

Project Title

Time for Net Zero Energy Buildings on UVM's Campus

Person who proposed it

Student co-authors of proposal: Jack Locker (ENVS '24), Sky Gale (ENSC '23), Cat Mawn (ENVS '24) and Jack Goodman (ENVS '23).

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Decision

Funding Approved for Plan B with recommendations for guidance

Budget

Plan A: \$31,021

Plan B: \$3,615.36

Project explanation

We feel the Net Zero Energy and Education Plan that has been followed by RSENR for almost 10 years has put the school in the position to proceed to the final step of achieving NZE in two of the school's buildings, Aiken, and Bittersweet. Rubenstein has been adhering to the following three step plan to minimize emissions for all four of their buildings:

Step 1- quantify baseline energy use for electricity, heating, and cooling (completed from 2016 through 2021);

Step 2- conduct energy audits and install efficiency upgrades to make the buildings Net Zero Ready (completion in 2022); and

Step 3- add renewable energy to balance the energy use of their buildings (Later in 2022 RSENR will have on-site RECs for approximately 400,000 kWh of renewable solar energy) and claim NZE for Aiken and Bittersweet.

We propose 2 possible plans to accomplish Step 3 and achieve Net Zero heating of Aiken and Bittersweet.

Plan A- Net Zero Energy Now

In our preferred Plan A to quickly create NZE buildings, we propose that Step 3 of the NZE plan be conducted in two phases: an immediate short-term solution to achieve NZE in both Aiken and Bittersweet followed by a long-term phase to determine a more sustainable approach to achieve NZE heating and cooling of Aiken and heating of Bittersweet.

In the immediate short-term solution of Step 3, we propose the purchase of locally sourced renewable natural gas (RNG) through Vermont Gas to cover the heating and cooling of Aiken and the heating of Bittersweet.

Cost of RNG and NG: On average (2016-2021 data), the University currently pays \$5,359.97 for Aiken and \$1,090.29 per year for Bittersweet natural gas use. The cost per year for purchasing local RNG for Aiken is \$16,752.36 and \$3,400.72 for Bittersweet.

Funds requested for RNG: Therefore, the money requested from the Sustainable Campus Fund in Plan A of this proposal would be \$11,392.39 more for Aiken and \$2,310.43 for Bittersweet per year to immediately make both buildings NZE.

The cost of purchasing local RNG: For 2 years for Aiken and Bittersweet is \$27,405.64 or only a 0.624% increase of the University's total natural gas budget.

The electricity used in Aiken and Bittersweet will be balanced by the on-site renewable energy generated by RSEN's existing solar panels on Spear Street, creating UVM's first NZE buildings. Our budget requests funding for two years of local RNG because we estimate that conducting an energy audit, increasing the energy efficiency of Bittersweet, and determining the best technology for the heating and cooling of Aiken and Bittersweet will take two years. Feasible technologies for heating and cooling include air source heat pumps, geothermal heat pumps, and development of a digester fueled by UVM food waste and manure produced by the Universities dairy farm.

In the second long-term phase for step 3 of Plan A we propose the creation of an internship position in which a student will

work during the summer of 2022 with UVM physical plant, UVM financial administration, and the Office of Sustainability personnel to assist with the creation of NZE buildings

Hiring Process: Will consist of a call for applications in the Greening of Aiken class and other applicable courses and then followed by an interview process of qualified candidates. The intern will be selected based on their knowledge of energy systems and UVM administrative procedures.

Supervision: We hope that the intern will be supervised by a group of mentors from the various departments as there is not a perfect mentor for all components of this project. Gary Hawley will be the faculty member who approves of hours and conducts weekly meetings with the intern.

Responsibilities: Besides assisting with the purchase of local RNG, the intern will help coordinate an energy audit of Bittersweet to maximize the buildings efficiency and contribute to the process of validating the solar RECs from RSENR's solar panels. Finally, they will help determine the most feasible long-term option to transition Aiken and Bittersweet to low emission renewable energy sources for heating and cooling.

Plan B- Net Zero Energy Research and Communication

In plan B, we propose that step 3 of the RSENR emission reduction plan begin with the creation of an internship position during the 2022 summer.

Hiring Process: Same as Plan A above

Supervision: Gary Hawley will be the faculty member who approves of hours and conducts weekly meetings with the intern. The intern will engage with UVM physical plant, UVM financial administration, and the Office of Sustainability personnel.

Responsibilities: The student intern will gather information on

what RSENR has done to make Aiken and Bittersweet as energy efficient as possible, how past funding has contributed to this work, student opinions on the creation of Net Zero buildings, and the institutional/environmental necessity of creating Net Zero buildings on UVM's campus.

Significance of responsibilities: This information will aid UVM to better understand why purchasing local RNG is the next logical step in creating Net Zero buildings. This information will be used to provide more evidence for a fall 2022 SCF proposal in which we will propose the purchasing of local RNG to create Net Zero buildings. This will be a short-term solution to achieve Net Zero heating as we will submit another proposal to the SCF in spring 2023 to determine the most feasible approach to implementing more affordable and sustainable technology to heat and cool Aiken and heat Bittersweet.

This project will provide benefits for many present and future UVM community stakeholders particularly students interested in building energy efficiency. The NZE buildings will attract prospective students who value institutional responsibility in addressing the climate crisis and lead to more competitive applicants selecting UVM as their desired school of higher education. The student intern will be provided with paid work, research, and networking experience.

This proposal is a critical piece that will help UVM meet some of the goals of the Climate Action Plan. Although this project is modest, it will provide data for two buildings that have reached NZE. This data can be viewed as a beta test to determine how other University buildings can improve the sustainability of their buildings.

UVM has the opportunity to be a leader in addressing the local impacts of the climate crisis by taking action to reduce campus GHG emissions. This proposal will demonstrate the feasibility of NZE buildings so we can take action before the impacts of climate change become prohibitively expensive to counteract.

Budget table

Plan A

Student Intern	\$3,360	\$14 per hour, 20 hours a week, for 12 weeks
Administrative cost of Intern	\$255.36	7.6% Benefit for student employee
Purchase local renewable gas for Bittersweet for 2 years	\$4,620.86	Short term solution to make Bittersweet heating NZE
Purchase local renewable natural gas for Aiken for 2 years	\$22,784.78	Short term solution to make Aiken heating and cooling NZE
Energy Audit of Bittersweet	\$0	RSENR has funds to run this audit

Plan B

This Money will Supply	Requested funds	Justification
Student Intern for Summer 2022	\$3,360	\$14 per hour, 20 hours a week, for 12 weeks
Administrative cost of intern	\$255.36	7.6% Benefit for student employee
Energy Audit of Bittersweet	\$0	RSENR has funds to run this audit