Sutton School Geo Study
(same as install application)

INITIAL APPLICATION

Please fill out each section below, print and sign. Send one signed original and five copies to the contact and address provided on the first page of the RFP. An electronic copy may be emailed or submitted on a CD.

Project Category (Energy Efficiency Retrofits, Financial Incentive Programs, Implementation of Transportation Projects, or Renewable Energy Technologies on Government Buildings):

Renewable Energy Technologies on Government Buildings

Applicant Name: Sutton School District
Applicant Address: 95 Underpass Rd., Sutton, VT 05867
Primary Project Contact Name, Telephone, and email address:
Tom Petit, Operations Officer 802-626-6100 X207 tpetit@cnsu-schools.org

Estimated Total Project Cost: $52,350
Funds Requested: $40,000

NOTE: All projects must include a minimum 10% match from applicants (which can be cash or in-kind) so you cannot request more than 90% of the total project costs.

Source of match funds (Describe source of funds, including pending and projected funds. Describe whether there is an outstanding request or a request yet to be made for any of the funds and the likelihood of receiving the funds, including when you expect to hear on pending sources of requested funds):

The Sutton Village School Board will access our school capital improvement fund to cover the 10% match.

Project Participants (Name and title of primary project personnel and their role in the project and their qualifications/ experience relevant to the project. Also list subcontractors including firm name and address, contact person, work to be subcontracted, and nature of subcontractor's abilities.) :

Project personnel

- **Principal:** Roberta Stradling, Principal for the Sutton Village School, 95 Underpass Road, Sutton, VT 05867. Twenty years as Vermont educator. Five and a half years experience as principal. Previous project experience – directed Windham Elementary School's participation in the grant funded construction of back up water chlorination system in collaboration with state agencies and engineers.

- **Project and Fiscal Management, Tom Petit,** Operations Manager, Caledonia North Supervisory Union, Lyndon, Vermont. Tom has been involved with maintenance and energy projects for 30 years in the public, semi-private and private sectors. He has been involved with dozens of small and large projects; including grant writing, bid specifications, bid selection, coordination of trades, project oversight, clerk of the works, project review and acceptance and final

payment. He was the Business Manager and Energy Efficiency Director of an electric utility for 10 years and is a certified energy auditor. He currently is overseeing several million dollars in federal grants including 1.4 million in ARRA funds.

- Jim Ashley, Local Geothermal Consultant, Green Mountain Geothermal, LLC P. O. Box 222, W. Danville, VT 05873, Phone: 802.684.3491, E-mail: jashley@vermontgeo.com

- Mechanical Engineer: Wayne Nelson, P.E., L.N. Consulting, Winooski, VT 05404.

- Subcontractors: Currently in the design process. No subcontractors selected.
  - All subcontractors will be pre-qualified, per DOE requirements.

Work to be subcontracted:

- The implementation of a geothermal HVAC system for the south wing renewable energy project. This project supports approximately 4,000 sq. ft. of classroom, library and office space. The geothermal HVAC system will improve the energy efficiency of the building, reduce fossil fuel consumption and implement more sustainable HVAC technology. This work will be completed through a subcontract to pre-qualified general, mechanical, well drilling, and electrical contractors.

Work Plan/Project Description (Include list of tasks to complete project; project timeline, which includes a start date and estimated completion date; quality assurance measures, including project oversight and plan to track and report required metrics; and description of the financial management plan. Staff member(s) that will be responsible for completion of the items above should be identified. Include date of construction for each existing building and/or structure that will be physically affected by the proposed project. Also describe the potential for public visibility and/or plan for promoting the site/project. Describe why this project is important to your community):

Project Description

The project will entail the replacement of the following:

- Removal of existing fossil fuel air furnace.
- Installation of a new geothermal heat pump, closed loop earth exchange heat exchangers, and energy saving controls system. $50,000
- Technical Assistance - $5,000(Geothermal consultant and engineer/designer)

The existing building at Sutton Village School is a partial two level structure with a gross area of approximately 23,000 square feet. The original building served as a church and was constructed in 1833. Attached to the old church on the north and south sides are two wings consisting of 5 classrooms, a library and several small offices. The south wing of the old section of the building has two levels. The newer section of the school consists of small offices, four additional classrooms and a multi-purpose suite (kitchen, gymnasium/performance stage, bathrooms, utilities room). This section was constructed in 1996.

Since December of 2007, we have been slowly improving the energy efficiency of our building using the recommendations in a Site Assessment completed by Norm Elkind in December of 2007 as part of a program sponsored by the Vermont Superintendents Association. This project coupled with proposal for energy Efficiency Retrofit makes this a more comprehensive application.

The furnaces that provide heat in the old section of Sutton School are about 40 years old and due to be replaced. We would like to test pilot the heating/cooling of the two level south section of the building (approximately 4,000 sq. ft.) using geothermal technology. This project coupled with our ongoing energy retrofit program supports the creation of an energy efficient building for a school population of 93 students in grades kindergarten through eight, 61% of whom qualify for Free and Reduced lunch.

The two level south section of the building will most likely net us the most benefit as it has recently been remodeled (December 2008) as a result of mold and water issues. This will give us the opportunity to see if Geothermal is a feasible option to phase in over the next decade as our primary source of heating and cooling for the whole building. (Furnaces for the newer section of building – currently 14 years old).

We are currently in the design phase of the south wing geothermal HVAC retrofit project. At this point we believe a ClimateMaster Tranquility 26, 6 ton water to air geothermal heat pump would be appropriate. This unit will be tied to the existing hot air ductwork in the 2 story addition. This unit has a rated output of 54,100 BTU's per hour when used in a closed loop configuration. This two stage unit is rated to operate at a Coefficient of Performance of 3.6 at full capacity and 3.9 when operating at partial capacity. Supporting this system will be three 400' deep closed loops between the school and the front parking lot.

The proposed engineering study will determine whether this heat pump is capable of totally heating the space without being supplemented by the existing hot air system. L.N. Consulting, Inc will complete the mechanical and electrical design work. Once design is complete, L.N. Consulting will provide bidding documentation to pre-qualified contractors to complete the retrofit. The design completion date is expected for April 2, 2010. The bids should be received by April 19, 2010. The estimated start time for the construction process is June 15, 2010. We expect the project to require seven weeks for completion date of August 15, 2010. Jim Ashley will provide the on site project management for the school and L.N. Consulting will complete the quality assurance services within their project construction administration services.

The project will be commissioned by L.N. Consulting to ensure the installation meets the design intent. The independent electrical circuits supporting the geothermal system (circulation pump and water to air heat pump) will be measured to ensure that the metrics are per the expected energy savings and design intent. Please see attached spread sheets 1-3 showing the modeling assumptions and anticipated energy savings.

The design metrics will be reconciled with the actual operating metrics by Jim Ashley and L.N. Consulting with documentation provided to Efficiency Vermont.

Project and fiscal oversight will be provided by the Caledonia North Supervisory Union Operations Manager, Tom Petit and staff.

Work Plan Overview			
Task	Responsible Party	Start	End
Preliminary Planning and Grant Production	Sutton Village School & L.N. Consulting	11/30/2009	12/8/2009
Bid Development	L.N. Consulting	12/2/2009	1/15/2010
Bid Review	Sutton Village School	4/19/2010	4/21/2010
Accepting Bid	Sutton Village School	4/23/2010	4/23/2010
Contract	Sutton School	4/26/2010	4/30/2010
Construction	Sutton School, L.N. Consulting & Subcontractor	6/15/2010	8/15/2010
Commissioning	L.N. Consulting	8/16/2010	8/23/2009
All dates scheduled to change based upon grant award and bid process.			

The public visibility for this project will be high. Sutton School maintains an active website that is constantly updated. Local news sources usually print directly from our website and we can easily arrange for both TV coverage through the local cable access station at Lyndon State College or a Caledonian Record reporter to attend a school board presentation meeting. This project has the potential to provide a positive counter balance to the potentially dismal state revenue crises related budget discussion expected at Town Meeting this year. We are in the process of contacting Lyndon State College science department to determine if they are interested in using this project as a local training site. We intend to incorporate this project into the school science curriculum. Our school would become a model site for renewable energy conversion for other schools in the district.

The school board had directed the principal, Roberta Stradling(me) to pursue alternative energy sources for the replacement of our antiquated oil heat furnaces prior to my receipt of the RFP from the State. The parents, school board and townspeople will be grateful in this current economic climate for the anticipated cost savings and supportive

of the educational benefits of geothermal technology within the school. We believe this project will be a major asset to the community as it will reduce the energy use associated with the south addition and will educate the students with regards to the importance of energy efficiency and sustainability within our schools.

Metrics: Fuel and Electrical Usage; Energy Savings

We expect an energy savings of $1,768 per year, which is a 41% energy reduction for the retrofit space, when this project is complete. *Please see attached spreadsheets pages 1- 3 indicating modeling assumptions and proposed energy savings for geothermal pump project and envelope improvements being considered.*

Required Approvals for Project (Include description of any town or school approvals received to date and any approvals yet required):
Sutton Village School, board approved pursuit of this grant on 12/2/2009
Historic Preservation permit will be sought for small section of project that is of historic nature.

Permitting (Include a list of all permitting requirements for the project and whether any of the permits have been obtained):
State Plumbing, not obtained.
State Electrical, not obtained.

Preliminary Planning/Project Development (Describe any planning or project development that has already been completed for the project, such as an energy audit or feasibility study):

L.N. Consulting retained Second Law to complete a Simple Energy Model in order to understand energy savings associated with the implementation of a geothermal HVAC system, copy attached.

Name, title, phone, and email of Authorized Representative(s):

Tom Petit, Operations Officer
802-626-6100 X 207 tpetit@cnsu-schools.org

Signature of an Authorized Representative:

Thomas Petit

Date: 12-08-2009

SECOND LAW

KAREN WALKERMAN
802-238-0880
karen@secondlaw.biz

energy modeling and consulting services

December 3, 2009

Wayne Nelson
LN Consulting
69 Union St
Winooski, VT 05404

Sutton Village School South Wing Geothermal HVAC Retrofit Energy Model:

Second Law has completed a simple energy model of the Sutton Village School South Wing Geothermal HVAC Retrofit Project. The school is modeled as follows:

Building Envelope:

Component	Description	R – value
Exterior Walls	Light Construction	R-6
Roof	Roof with 5-inches of foam insulation	R-20
Windows	Double Pane with Vinyl Frames	R-2.5

Internal Loads:

Space Type	Density	Schedule
Lights	1.0 watts/sf	Lights are on during school hours M-F, and limited during nights and weekends, off during holidays, lights are on for limited hours during the summer
Classroom miscellaneous electrical equipment	0.38 watts/sf	Follows a similar schedule to the lighting schedule
Classroom Occupancy	Approximately 30 people per classroom	Classrooms are occupied 8am to 3pm M-F during school days, limited occupancy during other times
Infiltration	Modeled at 0.50 ACH	

Ventilation:

Ventilation is modeled at about 15 cfm/person

Utility Rates:

Electricity: $0.12/kWh

Fuel Oil: $18.2/MMbtu ($2.55/gallon)

Alternatives Description:

Three models were completed:

1. Baseline System: The baseline system uses a fuel-oil fired furnace to provide heat to the spaces. The furnace is modeled with 70% full-load efficiency.
2. Geothermal System: The geothermal system is modeled with (3) 400' boreholes, and Climate-master Tranquility series heat pumps providing both heating and cooling to the spaces.
3. Geothermal System with Building Envelope Improvements: This alternative is in addition to the geothermal alternative, but demonstrates the additional savings available if building envelope improvements are incorporated into the project. Envelope improvements are as follows:
    a. Wall Insulation: overall wall R-value is increased to R-15
    b. Roof Insulation: overall roof insulation is increased to R-30
    c. Infiltration Reduction: building infiltration is reduced to 0.2 air changes per hour

Energy and Economic Results on Following Page:

	Probable Energy Use				Probable Utility Costs				Probable Carbon Impact				Peak Loads (not including ventilation)	
	Electricity (kwh)			Fuel Oil Million BTU	Electricity	Fuel Oil	Total	Savings	Electricty	Oil	Total	Savings	Cooling	Heating
	heating	cooling	Total		$	$	$	$	lbs	lbs	lbs	lbs	btu/hr	btu/hr
Baseline	0	0	9,306	174	$ 1,117	$ 3,155	$ 4,272		1,499	241,253	242,752	-	60,084	45,457
Geothermal Heat Pump System	8460	970	20,870	-	$ 2,504	$ -	$ 2,504	$ 1,768	3,362	-	3,362	239,390	60,084	45,457
Geothermal Heat Pump System with Envelope Improvements	5520	1060	17,150	-	$ 2,058	$ -	$ 2,058	$ 446	2,763	-	2,763	239,989	50,063	25,019

*Carbon impact factor based upon actual VELCO energy sources.

Thank You,

Karen Walkerman
Second Law
2 Church St Suite 3C
Burlington, VT 05401

PERFORMANCE AND SPECIFICATIONS

ASHRAE/ARI/ISO 13256-1 English (IP) Units (60Hz)

Model	Capacity Stage	Water/Water Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
		Cooling 86°F		Heating 68°F		Cooling 77°F		Heating 50°F		Cooling Full Load 77°F Part Load 65°F		Heating Full Load 50°F Part Load 62°F	
		Capacity Btu/h	EER Btu/W	Capacity Btu/h	COP	Capacity Btu/h	EER Btu/W	Capacity Btu/h	COP	Capacity Btu/h	EER Btu/W	Capacity Btu/h	COP
018	Full	26,300	15.9	30,800	5.0	28,900	24.5	25,700	4.6	26,600	19.0	19,600	4.0
	Part	19,400	16.3	23,400	6.1	22,200	30.9	18,500	5.1	21,300	26.0	16,500	4.6
024	Full	30,200	15.6	44,800	5.0	41,200	23.0	38,700	4.7	38,200	18.2	29,000	4.0
	Part	26,200	16.5	30,600	6.2	30,200	31.5	24,900	5.1	28,900	27.0	22,100	4.5
030	Full	46,400	16.7	59,000	5.0	54,600	22.5	48,300	4.7	50,600	17.9	37,500	4.0
	Part	36,100	18.0	44,300	6.2	40,700	28.7	35,400	5.1	39,000	24.9	31,200	4.6
036	Full	61,500	16.0	72,300	5.0	66,600	22.0	59,600	4.4	64,800	17.5	48,000	3.9
	Part	44,900	17.6	51,100	5.7	51,900	25.7	41,800	4.7	49,600	25.9	37,500	4.3
042	Full	65,700	14.2	86,800	4.6	77,100	19.9	70,200	4.3	71,600	16.3	53,100	3.6
	Part	52,600	16.0	58,200	5.1	59,600	24.5	51,700	4.3	57,700	21.4	45,400	3.9

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
Heating capacities based upon 68°F DB, 59°F WB entering air temperature
Ground Loop Heat Pump ratings based on 15% antifreeze solution
All ratings based upon operation at lower voltage of dual voltage rated models

ASHRAE/ARI/ISO 13256-1, Metric (SI) Units (60Hz)

Model	Capacity Stage	Water/Loop Heat Pump				Ground/Water Heat Pump				Ground Loop Heat Pump			
		Cooling 30°C		Heating 10°C		Cooling 10°C		Heating 10°C		Cooling Full Load 25°C Part Load 20°C		Heating Full Load 10°C Part Load 17°C	
		Capacity W	EER W/W	Capacity W	COP	Capacity W	EER W/W	Capacity W	COP	Capacity W	EER W/W	Capacity W	COP
018	Full	7,415	4.7	9,027	5.3	8,470	7.2	7,532	4.8	7,796	5.6	5,803	4.0
	Part	5,686	5.4	6,565	6.1	6,506	9.0	5,451	5.1	6,243	7.8	4,836	4.6
024	Full	10,610	4.6	13,130	5.2	12,075	6.7	10,756	4.7	11,196	5.3	8,499	4.0
	Part	7,679	5.4	9,027	6.3	8,851	9.2	7,260	5.1	8,476	7.9	6,477	4.5
030	Full	14,185	4.6	17,556	5.2	16,002	6.6	14,156	4.2	14,838	5.2	10,991	4.0
	Part	10,580	5.3	12,984	6.2	11,928	8.4	10,375	5.1	11,606	7.3	9,144	4.6
036	Full	18,025	4.4	21,190	5.0	20,100	6.4	17,468	4.4	18,992	5.1	14,068	3.9
	Part	13,159	5.2	14,977	5.7	15,211	8.7	12,251	4.7	14,595	7.4	10,991	4.2
042	Full	20,135	4.0	25,960	4.6	22,597	5.8	20,574	4.3	20,985	4.7	15,556	3.6
	Part	15,477	4.7	16,109	5.1	17,526	7.2	15,152	4.3	16,910	6.3	13,302	3.9

Cooling capacities based upon 24°C DB, 19°C WB entering air temperature
Heating capacities based upon 20°C DB, 15°C WB entering air temperature
Ground Loop Heat Pump ratings based on 15% antifreeze solution
All ratings based upon operation at lower voltage of dual voltage rated models

Dimensional Data

Model		Cabinet Width (A)	Cabinet Depth (B)	Cabinet Height (C)
018	in.	32.4	27.6	46.5
	cm	56.8	60.3	122.2
024	in.	32.4	30.6	50.5
	cm	66.5	77.1	128.4
030	in.	32.4	30.6	50.5
	cm	66.5	77.1	128.4
036, 042	in.	32.4	30.6	50.5
	cm	82.3	77.9	140.0

Model		Overall Cabinet Size (D)		
		A	B	C
018	in.	32.4	27.6	46.5
	cm	56.8	60.3	122.2
024	in.	32.4	30.6	50.5
	cm	66.5	77.1	128.4
030	in.	32.4	30.6	50.5
	cm	66.5	77.1	128.4
036, 042	in.	32.4	30.6	50.5
	cm	82.3	77.9	140.0

Note: add 4" (10 cm) to height for vertical downflow models

Voltage Options

Model	Volt	Hz	Phase
018, 024	208/230	60	1
030, 036, 042	208/230	60	1
	208/230	60	3
	460	60	3
048, 060	208/230	60	1

7300 S.W. 44th Street
Oklahoma City, OK 73179
Phone: 405-745-6000
Fax: 405-745-6058
www.climatemaster.com

Rev. 02/24/04

Summary

The existing building at Sutton Village School is a partial two level structure with a gross area of approximately 23,000 square feet. There are two sections of the building that have two levels: the old church constructed in1833 and the South Wing, a suite of rooms consisting of 4 classrooms, the library, connecting hallways on both levels, two small offices and a small computer server room all added in 1978. The North wing, added in 1972 consists of 2 large classrooms, a connecting hallway and two small offices. Four additional classrooms and a multi-purpose suite were constructed in 1996. The classrooms run west off of a long hallway that ending in the multipurpose room suite of kitchen, mechanicals room, 2 bathrooms and the All Purpose Room.

This grant proposal is for the implementation of a highly efficient geothermal HVAC system for the 4000 sq. ft. South wing addition. The existing south wing HVAC system is heated via a fuel oil furnace located in the central building basement which is 40 years old and due to be replaced. The existing air furnace has an efficiency rating of approximately 78%. The heated air produced by the furnace is distributed to and from the south wing addition via a 20"x 8" supply and a 20"x 8" return air duct. The air ducts then split into (2) 18"x 8" supply and (2) 18"x 8" return air ducts which are routed in soffits down the east and west perimeter of the south wing addition. The conditioned air is supplied and returned to the basement space via ceiling diffusers and through floor grilles on level one. The existing duct distribution system has a significant amount of air leakage, which as a result, contributes to high thermal losses.

The proposed geothermal system consists of (3) 525 ft. 6" boreholes that would be located to the east of the addition at the edge of the existing parking area. These boreholes will utilize 1 1/4" HDPE pipe with a U-Bend fitting and would be filled with a thermally conductive grout in order to assist in the geothermal transfer process. The primary means for space conditioning will be through a 5. 5 ton heat pump located in the basement mechanical space (currently computer server room). The heat pump shall have a COP of 4.3. We would utilize the existing duct distribution system to provide conditioned air to and from the south wing by ducting the heat pump supply and return ducts to the existing 18"x 8" supply and return air ducts. All of the existing air duct shall be resealed in order to minimize air leakage that is contributing significantly to thermal losses. The geothermal heat pump loop water shall be distributed through the system via a hydronic circulator on a variable speed controller. The variable speed controller will reduce electricity usage based on flow requirements.

An energy model was constructed utilizing a highly detailed software simulation program called eQUEST. This program utilizes data specific to the building and modeled to simulate building energy use, demand, as well as fuel and electricity usage. Information based on the existing building envelope, HVAC systems, occupancy, lighting systems, fuel usage, as well as assumptions based on a field review of the building were used to input data into the program in order to simulate the existing and proposed mechanical systems for the South Wing.

The model concluded that the existing south wing mechanical system utilizes approximately $5,450 in electricity and $3,631 in fuel oil per year, where the proposed geothermal system would only utilize $4,017 of electricity per year. The model concluded that the proposed geothermal system would provide a reduction in utility costs

of approximately $5,064, with a significant portion of the reduction in costs being due to the cutback in fuel oil usage.

Personnel

Wayne Nelson - L.N. Consulting, Inc., Winooski, VT
Wayne Nelson co-founded L.N. Consulting in 1999. Wayne has been a principal and president of the company since 1999. He has immense experience in diverse projects with master planning, conceptual design, detailed design, and construction administration. Wayne acts as the company manager and project manager for multiple large and small projects.
Prior experience includes five years as Project Engineer with Salem Engineering in Shelburne, Vermont.

Wayne is a graduate of State University of New York, Maritime College, B.E. of Marine Engineering, 1994. He holds licenses as a Professional Engineer in Vermont, New York, New Hampshire, and Rhode Island. He is LEED Accredited – 2004 and affiliated with USCG

George Martin - L.N. Consulting, Inc., Winooski, VT
George Martin began his engineering career as an engineering intern at L.N. Consulting while a junior at The University of Vermont. George completed two full summer internships at L.N. Consulting completing task design services for mechanical, electrical, and plumbing systems. Since graduating UVM in 2005 he has been responsible for the task design for a majority of the sustainable/energy efficient projects completed by L.N. Consulting. George has accumulated much experience in these aspects of building design and has been completing project management for the sustainable/energy efficient projects since the middle of 2007. He is certified as an E.I.T. in the State of Vermont.

Karen Walkerman, Second Law 2 Church St., Burlington, VT 05401 conducts energy modeling for engineering firms.

Jim Ashley, Green Mountain Geothermal, LLC, P. O. Box 222, W. Danville, VT 05873
Phone:802- 684- 3491, E-mail: jashley@vermontgeo.com

James Ashley operates Green Mountain Geothermal, LLC, a geothermal business providing consulting services for many residential and small business customers interested in geothermal heating and cooling systems. Ashley is a hydro-geologist with extensive experience with water wells. He is an accredited International Ground Source Heat Pump Association (IGSHPA) installer and is a member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). He has taken the shell training course for building energy auditors offered by Efficiency Vermont, and is an active member of the Vermont Groundwater Association. He has written articles explaining the efficiency of geothermal systems.

Tom Petit, Business Manager for the CNSU school district, has been involved in maintenance and energy projects for 30 years. Tom has coordinated dozens of small and large projects doing grant writing, bid specifications, bid selection, coordination of trades, project oversight, clerk of the works, project review, final payment and audits.

Tom was the Business Manager and Energy Efficiency Director of an electric utility for 10 years and is a certified energy auditor.

Roberta Stradling, Principal of Sutton School will coordinate activities among consultants, engineers, contractors, business office and school personnel.

System Description

The proposed Sutton Village School geothermal design is a closed loop system with (3) 525 ft 6" boreholes, each with a 1 1/4" HDPE pipe U-Bend Heat exchanger, and filled in with thermally conductive grout. A 5.5 ton Water to Air Heat Pump will heat and cool the space utilizing the water conditioned by the geothermal boreholes. Water is distributed through the heat pump and geothermal boreholes via a hydronic circulator on variable speed control located in the mechanical room. The loop system will be installed east of the bilevel south wing at the front of the building under the upper parking lot and driveway.

Sutton Village School is designed with (3) 525 ft 6" boreholes, each with a 1 1/4" HDPE pipe U-Bend Heat exchanger, and filled in with thermally conductive grout.
Maximum heating/cooling capacity of heat pump (tons) is 5. 5 tons
Soil conductivity values are unknown at this time
42% equipment, 58% installation cost
The system is Energy Star rated
Expected annual Btu of heating/cooling delivered is 47.56 million Btus/26.22 million Btus
Expected annual kWh consumed is 25,220 kWh (geothermal system only)
Expected Coefficient of Performance is 4.3

Payback

Increased cost of geothermal, geo-cost increase = $65,300.
Divided by $5,064 is a payback of 12.9 years before EECBG funding

After funding, the payback is: $65,300- $42,000 = $23,300.
Divided by annual savings of $5,064 = 4.6 years.

After EECBG funding and Technical Assistance, the payback is: $65,300- $42,000-$4,883 = $18,417.
Divided by annual savings of $5,064 = 3.6 years.

Project Notes

On January 27, 2010 Sutton School applied for a Technical Assistance Grant with CEDF and were awarded a grant in the amount of $4,883 to support a feasibility study and design services prior to submission of our Comprehensive Application. Please note I have included these funds on the Budget worksheet and a breakdown in the budget narrative section.

We have completed preliminary designs for the south wing geothermal HVAC installation project. L.N. Consulting, Inc will complete the mechanical and electrical design work. Once design is complete, L.N. Consulting will provide bidding documentation to pre-qualified contractors to complete the installation. The design completion date is expected for April 2, 2010. The bids should be received by April 16, 2010.

The estimated start time for the construction process is July 6, 2010. We expect the project to require seven weeks for completion date of late August 2010. Jim Ashley, of Green Mountain Geothermal, will provide the on site project management for the school and L.N. Consulting will complete the quality assurance services within their project construction administration services. The project will be commissioned by L.N. Consulting to ensure the installation meets the design intent.

Environmental, Economic, & Societal Impact

Estimate fuel and electricity savings (e.g., gallons of fuel oil or propane) the project will achieve.

Sutton Village School Fuel Oil: 1405 gallons.

Sutton Village School Electricity: 1433 kWh

Calculate the resulting reductions in greenhouse gas (i.e., $C0_2$) emissions using the assumptions for the amount of emissions per unit of fuel set forth below.

Sutton Village School: 33,520.5 lbs of CO2 emissions

If the project results in any increase in electricity consumption, such as the electricity required to operate a geothermal (aka ground-source) heat-pump, add the resulting $C0_2$ emissions from the increase in electricity consumption.

There is a net reduction in electricity consumption.

Summary of the net change in fuel consumption, electricity consumption, and associated $C0_2$ emissions.

The net change in fuel consumption is due to the inefficiency of the existing fuel oil furnace, controls systems, and poor envelopes. The project entails a new geothermal heat pump system, controls, and upgrades to the existing duct distribution system. These revisions are the

reason for the large decrease in fuel oil consumption. The incorporation of the geothermal system linked to the removal/minimization of the fuel oil furnace, and revised controls have also significantly reduced the electrical consumption. There is an overall electrical reduction even with the implementation of a geothermal HVAC system. In conclusion, the existing heating system is energy inefficient and the installation of this system will greatly reduce the impact on the environment once the revisions are complete.

New jobs created:

1.12 New jobs created through this funding
According to the Vermont Department of Labor and Economics – Demographic profile of Vermont 2009, the annual income per capita is $37,483.
$42,000 (EECG Request)/37,383 = 1.12

National Environment Policy Act Compliance Certification

Signed and attached

Waste Removal Plan

None required

Vermont Division for Historic Preservation

Adverse effect review letter attached

Budget Narrative for design Work

As noted earlier, we have received a grant from CEDF for $4,883 that will cover Technical assistance costs as outlined below in section A. Section B outlines the rest of the engineering, design and technical assistance costs associated with the project.

The personnel rates are as follows:

Wayne Nelson	$135.00 per hour
Karen Walkerman	$125.00 per hour
George Martin	$100.00 per hour
Jim Ashley	$ 35.00 per hour

A. Work Plan Overview - Pre-Comprehensive Application Submission – covered by Technical Assistance Grant

Task	Staff Member	Hours	Start	End
Field Survey	Wayne Nelson	8	2/4/2010	2/8/2010
Energy Model	Karen Walkerman	12	2/6/2010	2/12/2010
Systems Design	Jim Ashley	45	2/6/2010	2/20/2010
Systems Design	Wayne Nelson	10	2/16/2010	2/20/2010

Pre Comprehensive Application Expenditures

Task Budget	Total	Match	CEDF Grant
Field Survey:	$1,080	$108	$ 972
Energy Model :	$1,500	$150	$ 1,350
Systems Design I: JA	$1,575	$400	$ 1,175
GM	$1,350	$135	$ 1,215
Expenses	$171		$171
Totals	$5,505	$ 793	**$ 4,883**

Reimbursed Expenses:

Travel: 2 trips from Winooski, VT. @ 150 miles per trip -300 miles @0.50 per mile =150.00

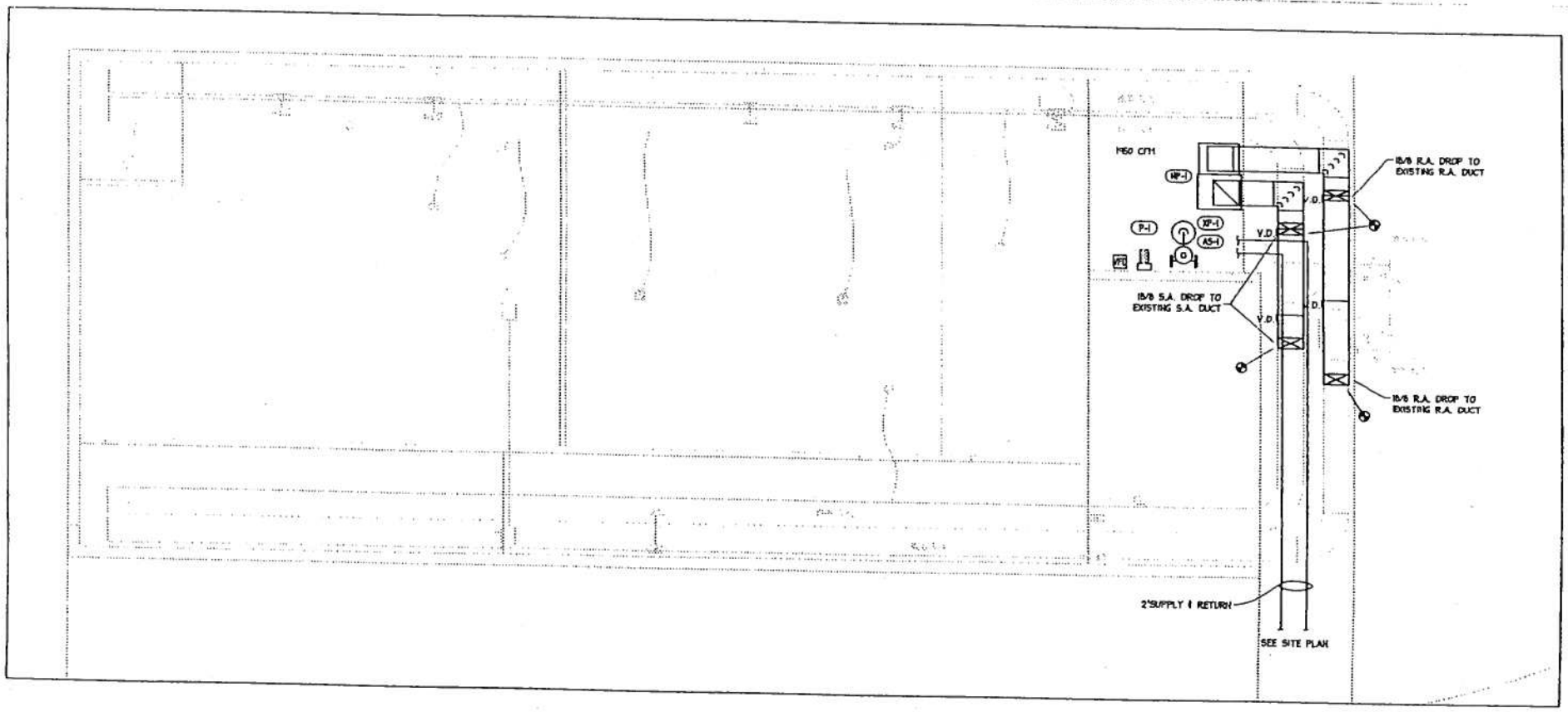
Supplies: 4 drawing plots at $10.00 each for 40.00

Total Reimburse Expenses = $190.00.00 - Match @$19.00 = CEDF Request of $171.00

B. Work Plan Overview - Post Comprehensive Application Submission

Systems Design	George Martin	24	2/16/2010	3/12/2010
Bid Review	Wayne Nelson	4	4/16/2010	4/23/2010
Construction Admin	Wayne Nelson	20	7/6/2010	8/26/2010
Project Management	Jim Ashley	30	2/16/2010	8/26/2010
Commissioning	Wayne Nelson	8	8/26/2010	8/27/2010

SHEET NO. M2	PROJECT NO. 08643	SCALE: 1/4"=1'-0"	PROJECT TITLE: SUTTON VILLAGE SCHOOL GEOTHERMAL GRANT SUPPORT	SHEET TITLE: MECHANICAL NEW WORK PLAN	NO. DATE REVISION	DRAWN: CJM	CHECKED: MSH	APPROVED:	DATE: FEB. 16, 2010	L.N. CONSULTING, INC. P.O. BOX 65178 BURLINGTON, VT 05406-5178 TEL: (802) 655-1753 FAX: (802) 655-7628	



① LEVEL ONE MECHANICAL LAYOUT
1/4"=1'-0"