to 15	12.5	10.9	0.0	98	85	104	287	38	68	0	181	0.1	10.0	20	1	1			0	0
5 to 10	7.5	6.4	0.0	134	30	79	243	33	57	0	153	0.1	10.0	20	1	1			0	0
0 to 5	2.5	2.2	0.0	73	14	34	121	16	29	0	76	0.1	10.0	20	1	1			0	0
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	13	23	0	61	0.1	10.0	20	2	1			0	0
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	12	20	0	55	0.1	10.0	20	2	1			0	0
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	4	8	0	20	0.1	10.0	20	2	2			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	0	1	0	2	0.1	10.0	20	2	2			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0.1	10.0	20	2	2			0	0
				2,920	2,920	2,920	8,760	1,173	2,064	0	5,523						0	0	1	3

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.00	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.15	SF	P45	
Existing Boiler Plant Efficiency	100.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	70.0	Q55	average temperature for all areas
UnOccupied	78.0	O56	60.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Maintenance Building
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	1.5	10.0	199	8	6	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1.5	10.0	199	7	5	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1.5	10.0	199	5	4	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	1.5	10.0	199	4	3	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	4	0	1	5	1.5	10.0	199	3	2	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	33	0	12	45	1.5	10.0	199	2	1	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	92	0	32	125	1.5	10.0	199	1	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	122	0	43	165	1.5	10.0	199	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	198	0	70	269	1.5	10.0	199	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	280	0	99	379	1.5	10.0	199	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	223	0	79	302	1.5	10.0	199	2	1			1	0
50 to 55	52.5	47.4	0.0	260	216	228	704	260	0	92	352	1.5	10.0	199	3	2			1	1
45 to 50	47.5	42.2	0.0	223	182	178	583	215	0	76	292	1.5	10.0	199	4	3			2	1
40 to 45	42.5	37.7	0.0	229	216	231	676	250	0	88	338	1.5	10.0	199	5	4			2	2
35 to 40	37.5	33.8	0.0	326	265	262	853	315	0	111	427	1.5	10.0	199	7	5			3	3
30 to 35	32.5	29.4	0.0	272	217	325	814	301	0	106	407	1.5	10.0	199	8	7			4	3
25 to 30	27.5	24.6	0.0	201	177	195	573	212	0	75	287	1.5	10.0	199	9	8			3	3
20 to 25	22.5	20.1	0.0	230	183	218	631	233	0	82	316	1.5	10.0	199	10	9			4	3
15 to 20	17.5	15.7	0.0	179	150	152	481	178	0	63	241	1.5	10.0	199	11	10			3	3
10 to 15	12.5	10.9	0.0	98	85	104	287	106	0	37	144	1.5	10.0	199	12	11			2	2
5 to 10	7.5	6.4	0.0	134	30	79	243	90	0	32	122	1.5	10.0	199	13	12			2	2
0 to 5	2.5	2.2	0.0	73	14	34	121	45	0	16	61	1.5	10.0	199	14	13			1	1
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	35	0	13	48	1.5	10.0	199	15	14			1	1
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	32	0	11	44	1.5	10.0	199	16	15			1	1
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	12	0	4	16	1.5	10.0	199	17	16			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	1.5	10.0	199	18	17			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.5	10.0	199	19	18			0	0
				2,920	2,920	2,920	8,760	3,237	0	1,143	4,380						0	0	31	27

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.00	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	1.51	SF	P45	
Existing Boiler Plant Efficiency	80.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	68.0	Q55	average temperature for all areas
UnOccupied	78.0	O56	63.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Notchview Lodge
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.9	10.0	113	4	4	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0.9	10.0	113	4	3	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0.9	10.0	113	3	2	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	0.9	10.0	113	2	2	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	0	0	6	0.9	10.0	113	2	1	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	30	3	0	57	0.9	10.0	113	1	1	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	83	9	0	157	0.9	10.0	113	1	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	110	12	0	208	0.9	10.0	113	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	179	19	0	339	0.9	10.0	113	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	252	27	0	477	0.9	10.0	113	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	201	22	0	380	0.9	10.0	113	2	1			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	235	25	0	444	0.9	10.0	113	2	1			1	1
45 to 50	47.5	42.2	0.0	223	182	178	583	194	21	0	368	0.9	10.0	113	3	2			1	1
40 to 45	42.5	37.7	0.0	229	216	231	676	225	24	0	426	0.9	10.0	113	4	2			1	1
35 to 40	37.5	33.8	0.0	326	265	262	853	284	31	0	538	0.9	10.0	113	4	3			1	2
30 to 35	32.5	29.4	0.0	272	217	325	814	271	29	0	513	0.9	10.0	113	5	4			2	3
25 to 30	27.5	24.6	0.0	201	177	195	573	191	21	0	361	0.9	10.0	113	5	4			1	2
20 to 25	22.5	20.1	0.0	230	183	218	631	210	23	0	398	0.9	10.0	113	6	5			2	3
15 to 20	17.5	15.7	0.0	179	150	152	481	160	17	0	303	0.9	10.0	113	7	6			1	2
10 to 15	12.5	10.9	0.0	98	85	104	287	96	10	0	181	0.9	10.0	113	7	6			1	1
5 to 10	7.5	6.4	0.0	134	30	79	243	81	9	0	153	0.9	10.0	113	8	7			1	1
0 to 5	2.5	2.2	0.0	73	14	34	121	40	4	0	76	0.9	10.0	113	8	7			0	1
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	32	3	0	61	0.9	10.0	113	9	8			0	1
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	29	3	0	55	0.9	10.0	113	10	9			0	1
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	11	1	0	20	0.9	10.0	113	10	9			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	0.9	10.0	113	11	10			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0.9	10.0	113	11	10			0	0
				2,920	2,920	2,920	8,760	2,920	317	0	5,523						0	0	13	20

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.02	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.83	SF	P45	
Existing Boiler Plant Efficiency	80.0%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	72.0	Q55	average temperature for all areas
UnOccupied	78.0	O56	63.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Peabody Lodge
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	145	6	5	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	145	5	4	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	145	4	3	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	1.1	10.0	145	3	2	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	0	0	6	1.1	10.0	145	2	1	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	30	3	0	57	1.1	10.0	145	2	1	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	83	9	0	157	1.1	10.0	145	1	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	110	12	0	208	1.1	10.0	145	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	179	19	0	339	1.1	10.0	145	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	252	27	0	477	1.1	10.0	145	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	201	22	0	380	1.1	10.0	145	2	1			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	235	25	0	444	1.1	10.0	145	2	2			1	1
45 to 50	47.5	42.2	0.0	223	182	178	583	194	21	0	368	1.1	10.0	145	3	2			1	1
40 to 45	42.5	37.7	0.0	229	216	231	676	225	24	0	426	1.1	10.0	145	4	3			1	2
35 to 40	37.5	33.8	0.0	326	265	262	853	284	31	0	538	1.1	10.0	145	5	4			2	3
30 to 35	32.5	29.4	0.0	272	217	325	814	271	29	0	513	1.1	10.0	145	6	5			2	3
25 to 30	27.5	24.6	0.0	201	177	195	573	191	21	0	361	1.1	10.0	145	6	6			1	2
20 to 25	22.5	20.1	0.0	230	183	218	631	210	23	0	398	1.1	10.0	145	7	6			2	3
15 to 20	17.5	15.7	0.0	179	150	152	481	160	17	0	303	1.1	10.0	145	8	7			1	3
10 to 15	12.5	10.9	0.0	98	85	104	287	96	10	0	181	1.1	10.0	145	9	8			1	2
5 to 10	7.5	6.4	0.0	134	30	79	243	81	9	0	153	1.1	10.0	145	9	9			1	2
0 to 5	2.5	2.2	0.0	73	14	34	121	40	4	0	76	1.1	10.0	145	10	9			0	1
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	32	3	0	61	1.1	10.0	145	11	10			0	1
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	29	3	0	55	1.1	10.0	145	12	11			0	1
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	11	1	0	20	1.1	10.0	145	13	12			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	1.1	10.0	145	13	13			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	145	14	13			0	0
				2,920	2,920	2,920	8,760	2,920	317	0	5,523						0	0	14	24

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.00	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	1.09	SF	P45	
Existing Boiler Plant Efficiency	86.0%	-	P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	68.0	Q55	average temperature for all areas
UnOccupied	78.0	O56	63.0	Q56	

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Brookside Lodge
Infiltration Reductions

TMY-3 Weather Data for Berlin NH								Operating Hours				Savings								
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs.	UnOcc On-Peak Hrs.	Occ Off-Peak Hrs.	UnOcc Off-Peak Hrs.	Total Crack Area (ft^2)	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ. Heating / Cooling Savings (MBH)	UnOcc. Heating / Cooling Savings (MBH)	Occ. Cooling Savings (MMBTU)	UnOcc. Cooling Savings (MMBTU)	Occ. Heating Savings (MMBTU)	UnOcc. Heating Savings (MMBTU)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Cooling																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	150	6	5	0	0		
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	150	5	4	0	0		
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	150	4	3	0	0		
90 to 95	92.5	75.2	0.0	0	0	0	0	0	0	0	0	1.1	10.0	150	3	2	0	0		
85 to 90	87.5	73.5	0.0	0	9	1	10	3	1	0	6	1.1	10.0	150	3	2	0	0		
80 to 85	82.5	71.2	0.0	0	82	8	90	28	6	0	57	1.1	10.0	150	2	1	0	0		
75 to 80	77.5	69.3	0.0	0	202	47	249	76	16	0	157	1.1	10.0	150	1	0	0	0		
70 to 75	72.5	67.2	0.0	9	234	87	330	101	21	0	208	1.1	10.0	150	0	0	0	0		
65 to 70	67.5	62.5	0.0	82	251	204	537	164	34	0	339	1.1	10.0	150	0	0	0	0		
60 to 65	62.5	56.6	0.0	245	221	291	757	231	48	0	477	1.1	10.0	150	0	0	0	0		
Heating																				
55 to 60	57.5	51.9	0.0	212	167	224	603	184	39	0	380	1.1	10.0	150	2	1			0	0
50 to 55	52.5	47.4	0.0	260	216	228	704	215	45	0	444	1.1	10.0	150	3	2			1	1
45 to 50	47.5	42.2	0.0	223	182	178	583	178	37	0	368	1.1	10.0	150	4	3			1	1
40 to 45	42.5	37.7	0.0	229	216	231	676	207	43	0	426	1.1	10.0	150	5	3			1	2
35 to 40	37.5	33.8	0.0	326	265	262	853	261	55	0	538	1.1	10.0	150	5	4			2	3
30 to 35	32.5	29.4	0.0	272	217	325	814	249	52	0	513	1.1	10.0	150	6	5			2	3
25 to 30	27.5	24.6	0.0	201	177	195	573	175	37	0	361	1.1	10.0	150	7	6			2	3
20 to 25	22.5	20.1	0.0	230	183	218	631	193	40	0	398	1.1	10.0	150	8	7			2	4
15 to 20	17.5	15.7	0.0	179	150	152	481	147	31	0	303	1.1	10.0	150	9	7			2	3
10 to 15	12.5	10.9	0.0	98	85	104	287	88	18	0	181	1.1	10.0	150	9	8			1	2
5 to 10	7.5	6.4	0.0	134	30	79	243	74	16	0	153	1.1	10.0	150	10	9			1	2
0 to 5	2.5	2.2	0.0	73	14	34	121	37	8	0	76	1.1	10.0	150	11	10			1	1
-5 to 0	(2.5)	0.0	0.0	53	15	28	96	29	6	0	61	1.1	10.0	150	12	11			0	1
-10 to -5	(7.5)	0.0	0.0	60	3	24	87	27	6	0	55	1.1	10.0	150	13	11			0	1
-15 to -10	(12.5)	0.0	0.0	31	1	0	32	10	2	0	20	1.1	10.0	150	13	12			0	0
-20 to -15	(17.5)	0.0	0.0	3	0	0	3	1	0	0	2	1.1	10.0	150	14	13			0	0
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.1	10.0	150	15	14			0	0
				2,920	2,920	2,920	8,760	2,677	560	0	5,523						0	0	15	27

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Berlin NH
I - L	Occupied hours as per the RFP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	= [col M] x [col N] x 5286 ÷ 60 x P49
P	= 1.08 x [col O] x ([col B] - O55) ÷ 1000 cooling, 1.08 x [col O] x (Q55 - [col B]) ÷ 1000 heating
Q	= 1.08 x [col O] x ([col B] - O56) ÷ 1000 cooling, 1.08 x [col O] x (Q56 - [col B]) ÷ 1000 heating
R	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P47 x P48
S	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P47 x P48
T	[col P] x ([col I] + [col K]) ÷ 1,000 ÷ P46
U	[col Q] x ([col J] + [col L]) ÷ 1,000 ÷ P46

Assumptions:	Value	Unit	CELL REF	Description
Other Crack Area	0.72	SF	P43	
Window Crack Area	0.00	SF	P44	
Door Crack Area	0.41	SF	P45	
Existing Boiler Plant Efficiency	81.6%		P46	
Existing Cooling Plant Efficiency	2.93	COP	P47	
Percent Building Cooled	0.0%		P48	
Average Winter Wind Speed	10.0	MPH	P49	
Average Summer Wind Speed	10.0	MPH	P50	
Crack Area Windward Diversity	15.0%		P51	

Average Space Temperatures - After implementation of EMS					
	Cooling		Heating		Description
Occupied	72.0	O55	71.0	Q55	average temperature for all areas
UnOccupied	78.0	O56	63.0	Q56	

ECM 13: Electrical Upgrades

ECM Overview

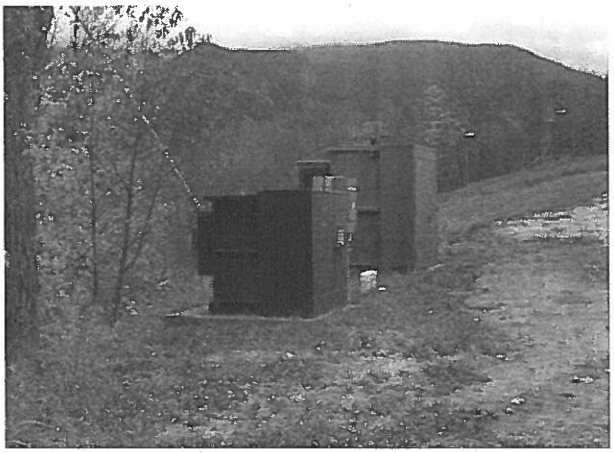

Figure 13.1: [redacted] proposes to upgrade Cannon Mountain's high voltage system by replacing a direct buried 35 kV feeder.

[redacted] proposes to replace one of the 35 kilovolt (kV) electrical feeders that serves Cannon Mountain's secondary electrical system. The existing feeder is direct buried and has reached the end of its useful life. [redacted] proposes to trench in parallel to the existing line and install a new 35 kV electrical line. The new line will be placed in conduit and will extend from the riser pole located in the dirt parking lot to the Valley Station Lodge. During construction of the new trench, [redacted] encourages Cannon Mountain to place any additional services (cable, control wiring, etc.) into the new trench prior to back filling. Originally, [redacted] proposed to replace two antiquated S&C switches during the Proposal Phase. One switch is located near Snowbase and the other is located in the Tram parking lot. These two S&C switches are being replaced this year by Cannon and have been removed from the scope.

The proposed electrical upgrade will provide Cannon with an improved main electrical system that will reduce maintenance costs, avoid future capital costs and improve system reliability.

ECM Detail

Existing System

Cannon Mountain receives electrical power from EverSource under their primary general delivery rate (GV). Power is received at two riser poles located in the dirt parking lot across from the Peabody, Brookside, and Notchview Lodge Area. At this location, an EverSource central meter records usage and power draw. From the meter, two underground 35 kV feeders serve the entire mountain. One feeder serves the Peabody, Brookside, and Notchview Lodge Area and the other travels down along the base of the mountain to serve other buildings and equipment South of the Route 18 main switch. The feeder that serves the Peabody, Brookside, and Notchview Lodge Area has been recently replaced and electrical equipment such as switch gear and transformers have been upgraded. The second 35 kV feeder that provides power to the remaining areas is original and is direct buried. The service cable has reached the end of its useful life and has a high potential for failure. Recently, Cannon had a failure in the line this past season and had to perform an

emergency repair. The direct buried 35 kV electrical feeder passes through two live front S&C switches on its way to the Valley Station. These switches are currently being replaced this year by Cannon Mountain.

Proposed Systems

[redacted] proposes to replace the 35 kV electrical feeder that serves Cannon Mountain buildings and equipment south of the Route 18 Switch Gear. The existing feeder travels from Route 18 Switch Gear to the riser poles next to Valley Station. [redacted] proposes to trench in parallel to the existing line and install a new 35 kV electrical line (EPR rated). The new line will be placed in conduit and will extend from the riser pole located in the dirt parking lot to the Valley Station Lodge. Based on drawings of the existing electrical service, approximately 5,200 feet of trenching will be necessary.

During construction of the new trench, [redacted] encourages Cannon Mountain to place any additional services (cable, control wiring, etc.) into the new trench prior to back filling. The installation of the new feeder will include sectionalizing enclosures, bracketing, elbows and terminations as needed. Two five 5" power conduits will be installed with one to remain a spare with pull string. The scope also includes three new sector cabinets and new lateral feeds off the main line to the single phase Ski Museum Transformer and the Zoomer Chair Lift Transformer.

As part of the scope, [redacted] will conduct a private utility survey to identify existing utilities (air lines, water lines, electrical lines, etc.) along the proposed area of the 35 kV line. Following the detailed survey, the exact path for the new line will be identified and reviewed with [redacted]/Cannon Mountain personnel. The work will be conducted during the summer season and any necessary shut downs will need to b coordinated with mountain personnel.

Clarifications

- No removal of earth material included in scope
- Open cut style excavation across RT 18

Equipment Sizing Considerations

New electrical gear and cables will be sized to meet current loads. Prior to design, [redacted] will discuss with Cannon Mountain any potential expansions and adjust sizing of equipment accordingly.

Integration of Proposed Equipment with Existing Systems

Adjustments will be made to existing system to accommodate the new electrical service upgrade.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

It will be the State's responsibility to maintain the new electrical systems.

Special Operating Requirements

There are no special operating requirements for new electrical upgrades.

Lead-Time required to procure the item

Procurement is expected to be between 12 and 14 weeks.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

Impact on Facility Operations and Performance

The new electrical upgrades will provide Cannon Mountain with an improved main electrical system that will reduce maintenance costs, avoid future capital costs and improve system reliability.

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ECM 16:
Snow Making System Upgrades

ECM Overview

[redacted] proposes to upgrade the snow making system at Cannon Mountain by replacing most of the existing snow guns with new low energy equipment. The proposed strategy is to replace the existing energy intensive land based air/water guns and other similar models with tower mounted HKD low-energy tower guns. The new tower guns will greatly reduce compressed air energy use as well as the labor required to move the old land guns around the mountain. In addition to the new HKD tower mounted guns, [redacted] proposes to supply Cannon with 17 new HKD portable air/water guns. These sled/tripod guns will complement the new HKD tower guns to allow for spot snow making as well as for snow making on trails where tower guns are not practical.

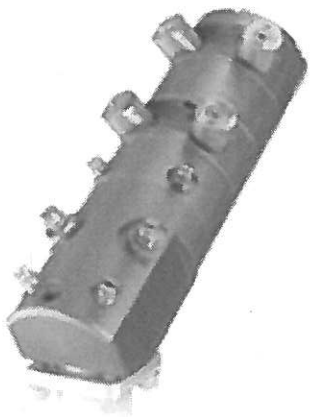


Figure 16.1: Proposed HKD Impulse Tower Gun.

The reduced air usage will allow Cannon to make more snow using the existing air and water infrastructure. It is expected that with the proposed system, Cannon will rarely, if ever, reach the air delivery limit of 21,000 CFM. Due to these reductions, [redacted] is proposing to implement a demand reduction strategy whereby at least one 600-hp Joy compressor is left off during peak periods in order to save nearly 450-kW of peak demand per month, or nearly a total of $20,000 for the four peak snow making months.

[redacted] believes the HKD tower gun design along with the 17 new HKD portable gun complement is the most cost effective strategy for Cannon. Further, we believe this is the simplest and least disruptive approach compared to current operations which was stressed as a key factor for Cannon Mountain.

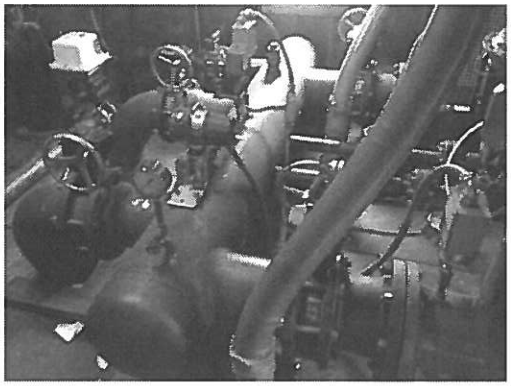


Figure 16.2: The existing Booster Pump House at Cannon Mountain will be replaced with a new structure and mechanical system.

[redacted] proposes to replace the existing booster pump house located half way up the mountain. The existing structure will be demolished and a new structure will be built in its place. The new structure will be a 20' by 20' building and will contain two new 300 horsepower (HP) pumps with variable frequency drives. The new booster pump house will provide the additional pressure necessary for

snow making on higher elevations of the mountain. In addition, [redacted] will install 73 new low-energy tower snow guns on trails that couldn't be addressed in the Snowmaking ECM due to pressure issues. The trails include the upper part of Profile, Tramway, and Skylight. On Taft Slalom, new water/air lines will be installed to allow for more efficient snowmaking.

ECM Detail

Existing System

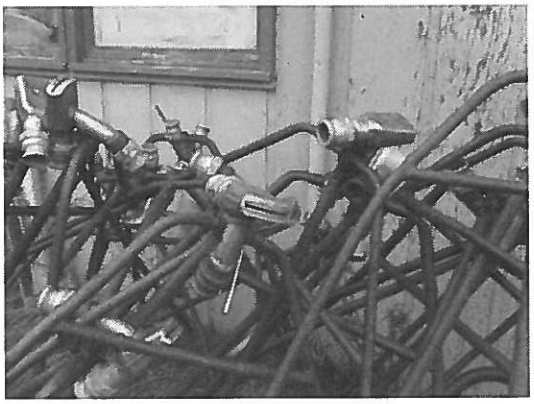


Figure 16.3: Existing K-2000 air/water guns.

Cannon Mountain's snowmaking equipment consists of a compressed air system and water distribution system that serve approximately 160 acres of ski terrain. The systems provide water/air to several loops that travel up and down the mountain and provide water and air to fixed hydrants. The hydrants are used to connect snowmaking guns (fixed or movable) and provide the necessary air to water ratio to produce snow. Currently, the snow gun equipment consists of potable Ratnik Baby Snow Giants, K-2000, HKD Impulse, and Turbo Crystal Fan Guns. These guns are either mounted to fix posts (slope-side) or on sleds that allow them to be moved over the terrain to serve tough to reach areas. Currently, most of the K-2000 snow guns have been replaced by Baby Snow Giants and thirty new energy efficient HKD Impulse have been installed to serve two slopes (Avalanche, Polly's Folly).

The compressed air system consists of four air compressors that generate roughly 80-90-psi for the snow making equipment and a total air volume of 21,000 cubic feet per minute (CFM). The largest compressor, nicknamed "Big Bertha" is located in a separate garage behind the Notchview Lodge. This compressor is capable of supplying 9,000 cfm of air. The base of the snow making operations is located at SnowBase which houses the three remaining compressors. One unit is rated for 6,000 cfm and the remaining two are rated for 3,000 cfm each, for a total system capacity of 21,000 cfm. A dedicated cooling pump circulates lake water through heat exchangers on each compressor to cool them while in operation. This pump also circulates water through another heat exchanger used to cool and dry the compressed air before it is sent up the mountain. Recently, this system has been extended to serve the "Big Bertha" air compressor. Originally, "Big Bertha" utilized a cooling tower for its cooling needs. During peak snowmaking periods, all four compressors are in operation and draw approximately 3,000 kW of power and 21,000 CFM of air under full load.

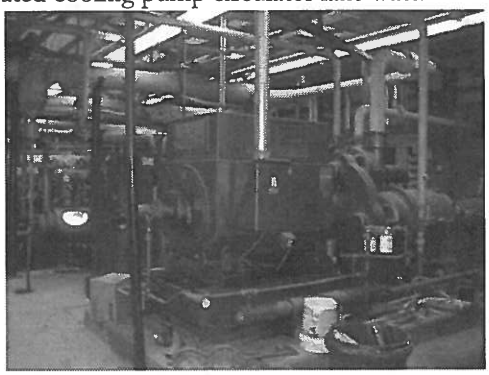


Figure 16.4: Existing compressors located in SnowBase.

Water used for the snow making equipment is pumped from an open well fed from Echo Lake. One 500-hp and four 400-hp vertical pumps supply water at about 750-psi to the mountain. Four of these pumps operate at full speed with the larger pump operated on a VFD. A control system aids in

the operation of these pumps where the VFD pump is started as the lead pump and each additional pump is activated as more water is needed. The VFD maintains pressure in the system as pumps are turned on and off. Two 200-hp booster pumps located up the mountain boost the pressure to 500-550-psi in order to serve the top of the mountain. At peak flow with one of the 200-hp booster pump in operation, the maximum electrical draw is approximately 1,670 kW. The booster pump house structure is in very poor shape and is literally fall apart. The structure is heater by electric resistance heaters and struggles to maintain proper space temperature due to the condition of the building.

Based on daily snowmaking logs, the mountain pumps an average of 210 million gallons of water from Echo Lake for the entire ski season.

Proposed Systems

Snowmaking Equipment

During the development phase of the project, [redacted] met with Cannon's snowmaking personnel to review existing conditions and to develop a scope to replace existing snowmaking guns that best fit their needs as well as Cannon Mountain's needs in general. Originally, [redacted]'s proposal offered HKD low-energy tower guns, new HDK fan guns, and several Ratnik Baby Snow Giants to replace existing snow making equipment. During our meetings, Cannon wanted [redacted] to also evaluate the option of using Snowlogic's energy efficient snow making equipment. [redacted] worked with both HKD and Snowlogic and has reviewed both options. Under these options, the total number of tower mounted snow guns and ground mount guns are the same and only differ by manufacture. The HKD option utilizes their new Impulse Tower low air flow snowgun and their Viper ground gun (tripod or sled). The Snowlogic option utilizes their new Snowlogic DV4 tower low air flow snowgun and their DV4 Striker ground gun (tripod or sled). Due to the lower cost and the impact to the overall project, [redacted] has chosen to include the HKD option in the Detailed Energy Audit.

[redacted] proposes to upgrade the snow making system at Cannon Mountain by replacing most of the existing snow guns with new low energy equipment. The proposed strategy is to replace the existing energy intensive land based air/water guns with HKD low-energy tower mounted and ground mounted air/water snow guns. The new tower guns will greatly reduce compressed air energy as well as the labor required to move the old land guns around the mountain. In addition to the new tower guns, [redacted] proposes to supply Cannon with 17 new low-energy ground air/water guns to be mounted on portable skids or tripods. These guns will complement the new HKD tower guns to allow for spot snow making as well as for snow making on trails where tower guns are not practical.

[redacted] is recommending to replace all of the identified existing high energy snow guns with new low energy guns. The only areas on the mountain that are expected to require the use of the high energy snow guns are slopes higher on the mountain (ex. Middle Cannon, Big Link, Easy Link) and summit. Water pressure in these areas is not favorable for low-energy snow guns. The booster pump house half way up the mountain provides an increase in water pressure for the summit trails, but is undersized for the operation of low-energy snow guns. In ECM 23, [redacted] proposes to replace the booster pump house. The new pump house would provide the necessary pressure to operate low-energy snow guns. Replacement of the high

energy guns served by the booster pump house is included in ECM 23. There will still be some areas on the mountain (ex. Middle Cannon, Big Link, Easy Link) that will require the use of the Baby Ratnik Snow Guns. Our saving calculations account for using the high energy intensive snow guns in these areas.

For the proposed new equipment [redacted] will install 298 new HKD tower guns and 17 new HKD ground guns with sled or tripod. The new equipment will be installed on the trails detailed in table 16.2 below. Along with the table, an attachment in Appendix II provides a map of the mountain showing the location of the proposed equipment.

The HKD Impulse towers and Viper will be equipped with HKD's "Low Flow" nucleators which use a total of 8 CFM of compressed air in colder conditions and 48 CFM of air in marginal temperatures. These nozzles will allow for 6% additional annual kWh savings over the standard HKD configuration. HKD has successfully installed these "Low Flow" nucleators at other resorts. Performance data is shown in table 16.1.

Table 16.1: HKD Performance Data

HKD - Impulse		
@ 500 PSI - Cannon's standard pressure		
	GPM	**CFM**
Step 4 - at WB < 15	50	8
Step 3 - at WB 20	38	8
Step 2 - at WB 24	32	48
Step 1 - at WB > 28	19	48

Table 16.2: New HKD Snow Making Equipment

Map Ref.	Trail Name	Area (acres)	30' Tower	20' Tower	10' Tower
	Turkey Trot	2.79	8	8	0
	Moose Alley	3.13	0	0	0
	Deer Run	2.46	5	8	0
	Bear Pow	1.43	0	11	0
	Fox Tail	1.00	0	0	6
	Base	0.54	0	0	0
5 – 6	Big Link, Easy Link	4.90	0	0	0
7	Middle Cannon	3.10	2	0	0
8	Middle Cannon Bypass	4.20	6	0	0
21	Rock Garden	3.50	7	0	0
23	Half Pipe	3.29	12	0	0
24 - 25	Toss Up	2.84	3	0	0
27 – 28	Gremlin, Parkway	8.70	12	6	0
29	L. Lower Ravine	3.72	13	5	0
33	Turnpike Cutover	1.45	6	0	0
38/30	Middle Ravine	6.23	23	0	0
31	L. Turnpike	4.42	21	0	0
11	Jasper's Hideaway	3.88	11	0	0
12	Banshee	3.41	10	0	0
14	Avalanche	6.43	0	0	0
15	Polly's Folly	4.88	0	0	0
16	Zoomer	6.84	15	0	0
17	Rocket	6.04	9	0	0

Map Ref.	Trail Name	Area (acres)	30' Tower	20' Tower	10' Tower
18	Gary's	6.30	6	0	0
9	Polly's Extension	2.76	8	0	0
22	Chute	1.67	4	0	0
39	Lower Hardscrable	0.80	0	12	0
2	Tramway	1.57	14	0	0
41	Profile	5.40	14	0	0
42	Skylight	2.22	12	0	0
43	Upper Ravine	1.04	11	0	0
35	Asa's Acre	3.00	0	0	0
25	L. Lower Cannon	10.96	10	0	0
	Brookside	3.98	0	0	0
18	Top	1.21	0	0	0
17	Top	1.10	0	0	0
19	Tram Cutback	2.14	0	0	0
	Remaining Trails	50.67	0	0	0
Totals		**184**	**242**	**50**	**6**

As part of this project, [redacted] is proposing to include replacing an existing 6" water line with an 8" water line on Middle Cannon. The scope of work for this improvement includes:

- Remove existing 6" water line on Middle Cannon Trail
- Piping is to be 8" API5L X-42 steel pipe with welded connection or by Zap-Lok System.
- Use low impact equipment for pipe transport to the installation site.
- String pipe together to improve installation efficiencies; ensure strings are manageable to reach the site.
- Prevent any debris from entering the pipe by covering opened pipe end with weld pipes (or similar) prior to pipe dragging or skidding to site.
- Piping will be installed above ground with proper supports.
- Visually inspect inside of the pipe for debris (dirt, rocks, etc.) and remove before joining sections of pipeline.
- Install new water hydrant (15) couplings.
- Provide and install necessary manual valves for isolation.
- Work on the mountain is to be performed with minimal disruption to the existing vegetation.
- In areas necessary, the contractor will provide necessary soil containment to prevent erosion of the trails.

The work will be conducted during the summer/fall season and any necessary shut downs will need to coordinated with mountain personnel.

In addition to the new snow guns, [redacted] will replace 140 existing hydrants. New support posts are included for the 298 HKD guns which includes installation as well as new hoses. Additionally, the snow making crew requested controls for "Big Bertha" that would allow for remote operation from SnowBase. [redacted] has included these controls along with a software upgrade to the existing control system.

The reduced air usage will allow Cannon to make more snow using the existing air and water infrastructure. It is expected that with the proposed system, Cannon will rarely, if ever, reach the air delivery limit of 21,000 CFM. Due to these reductions, [redacted] is proposing to implement a demand reduction strategy whereby at

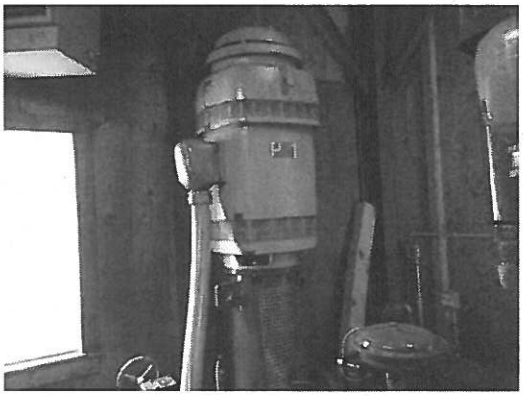
least one 600-hp Joy compressor is left off during peak periods in order to save nearly 450-kW of peak demand, or nearly $20,000 for the four peak snow making months. It is expected that for most of the season more than one compressor will be off. The current restriction of compressed air is not expected to be an issue and Cannon will have the ability to produce more snow during the season. In [redacted]'s analysis, it's assumed that there will be an increase in pumping energy as a result. The increased energy usage associated with increased pumping has been built into the energy savings calculation in order to provide Cannon with a conservative savings estimate.

Pump House

[redacted] proposes to demolish the existing booster pump house and construct a new structure with two new 300 horsepower pumps with variable frequency drives. Along with the new structure and mechanical equipment, new controls will be added to operate and maintain system pressure from Snowbase's main control system. Along with the new booster pump house, [redacted] will install 73 more HKD tower snow guns on trails at the summit. This is in addition to the proposed snow guns outlined in ECM 16. On the Taft Slalom Trail, a new air/water line will be installed and will allow Cannon the ability make snow more efficiently on this areas of the mountain. The scope of work for removing the existing structure, building a new 20' by 20' structure, mechanical work, electrical work, and controls is outlined below.

Mechanical System

The scope of work includes demolition of the existing booster house mechanicals (pumps, piping, and accessories) and installation of new pumps, motors, piping, and auxiliaries in new booster pump house. The new pump house structure will be in the same location as previous and will be of similar size.



[redacted] will be responsible for taking delivery of the new pumps, motors, valves, and system auxiliaries (gauges, control devises, etc.) and transporting them to the desired locations of the mountain. Work on the mountain is to be performed with minimal disruption to the existing vegetation. In areas necessary, the contractor will provide necessary soil containment to prevent erosion of the trails. The work will be conducted during the summer season and any necessary shut downs will need to be coordinated with mountain personnel. Scope includes:

- Isolate existing water system.
- Remove and properly dispose of all existing piping in the existing booster pump house.
- Remove existing piping outside of house up to isolation valve.
- Remove motors (200 HP) and pumps and dispose of properly (Electrical Contractor will disconnect motors from electrical service).
- Disconnect existing air lines present in existing house.
- All electrical components will be removed by Electrical Contractor (Electric panels, disconnects, wire).

- Demolition of structure will be performed by separate contractor.
- Take delivery of new pumps, motors, valves, and miscellaneous control accessories and transport to new booster pump house ([redacted] will provide pumps, motors, valves, control items).
- Provide and install new piping for new booster pump house. Refer to attached Drawing for Details
- Proposed Piping Manifold will be 12" Pipe (assume 8' of suction and 8' of discharge pipe)
- Install welded flanges for connections of valves (refer to drawing for sizes)
- Provide taps for control devises such as pressure gauges and flow meter.
- Extend existing piping (from isolation) and connect to new pumps house piping.
- Rig and set new motors (300 HP) on pumps (Electrical contractor will provide electrical connections)
- Upon completion, fill and test system.

Electrical System

The scope of work is to remove existing electrical systems from existing booster pump house and install new electrical systems for the new booster pump house. The scope of work includes the following:

- Disconnect and remove existing feeder from the outside transformer and building service panel.
- Remove and properly dispose of all electrical components, such as panels, disconnects, outlets, lights (interior & exterior), wiring, electric heater, etc.
- Take delivery of new variable frequency drives (300 HP) and transport to new booster pump house.
- Install VFDs and wire to motors.
- Provide and install the following. Refer to attached Drawing for Details
- Main Service Entry & Power Distribution Panel
- Transformer 30 kVA 480V Y/120V
- Building Lighting and Outlet Panel (100 amp, 30 circuit)
- (2) Two 10kW Electric Unit heaters with Thermostats
- Side mount exhaust fan (3000 cfm) with switch.
- (6) Six 20 amp duplex outlets – two circuits
- (4) Four 2 Lamp Industrial T8 Light Fixtures with Switches
- (2) Exterior LED lights, photocell control
- Disconnects for Drives/Motors and starter heaters
- Provide and install new feeders from existing outdoor transformer.
- All wire (interior and exterior) to be in EMT conduit.
- Provide start-up of VFDs and motors.
- Each motor shall be metered for amperage and voltage, including all three phases, before and after installation of new motor.

Building Structure

The scope of work includes all site work, demo work, and building materials to demolish existing pump house and install a new pump house structure in the same general location. The new pump house will be insulated and contain new mechanical and electrical equipment. All mechanical and electrical will be performed by separate contractors. The new structure will be built to comply with the State's building/code requirements. The new structure will be 20' by 20' and will have a new concrete foundation. Transportation of the concrete will be via helicopter. Provide and install steel beam system within new structure to rig into new motors. Work on the mountain is to be performed with minimal disruption to the existing vegetation. In areas necessary, the contractor will provide necessary soil containment to prevent erosion of the trails. The work will be conducted during the summer season and any necessary shut downs will need to coordinated with mountain personnel. Existing concrete will be broken up and wasted per Cannon Mountain.

Controls

The scope of work includes control for the operation and monitoring of the pumps at the new booster pump house. Install a PLC Control System that will monitor suction and discharge pressure and enable and disable pump motors. The new control system will have an 8" touchscreen for monitoring and adjustments onsite and will be tied into the existing control system at Snowbase for remote monitoring and control.

Snowmaking

As part of this ECM, [redacted] is proposing to install a new water/air line for Taft Slalom. The new air/water line will be six inch and will be connected to the "J" house at the top of the trail and will have a new manual 6" valve. The new pipe will travel down the Taft Trail (approximately 2,000 feet) and terminate at the bottom with a new drain valve. Scope for this improvement Includes:

- Install new lines (water and air), 2,000' in length and will start at the "J" house junction box at the top of Taft Slalom.
- Piping is to be 6" API5L X-42 steel pipe with welded connection or by Zap-Lok System.
- Use low impact equipment for pipe transport to the installation site.
- String pipe together to improve installation efficiencies; ensure strings are manageable to reach the site.
- Prevent any debris from entering the pipe by covering opened pipe end with weld pipes (or similar) prior to pipe dragging or skidding to site.
- Piping will be installed above ground with proper supports.
- Visually inspect inside of the pipe for debris (dirt, rocks, etc.) and remove before joining sections of pipeline.
- Install new air and water hydrants (19) supplied by Snow-gun manufacture.
- Provide and install necessary manual valves for isolation.

- Work on the mountain is to be performed with minimal disruption to the existing vegetation.
- In areas necessary, the contractor will provide necessary soil containment to prevent erosion of the trails.

Along with the new air/water pipe on Taft Slalom, [redacted] will install addition tower snow gun on summit trails that are served by the booster pump house. The total amount of new HKD Tower Snow Guns added to the peak of the mountain is 73. The following table provides the size and location of the additional snow guns. The new HKD Snow Guns are in addition to the ones listed in ECM 16.

- *Table 16.3: New HKD Snow Making Equipment*

Map Ref.	Trail Name	30' Tower	20' Tower	10' Tower
41	Profile (Top)	6	0	0
2	Tranway	5	3	0
3	Upper Cannon	0	8	14
42	Skylight (Top)	4	0	0
43	Upper Ravine	0	10	4
44	Taft Slalom	19	0	0
Totals		**34**	**21**	**18**

Along with the new snow guns, new hoses will be provided along with 39 new hydrants.

The work will be conducted during the summer/fall season and any necessary shut downs will need to coordinated with mountain personnel.

Equipment Sizing Considerations

The new snow guns will be designed to meet the snow coverage requirements of the trails they serve. New pumps will be size to meet current snow making requirements (pressure, flow). Attached is a preliminary design for the proposed pumps. All new electrical equipment will be sized to serve the new motors and heating requirements.

Integration of Proposed Equipment with Existing Systems

The new snow guns will tie into the existing air and water infrastructure. New booster pump house will be integrated into the existing snowmaking water system and existing electrical distribution system. The new equipment will enhance the mountain's new making system.

Specific Commissioning Methods

A specific commissioning plan for this measure is outlined in Section 6.

Appropriate Measurement & Verification (M&V) Methods

The measurement and verification (M&V) plan for this measure is outlined in Section 7.

Maintenance Requirements

It will be the State's responsibility to maintain the new snow guns. Maintenance on the new pumps and drive will be similar to the existing system in place. Additional maintenance for the new equipment is not expected and most likely will result in a reduction in maintenance.

Special Operating Requirements

There are no special operating requirements for new snow guns.

Lead-Time required to procure the item

Procurement is expected to be about 16 weeks for the proposed quantity of snow guns. Lead times for pumps, variable frequency drive, transformer, and control is approximately 8 to 10 weeks.

Equipment, Design and Construction Documentation

Equipment will be identified in submittals provided for approval prior to procurement. Documents will be submitted to the facilities department for their review and comment. Upon approval, these will constitute the construction documents. Upon completion of the construction phase, the documents will be revised as needed to reflect "As-Built" conditions and submitted in multiple for record.

Impact on Facility Operations and Performance

The new snow making equipment will greatly enhance the snow making capabilities of the mountain which will not only reduce energy usage but enhance the marketability of the mountain, translating in increased revenue. The new booster pump house will improve the snowmaking operation and provide the required pressure to operate low-energy snowmaking equipment at high elevations on the mountain.

Appendix for ECM 16: Snow Making System Upgrades

I. *Energy Savings Calculations*

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[redacted]

Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	**16**
Measure Name:	**Snow Making System Upgrades - HKD**
Measure Location:	
Engineers:	

Site Name:		**Snowprocess**	**Summary**
Item	Units	Savings	
Electricity			
Energy On-Peak	kWh	1,308,423	1,308,423
Energy Off-Peak	kWh	1,308,423	1,308,423
Energy Total	kWh	2,616,846	2,616,846
Demand On-Peak, Monthly	kW	447.6	447.6
Demand On-Peak, Annual	kW	1,790.4	1,790.4
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			0
Natural Gas (NG)	Therms		0
Liquid Propane Gas (LPG)	Gallons		0
Steam	Mlbs		0
Fuel Oil, #2	Gallons		0
Fuel Oil, #4	Gallons		0
Fuel Oil, #6	Gallons		0
Miscellaneous	Misc		0
Water			0
Water Savings	kGallons		0
Sewer			0
Sewer Savings	kGallons		0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area	
Energy and Demand Savings Summary	
Measure ID:	**23**
Measure Name:	**Replace Booster Pump House**
Measure Location:	
Engineers:	

Site Name:		**Snowprocess**	**Summary**
Item	Units	Savings	
Electricity			
Energy On-Peak	kWh	163,571	163,571
Energy Off-Peak	kWh	163,571	163,571
Energy Total	kWh	327,141	327,141
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			0
Natural Gas (NG)	Therms		0
Liquid Propane Gas (LPG)	Gallons		0
Steam	Mlbs		0
Fuel Oil, #2	Gallons		0
Fuel Oil, #4	Gallons		0
Fuel Oil, #6	Gallons		0
Miscellaneous	Misc		0
Water			0
Water Savings	kGallons		0
Sewer			0
Sewer Savings	kGallons		0

[redacted]

Cannon Mountain Aerial Tramway & Ski Area
Snow Making System Upgrades - HKD

Operating Parameters	TMY Data	Compressors HP	Compressors CFM
Below 10° F Wetbulb	25%	1,750	9,000
11° F - 19° F Wetbulb	29%	1,750	9,000
20° F - 24° F Wetbulb	22%	1,250	6,000
24° F - 26° F Wetbulb	19%	600	3,000
26° F - 28° F Wetbulb	6%	600	3,000
TOTAL	100%	4,200	21,000

Water Capacity of Plant (gpm)	3,530	
Air Capacity of Plant (cfm)	21,000	5.00 cfm/HP
Air Capacity of Plant (HP)	4,200	6.70 cfm/kW (calculated from snowmaking logs)
Average Snow Depth Made Over Season (feet)	7.11	0.54 kW/gpm (average from snowmaking logs)
Gallons of Water per cubic-foot of Snow	3.68	

Air/Water Baseline	Water Flow (gpm)	Air Flow (cfm)	Air Water Ratio	Water Use per Hour (gallons)	Compressor kW	kWh/gallon	Quantity of Guns Operating	Air Flow (cfm)	Water Flow (gpm)	Total Water Flow (gpm)
Below 10° F Wetbulb	82	387	4.72	4,920	57.8	0.01175	30	11,616	2,460	3,455
11° F - 19° F Wetbulb	65	450	6.92	3,900	67.2	0.01722	43	19,350	2,795	3,497
20° F - 24° F Wetbulb	64	541	8.45	3,840	80.7	0.02101	38	20,541	2,432	2,918
24° F - 26° F Wetbulb	34	567	16.68	2,040	84.6	0.04148	37	20,977	1,258	1,647
26° F - 28° F Wetbulb	33	762	23.10	1,980	113.8	0.05746	27	20,582	891	1,134
Average Air and Water Flows	61.28	494.30		3,677	73.8	0.02007				

Fan Gun Baseline	Water Flow (gpm)	Horsepower (HP)	Air Water Ratio	Water Use per Hour (gallons)	Fan kW	kWh/gallon	Quantity of fans Operating	Air Flow (cfm)	Water Flow (gpm)
Below 10° F Wetbulb	111	35	n/a	6,630	26.1	0.00394	9	n/a	995
11° F - 19° F Wetbulb	78	35	n/a	4,680	26.1	0.00558	9	n/a	702
20° F - 24° F Wetbulb	54	35	n/a	3,240	26.1	0.00806	9	n/a	486
24° F - 26° F Wetbulb	43	35	n/a	2,592	26.1	0.01007	9	n/a	389
26° F - 28° F Wetbulb	27	35	n/a	1,620	26.1	0.01612	9	n/a	243
Average Water Flow	71.30			4,278	0.0	0.00000			

Air/Water Proposed	Water Flow (gpm)	Air Flow (cfm)	Air Water Ratio	Water Use per Hour (gallons)	Compressor kW	kWh/gallon	Quantity of Guns Operating	Air Flow (cfm)	Water Flow (gpm)	Total Water Flow (gpm)
Below 10° F Wetbulb	50	8	0.16	3,000	1.2	0.00040	50	400	2,500	3,495
11° F - 19° F Wetbulb	50	8	0.16	3,000	1.2	0.00040	56	448	2,800	3,502
20° F - 24° F Wetbulb	38	8	0.21	2,280	1.2	0.00052	80	640	3,040	3,526
24° F - 26° F Wetbulb	32	48	1.50	1,920	7.2	0.00373	95	4,560	3,040	3,429
26° F - 28° F Wetbulb	19	48	2.53	1,140	7.2	0.00628	170	8,160	3,230	3,473
Average Air and Water Flows	42.23	17.83		2,534	2.7	0.00105				

Existing Air/Water Usage	Air/Water Use (gallons)	Air/Water Electric Use (kWh)	Fan Gun Water Use (gallons)	Fan Gun Electric Use (kWh)
Below 10° F Wetbulb	36,590,224	429,794	6,258,155	24,646
11° F - 19° F Wetbulb	43,800,877	754,320	7,491,419	41,795
20° F - 24° F Wetbulb	32,141,099	675,290	5,497,206	44,300
24° F - 26° F Wetbulb	27,922,100	1,158,211	4,775,615	48,106
26° F - 28° F Wetbulb	8,744,833	502,502	1,495,660	24,106
Total	149,199,133	3,520,118	25,518,055	182,953

Existing Low-energy Equipment Baseline	Air/Water Water Use (gallons)	Air/Water Electric Use (kWh)
Below 10° F Wetbulb	3,409,982	1,357
11° F - 19° F Wetbulb	4,081,970	1,625
20° F - 24° F Wetbulb	2,995,351	1,569
24° F - 26° F Wetbulb	2,602,167	9,710
26° F - 28° F Wetbulb	814,964	5,122
Total	13,904,434	19,382

- Existing Low-Energy equipment includes the new HKDs
- New equipment put online for the first time Winter '14/'15
- No savings are claimed for these already purchased guns

Proposed Air/Water Usage	Low-E Air/Water Use (gallons)	Low-E Air/Water Electric Use (kWh)	Fan Gun Water Use (gallons)	Fan Gun Electric Use (kWh)	Summit Guns (gallons)	Summit Guns (kWh)	Ratnik Air/Water Use (gallons)	Ratnik Air/Water Electric Use (kWh)	Summit Guns - Low-E (kWh)	Summit Guns Savings (kWh)
Below 10° F Wetbulb	36,667,089	14,594	3,194,762	12,581	3,614,022	42,451	2,782,489	32,684	1,438	41,012
11° F - 19° F Wetbulb	43,892,888	17,470	3,824,337	21,336	4,326,219	74,504	3,330,821	57,362	1,722	72,782
20° F - 24° F Wetbulb	32,208,617	16,868	2,806,300	22,615	3,174,581	66,699	2,444,157	51,352	1,663	65,036
24° F - 26° F Wetbulb	27,980,755	104,406	2,437,931	24,558	2,757,870	114,397	2,123,325	88,076	10,291	104,106
26° F - 28° F Wetbulb	8,763,204	55,071	763,528	12,306	863,728	49,632	664,997	38,213	5,428	44,204
Total	149,512,552	208,408	13,026,859	93,397	14,736,420	347,683	11,345,790	267,686	20,541	327,141

Potential Additional Water Pumping	Increased Water Flow (GPM)	Average Run Hours	Existing Water Use (gallons)	Potential Water Use (gallons)	Increased Water Use (gallons)	Increased Pumping Use (kWh)	Increased Water Use (gallons)
Below 10° F Wetbulb	40	140	28,943,343	29,278,481	335,138	3,016	335,138
11° F - 19° F Wetbulb	5	167	35,073,319	35,123,466	50,148	451	50,148
20° F - 24° F Wetbulb	608	123	21,475,557	25,950,244	4,474,688	40,272	4,474,688
24° F - 26° F Wetbulb	1,782	107	10,529,006	21,922,428	11,393,423	102,541	11,393,423
26° F - 28° F Wetbulb	2,339	33	2,270,717	6,954,321	4,683,604	42,152	4,683,604
Total		569	98,291,941	119,228,941	20,937,000	188,433	20,937,000
		4.74	average hours per day				10.0%

67,500,000 Mittersill increase
42.00 acres
10.03 assumed snow depth
32% increase over maximum

Baseline Low-energy Water Use	13,904,434 gallons	Existing low-energy guns
Baseline Hi-energy Water Use	174,717,188 gallons	Existing Lower Cannon Fan Guns plus newer Ratnik and HKD Air/Water Guns
Baseline Recirculate Water	20,748,378 gallons	Assumed 11% based on discussion with Cannon
Total Snowmaking Water Use	209,370,000 gallons	Average Annual Amount of Water Pumped from Echo Lake
Baseline Compressed Air Electric Use	3,722,453 kWh	
Proposed Compressed Air Electric Use	917,174 kWh	
Low-E Snow Gun Savings	2,805,279 kWh	
Increased Pumping Penalty	-188,433 kWh	
Total Savings	2,616,846 kWh	
Demand Savings	447.60 kWh	Demand savings are based on load shedding one 600-hp to the offpeak period due to the air savings associated with the gun replacements

Description	Area (acres)	Required Snow Depth (feet)	Required Snow Volume (acre-feet)	Required Water Volume (kgallons)
<< Existing Guns	130.91	7.11	930.74	149,199
<< Newer Towers	12.20	7.11	86.74	13,904
<< Older Fan Guns	10.96	7.11	77.92	12,491
<<Newer Fan Guns	11.43	7.11	81.27	13,027
Totals	165.50	28.44	1,176.67	188,622
<< Existing Ratnik	9.98	7.11	70.78	11,346
<< New Towers	93.35	7.11	663.68	106,389
<< Newer Towers	12.20	7.11	86.74	13,904
<< New Portables	25.64	7.11	182.28	29,219
<<Newer Fan Guns	11.43	7.11	81.27	13,027
<< Existing Summit - High Consump	12.93	7.11	91.93	14,736
Totals	165.50	42.66	1,176.67	188,622

From Proposal
93.43 << Existing High Consumption Guns
52.18 << Newer Towers
10.96 << Older Fan Guns
11.43 <<Newer Fan Guns

Existing Conditions From Detail Inventory
130.91 << Existing Guns
12.20 << Newer Towers
10.96 << Older Fan Guns
11.43 <<Newer Fan Guns

Proposed Conditions From Detail Inventory
22.89 << Existing High Consumption Guns

93.35 << New Towers
12.20 << Newer Towers
25.64 << New Portables
11.43 <<Newer Fan Guns

Breakout of existing high consumption
9.96 << Existing Ratnik
12.93 << Existing Summit - High Consump