ASURE

APPALACHIAN STATE RENEWABLE ENERGY INITIATIVE

Annual Report

2022-2023

Compiled by Ransom Cope, Historian

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Introduction to the REI

Purpose of the Annual Report

This document has been prepared to assist in the proceedings in recognizing the REI Committee's ability to make responsible decisions for the allocation of student funds. We understand that students have never before been in the position of being accountable for such large a sum of money and that there may be some hesitation on the part of the Administration. The following document is being provided to assure you that the decisions made on behalf of the Committee will be done in a thorough and legitimate manner. We are ready to fulfill the responsibilities that have been charged to us.

Included in this document is information regarding the history of the REI, the formation of its committee, the students' involvement, and the rules that govern the committee's decision making process. A set of appendices have been attached to provide further documentation of specified events. You will find minutes from the Board of Governors, the Faculty Senate, the REI Committee and other correspondence pertinent to the operations and decisions of the Committee.

We appreciate your help in resolving this issue. Thank you for taking the time to review our progress. Please let us know if there is any additional information that we can provide for you. We are excited to begin fulfilling our commitment to the student body through the implementation of renewable energies. With your help, we are able to stand proud behind Appalachian as it transforms into a more sustainable campus, and serves as a role model for other schools in the UNC system.

- Annual Report 2004-2005

This Initiative has come far from its close-knit group of founding members whose foremost efforts were introducing renewable energy to the ASU campus and proving the effectiveness and worthiness of it to the student body and to the University.

We are now an organization of 40 members with 16 board positions and four subcommittees that work in tandem to implement renewable energy and energy efficiency technologies across campus, update the aging systems within buildings, promote engagement with the newest forms of high-efficiency infrastructure, and increase awareness of the need for green energy technologies.

This document will build off of the history, projects, and efforts of previous years to summarize the REI's cumulative impact, provide comprehensive evidence to support our utilization of student funds, and outline the future that we envision for this Initiative.

Mission Statement

"Reduce the environmental impact of Appalachian State University by implementing renewable energy technologies, investing in energy efficiency projects, and promoting campus engagement."

History

In February of 2004, the idea for an ASU Renewable Energy Initiative (REI) was conceived by Ernie Hodgson, Fmr. President ASU Sustainable Energy Society, based upon a similar concept that was initiated at UNC Chapel Hill. With the assistance from Miriam Makhyoun, Justin Pittman, Cole McVey, and Jeff Lauckhart, a referendum was drafted to be put before the Student Government Association.

The SGA approved the referendum and, in March of 2004, a survey was presented to the student body. This initial referendum was approved with a 82% acceptance rate, voting to impose a five dollar increase per semester in each student's fees in order to fund the reduction of the University's fossil fuel consumption by the installation of renewable energy technologies across campus.

Over the summer and fall of 2004, the University Chancellor, the State Board of Trustees, and the State Board of Governors all voted to approve the fee increase. The first funds into the REI were collected in the Fall of 2005 and work began in fulfilling the duties charged to the Initiative.

The passed referendum had a three-year time limit so in March of 2007, a new survey was put before the student body and they voted to maintain the REI and the $5 per semester fee with an approval rate of 93%.

The REI completed a number of projects in its early years and earned recognition for its efforts. In the fall of 2009, the REI was notified from the University that they would be promoted from their current position as an initiative within the SGA to an University Funded Organization.

Sometime between then and now, the REI transitioned to a Departmentally-Affiliated Organization, or a DAO, and has been operating as such since.

Completed Projects

Biodiesel Collaborative Solar Thermal
(Fall 2005)
The REI allocated $7,000 to the Biodiesel Collaborative which was used to purchase two 4x10 and two 4x8 solar thermal collectors. These collectors produced 100% of the heat required to produce biodiesel at the University‟s biodiesel research facility.

ASU & AppalCART Biodiesel Tank
(Fall 2005 – Fall 2006)
The REI, in partnership with AppalCART, purchased a 10,000 gallon fuel tank; The REI allocated $60,000 and AppalCART provided the remaining $40,000. This tank is used to store B-20 biodiesel which is used by both University and AppalCART fleet vehicles. The REI also allocated $2,500 for bumper stickers to promote the progressive and collaborative efforts to reduce emissions. This project has helped to reduce the University‟s annual motor vehicle emissions by 10 to 20 percent.

Biodiesel Collaborative PV
(Fall 2006 – Spring 2008)
The REI allocated $17,500 to construct a ten panel, 1.7 kW pole mounted photovoltaic array. The array is the first grid-tied system for both the University and the local utility, New River Light and Power. This 1.7 kW system was sized to meet 100% of the electrical needs of the University Biodiesel Collaborative project and produces over 2,000 kWh annually.

Katherine Harper Hall PV
(Spring 2007 – Spring 2008)
In an effort to provide additional hands-on learning opportunities for students in the Appropriate Technology program, the Department of Technology and the REI partnered to construct a 1.5 kW direct grid-tied PV system on Kerr Scott Hall. The REI funded $5,000 dollars towards this project while the remaining $7,000 was donated by the Technology Department

Peacock Hall PV
(Spring 2007 - Fall 2008)
The Peacock Hall 4 kW PV array was designed to reflect the mountain landscape in which Appalachian State University is located. The installed price of the system was over $65,000. During the system's first year of operation it produced over 4000 kWh of electricity.

REI Informational Kiosk
(Fall 2007 – Spring 2008)
In order to inform the campus community about the REI‟s projects, an informational kiosk was designed and constructed by students in the Department of Technology. The Kiosk is housed in the Plemmons Student Union and presents information regarding the REI activities.

Solar Picnic Tables

(Fall 2017 - Spring 2018)

The Peacock Hall patio solar tables are a collaboration between the REI, the Office of Sustainability, and the Walker College of Business. The solar picnic tables made from recycled plastic generate and store electricity for use day or night with 295 Watts of solar power. They feature: 4 standard 110vac outlets and 4 USB type "A" outlets, as well as 4 Qi enabled wireless charging locations integrated into the table top. The REI granted $11,295 to fund this project.

Blackburn Vannoy Farm PV, Solar Thermal, & Insulation

(Spring 2012)

The Blackburn Vannoy Farm is the Sustainable Development Teaching and Research Farm, a student and faculty-powered operation that offers students an opportunity to immerse themselves into a living lab. The 3.76 kW PV system at the Farm produces energy for the farm house where faculty and students live and work and cost $7200. When conditions are favorable, the hot water needs of the farm's daily operation are met by a 30-unit evacuated tube solar thermal system mounted on the roof of the house and cost $4600. Additionally, the residence on the property was surveyed and inspected, and was insulated in the roof and around the windows to mitigate heat loss.

Solar Homestead Sponsorship

(Fall 2011)

The REI joined in providing support for App State's entry into the 2011 US Solar Decathlon which challenges teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. The REI pledged $50,000 to support this project and the submission, dubbed the Solar Homestead, took home second place in the Communications Contest and won the People's Choice Award in this nationwide competition.

Library Traffic Circle PV

(Spring 2012)

This 6.63 kW roof-mounted system is located on the roof of the College Street Appalcart station and produces more than enough electricity to power the average US home. This project cost $30,000 to complete.

Team Sunergy Battery Pack & Sponsorship

(Spring 2018 - Spring 2019)

The REI became a platinum level sponsor for Team Sunergy when they funded all of the equipment and technical upgrades for the 2018 racing season. After placing second in the American Solar Challenge, Team Sunergy approached the REI with a proposal for an updated battery pack and control system for their solar vehicle, ROSE, in order to be the most competitive at the 2019 Bridgestone World Solar Challenge. The REI granted $13,500 to this project.

Broyhill Wind Turbine

(Spring 2005 - Spring 2010)

The REI's second biggest project to date, the 100kW wind turbine located at the site of the old Broyhill Inn and Conference Center has been a defining piece of the ASU landscape. This project was developed over many years and, through a partnership with New River Light & Power, was constructed in 2009 to a shared bill of $523,000. The cost was split $304.000 from the REI, $218,000 from NRLP, and $1000 from the senior class of 2009.

PSU Solar Thermal

(Fall 2009 - Spring 2010)

The longest running project of the REI is a domestic hot water solar thermal system on the roof of Plemmons Student Union. This 42 panel system saves approximately $10,000-$15,000 annually in energy consumption and cost $153,000. Through this complex and issue-riddled process, the system was completed in May of 2010 and the REI contributed $15,300.

Summit Hall Solar Thermal

(Spring 2012 - Fall 2012)

This solar thermal system is a pressurized glycol system consisting of 72 flat plate solar thermal collectors that provides hot water for the 330 students that live in the tallest building on campus. The REI partially-funded this project with $131,000.

Big Belly Solar Compactors

(Spring 2011)

The BigBelly Solar Compactor is a patented compacting trash receptacle that is completely self-powered using solar power for 100% of its energy needs. The BigBelly unit takes up only as much space as the footprint of an ordinary trash receptacle, but its capacity is five times greater. A total of 4 stations were purchased and placed on Sanford Mall, near the Library, and near the Central Dining Facility.

E3 House PV

(Fall 2009 - Spring 2010)

The Energy, Environment, and Economic House is an innovative design to replace FEMA disaster relief trailers. The REI granted $30,000 to Nick Hurst, an Appropriate Tech grad student, to install a 3kW PV array on the house to make the battery-backed and grid-tied system completely self-sufficient.

IDEX mobiLANDING PV

(Spring 2018)

The REI collaborated with the IDEX mobiLANDING project in order to equip the structure with solar. This project cost $2,150.

State Farm Data Center PV Array

(Spring 2019 - Fall 2022)

The largest PV project that the REI has completed is the 99.9 kW PV array located at the ASU State Farm property. This system produces over 130,000 kWh of electricity per year and this project cost over $475,000 to complete.

College of Education Solar Thermal to PV

(Spring 2018)

Our newest and smallest solar thermal system, with just four collector panels, helps to preheat the water used in the Reich COE.

Legends EV Charging Stations

(Spring 2015)

This system, a four-station electric vehicle charging station, is capable of producing up to 5Kw of clean, renewable energy to power the charging process. The station, located in Legends parking lot on Hardin Street, is the university's first solar powered system dedicated to transportation. The REI provided $50,000 to cover the cost of the photovoltaic components of the charging station including the 5 kW solar photovoltaic array, the structure canopy, an inverter, charge controller and a campus compatible, web-based monitoring system.

Police Parking LED Upgrade

(Spring 2017)

This energy efficiency project was in collaboration with the ASU Police Department to convert the T8 bulbs in the Rivers Street Parking Deck to LEDs. This cut the amount of bulbs in the structure in half and will pay itself off within 7 years. The total cost of this project was $17,500.

College of Health Sciences PV

(Spring 2018)

This 57.8 kW system consists of 214 panels and is the largest photovoltaic system on campus and produces enough electricity each year to power the equivalent of 8 US homes.

Frank Hall Solar Thermal & PV

(Fall 2009, Spring 2018)

The original solar thermal system was a pressurized glycol system consisting of 42, 4’X10’ solar thermal collectors that served the residents of Frank Hall. When supply/demand issues for hot water arose for the building, the REI decided to conduct the first and only retrofit to date. The solar thermal system was replaced with a 36.2 kW solar array at a cost of $120,000

Art Bus PV

(Spring 2019)

This project was a collaboration between the Art Department, the Office of Sustainability, and the REI to build out a 2000 Thomas Built Freightliner FS-65 school bus as a mobile art workshop with interior electricity provided by solar. The Art Department and the Office of Sustainability contributed monetary support, while the REI donated six solar panels to the project.

College of Health Sciences PV

(Spring 2018)

This 57.8 kW system consists of 214 panels and is the largest photovoltaic system on campus and produces enough electricity each year to power the equivalent of 8 US homes. This project cos

State Farm Solar Lab Battery System

(Spring 2012)

This research facility is located at the ASU State Farm complex and serves as a teaching and research lab for the sustainable technology department. The REI split the $33,000 cost of this project with the sustainable technology department.

Alumni Hall Window Film
(Spring 2022)
This low-cost, high-impact project was to install Huper Optik Ceramic 35 window film across the south-facing windows of the McKinney Alumni Center in order to lower cooling costs and reduce heating costs for the building. This project totaled out to $6,370.

Chapell Wilson Window Film
(Spring 2022)
This is another project that paid for itself in the very short term. This project was to add Huper Optik Ceramic 35 across 145 window panels in one of the oldest buildings on campus, Chapell Wilson Hall. This reduces the heating and cooling costs for this building and takes another step towards our goal of getting the building LEED certified. The project cost totaled $17,875.

Rankin Science West Window Film
(Fall 2021 - Spring 2022)
This project was a collaboration between the REI and Dr. Liutkus-Pierce to allow for their offices to maintain temperature control. This window film was later extended to cover the entire entrance of the building and totaled to a cost of $7,000.

ROTC Offices LED Upgrade
(Spring 2022)
As a part of the REI's goal of upgrading the 25,000 non-LED light fixtures across campus, this project was the replacement of 65 T8 light fixtures within the ROTC offices in the Varsity Gym with 59 CREE ZR troffers, 6 battery backup fixtures, and 20 occupancy sensors. This project amounted to $10,350.

Rankin Science South Duct Sealing
(Fall 2022)
This energy efficiency project was executed in conjunction with the university's Facilities Operations to use aerosolized sealant to coat the insides of the air ducts in Rankin Science North and South over the winter break of 2022. The REI granted $40,000 for the duct sealing of Rankin South.

NRLP Green Power Purchase
(Fall 2021 - Fall 2022)
The local energy company owned by ASU, New River Light & Power, opened a program to the public to pay a premium in order to allocate energy from a nearby hydroelectric dam to your home. The REI has decided to participate in this program for the last two years and purchase $50,000 of energy blocks in 2021 and 2022 in order to offset the university's need for nonrenewable energy sources.

Academic Year 2022-2023

Goals and Intentions

We had three main goals for this year:

1. Maintain our efforts in the implementation of renewable energy technologies and energy efficiency upgrades across campus.

2. Continuously evaluate ourselves and the REI in order to improve our processes, organization, and effectiveness.

3. Work to improve on-campus engagement and increase interaction with the student body.

Meeting Dates, Times, & Locations

Fall 2022
Board Meetings: Mondays 5pm - 6pm, Katherine Harper Hall 030
Public Relations & Outreach Meetings: Tuesdays 5pm - 6pm Appalachian Hall 161
Project Management Meetings: Wednesdays 5pm - 6pm Katherine Harper Hall 178
Data Management Meetings: Wednesdays 6pm - 7pm Katherine Harper Hall 178
General Committee Meetings: Fridays 2pm - 3pm Reich College of Education 024

Spring 2023
Board Meetings: Mondays 5pm - 6pm Appalachian Hall 085
Public Relations & Outreach Meetings: Tuesdays 5pm - 6pm Appalachian Hall 161
Project Management Meetings: Wednesdays 5pm - 6pm Katherine Harper Hall 178
Data Management Meetings: Wednesdays 6pm - 7pm Katherine Harper Hall 178
General Committee Meetings: Fridays 2pm - 3pm Appalachian Hall 085

REI Membership Fall 2022

Board

Chair - Caleb Barber
Vice Chair - Fauna Jorgensen
Project Management Chairs - Joey Crews, Jackson Hager
Public Relations & Outreach Chairs - Leia Ross, Emily Hodges
Data Management Chair - Caleb Barber
Treasurer - Max Kleban
Secretary - Daniel Hayes
SGA Representative - Blake St. Romain
Webmaster - Duncan Burns
General Members - Maddie Minton, Jackson Lamb

Student Members

Ransom Cope, Kaden Cusack, Hannah Armstrong, Erin Nash, Eli Orians, Chandler Medford, Kristen Applebaum

Advisors

Jim Dees - Office of Sustainability
Jonathan Pierson - ASU Energy Manager

REI Membership Spring 2023

Board

Chair - Joey Crews
Vice Chair - Fauna Jorgensen
Project Management Chairs - Duncan Burns, Jackson Hager
Public Relations & Outreach Chairs -Emily Hodges, Erin Nash
Data Management Chairs - Eli Orians, Kristen Applebaum
Treasurer - Max Kleban
Secretary - Daniel Hayes
SGA Representative - Blake St. Romain
Historian - Ransom Cope
Social Media Manager - Hannah Armstrong
Webmaster - Kristen Applebaum
General Members - Maddie Minton, Jackson Lamb, Chandler Medford, Kaden Cusack

Student Members

Eli Lyons, John Macdonald, Milena Garcia-Carillo, RyLee Wadman, Samantha Cullen

Advisors

Jim Dees - Office of Sustainability
Jonathan Pierson - ASU Energy Manager

Renewable Energy Projects

Continued Work at State Farm and Unveiling

Following the conclusion of the Spring 2022 semester, there were a few things holding up the completion of our largest project to date, namely the malfunctioning transformer and incompatible data collection softwares. These issues were slowly resolved over the course of the year and culminated in the unveiling of the State Farm Data Center Solar Array. Club members, faculty, and local news were all in attendance as we officially cut the ribbon and began utilizing the production from the solar array. On average, the array produces enough electricity to offset about 30% of the energy usage of the App State Data Center.

Walker Hall Charging Stations

Designed, proposed, and funded during the Fall 2022 semester by Project Management Chair Joey Crews, this wireless charging-enabled solar trellis from Enerfusion arrived and was installed in the summer of 2023 in the front lawn area of Walker Hall.

Adapting to Plans for Campus Development

As a part of our efforts to achieve our outlined goals, a large portion of this year was dedicated to developing master plans for long-term projects, implementing new processes for creating new projects, as well as strengthening our connections with App State's Planning, Design, and Construction and Facility Operations. We made considerable progress on a master plan for Chapell Wilson Hall; with a multi-year goal of getting the building LEED certified, our priorities will be set on maximizing the efficiency of interior systems and then working towards the installation of renewable energy. Additionally, as we have worked closer with Design and Construction, we have had the opportunity to develop and fund projects in areas where we can have the most impact.

Energy Efficiency Projects

Rankin Science Duct Sealing

With contractors already going to be on-site over winter break to perform a duct sealing project on Rankin Science North, we proposed funding to go forward with a duct sealing of Rankin South to happen in tandem. This project was funded 50% from the REI and 50% from the University. It consisted of sealing outlet and inlet vents in the building and spraying an aerosolized silicon-based liquid that coagulates upon contact with the metal ducts, sealing any size leak or hole in the duct system. This process yields an energy savings of 148,762 kWh per year and will be paid back under 4 years.

Doughton Hall LEDs

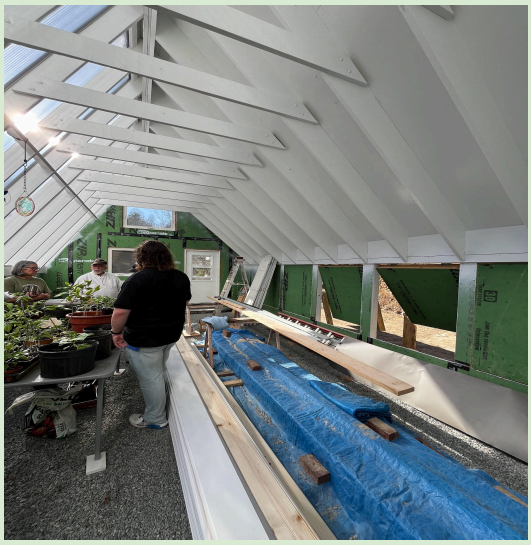
A retrofitting/upgrade of Doughton Hall with LEDS, this was a partnership with housing as they paid for installation, and will continue to pay for maintenance. This project will increase the building efficiency and save a total 105,286 kWh per year.

Belk Library LEDs

This project assisted facilities in converting all the lights and fixtures in the library to LEDS. In total, this will save 537,975 kWh annually. The total cost of this project was $60,000. This fits our mission statement by greatly reducing campus emissions using energy-saving measures. Annual projected kWh savings are 537,975 kWh, with a peak demand reduction - 89 kW. Annual avoided costs are anticipated to be $55,411 with a simple payback of an estimated 5.3 years. Additionally 193 MT eC02 per year will be avoided.

Outlook For REI

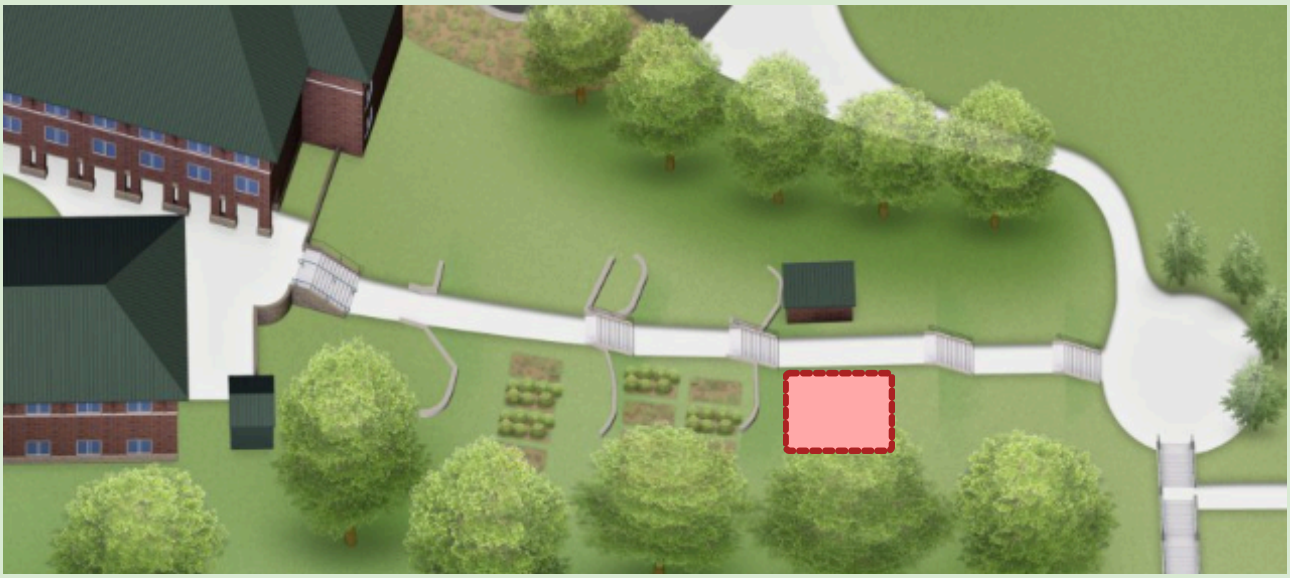
Future Projects



SD Suncatcher Greenhouse

REI has toured and purchased the plans for a Suncatcher Greenhouse, a high-efficiency greenhouse designed locally by a retired professor. Working with the Sustainable Development department we have already picked a site and planned the preliminary construction.

The goal of this project is to purchase and install a passive/efficient greenhouse in the Sustainable Development Civic Garden to support student learning and student community engagement. The greenhouse would be a space on campus for hands-on learning, conducting research, and growing plants efficiently, such as germination for the plots in the garden..

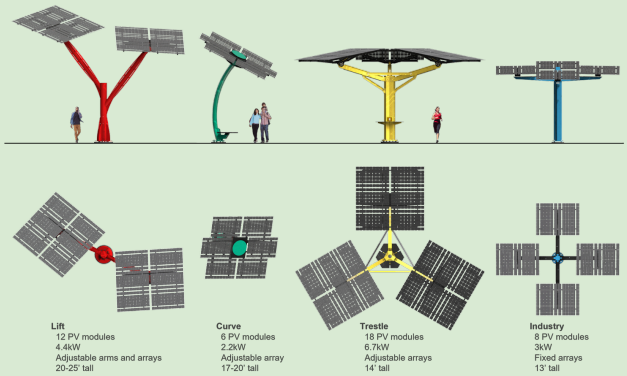


Hickory PV System

The Hickory Campus rooftop is currently solar-ready. The max system size DC is over 160kW. The approximate cost of the project is around $700,000-800,000. Our budget proposal plan is to offer approximately $400,000 in hopes that App State will match our offer and proceed with the project.

Spotlight Solar Tree

Spotlight Solar Trees are a smaller project that can be installed on campus. Four designs are available: curve, trestle, industry, and lift. The trestle is the biggest, with 18 PV modules and 6.7kW. The lift has 12 PV modules and 4.4kW, the industry has 8 PV modules and 3kW, and lastly, the curve is the smallest with 6 PV panels and 2.2kW. These solar trees could be installed on campus and attract attention to REI.



Our Mission for the Coming Years

The SGA, in tandem with REI, have pledged their continued effort to combat climate change. For the students of Appalachian State, the effects of climate change on the planet and the desire for independence with alternative energy resources continue to be a pressing concern. It is a sad fact that hopelessness and anxiety for our planet's future cloud the zeitgeist of our generation. This however has not been the only defining trait of the young people of today. In them, we see fighters, dreamers, those with an indomitable drive to help others. REI is the product of the dreams of these young people. It has served as a beacon for the future and proof that if people work hard enough we can enact real change in our communities. That a ragtag team with enough moxie can grow into a massive organization.

People care, people have it in them to work toward a greener future. REI sees ourselves continuing to be a voice for these people. We will continue to offer them hope and a path to realizing their goals to protect the earth and improve this school we all love.