

School Uplift: An Inspiring Program to Save Energy in Schools of Disadvantaged Communities

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ABSTRACT

The Tennessee Valley Authority (TVA) EnergyRight® School Uplift Program, launched in 2020 in conjunction with the State of Tennessee’s Energy Efficient Schools Initiative (EESI), focuses on providing Strategic Energy Management (SEM) training and capital improvement funding to schools in under-served areas of TVA’s territory. Through behavioral and operational changes, SEM helps schools make smart energy choices that save money through decreased energy use and improve facilities where students, teachers, and staff learn and work. Through SEM, students and the community engage and learn about the capabilities and benefits of energy conservation and renewable energy. Following SEM, schools are invited to compete for grants funding energy efficiency and decarbonization improvements or learning environment improvements. Inclusive of its third year, the program will have engaged 150 schools, 90,000 students and faculty, and resulted in over \$8 million in lifetime energy savings collectively for all schools.

This discussion provides an overview of the program design and implementation, followed by insights from the K-12 schools including examples of student-driven efficiency messaging and engagement. We apply a deeper focus on completed projects in underserved school districts in TVA’s territory. Topics will include low-cost operational and behavioral measures specific to schools, funding partnership opportunities, and an overview of gamification as a key driver for participation among schools in the form of competitions among school districts and between students and teachers. From student council pledges to YouTube videos, these students never ceased to amaze with their creative perspectives of saving energy.

Introduction

Tennessee Valley Authority (TVA) is the largest public power company in the United States. It stretches across the Tennessee Valley (Valley) and supplies power to more than 10 million people in seven different states in the southeastern United States. TVA partners with 153 Local Power Companies (LPCs) comprised of both municipal utilities and regional cooperatives that assist with the distribution and sale of electricity TVA generates for end-use customers.

“To make life better for the people of the Tennessee Valley through the integrated management of the region’s resources.” (TVA At a Glance). This is TVA’s mission that started during the agency’s creation in 1933. This mission continues today and takes many different forms. One such form is a reinvestment into the Valley within our energy services group, known as the TVA EnergyRight® Business and Industry team. This team carries the mission a step further by building and implementing customer programs to “help make life better for the people who live and work in our region.” (<https://energyright.com/business-industry/>) This more

specific mission has been used to target the energy burden and carbon reduction in underserved communities.

One of the ways these community goals are accomplished is through the School Uplift program, where we focused our efforts on a key customer segment, K-12 schools. Throughout the Valley, schools represent the heart and a portion of the identity of thousands of unique communities. Schools, particularly those in underserved communities, do not always have the time or financial resources to take advantage of our EnergyRight incentive program offerings, so School Uplift helps bridge the gap. The program focuses on energy education and providing ways to save money with little to no capital costs while providing a competitive capital funding grant opportunity. K-12 schools are the future of the Valley and supporting the students, faculty, and staff of our schools is the driver of our efforts.

Program Highlights

Building on the success of our industrial SEM program, TVA launched the School Uplift Initiative to help public school districts make smart energy choices, thus improving learning environments and saving money through energy reduction. This effort has already engaged 54 schools and utilizes creative program design elements. This includes both needs-based building energy upgrade grants and performance-based competition for learning environment grants as well as funding partnerships such as EESI. The determination of needs is evaluated by a scoring committee which is comprised of an independent volunteer team of local energy stakeholders. Finalists receive an investment grade audit (IGA) at no charge, during which program engineers gather information on capital upgrade opportunities in the school and generate a report which includes project cost and savings estimates as well as non-energy benefits. From this report, each school identifies which projects they would like to undertake and submits their application for scoring committee evaluation.

In a separate type of grant, which encourages healthy competition and drives higher participation, the program includes a gamification approach. Gamification is scored based on three distinct categories: engagement activities, weather normalized EUI% improvement, and the use of energy coaching calls with program personnel. To continue the effort of supporting underserved schools, we provide additional bonus points for those with a higher county poverty rate in children 0-17 compared to their state average. The scores are calculated by a third party for fairness, and the scoring criteria keep the participants competitive while actively practicing the program goals of supporting underserved schools and saving energy. Providing this gamification component has produced better engagement for many of these schools. The grants are certainly an enticement to join and compete but after participating for just six months we recently heard from Sheffield City Schools in Alabama, "The best thing about the program is the actual program." Once they see how much they can save through these energy management best practices, the savings and shared purpose become an incentive all on their own.

Across the Valley, participating schools are provided with an energy coach from the program staff, with whom they have direct one-on-one monthly contact to assist them in creating a successful SEM program specific for their district and schools. This direct one-on-one relationship offers a unique approach to energy management with TVA and the LPC staff members, becoming an extension of the school's energy team. Additionally, energy coaches

provide weekly, virtual, and open-office hours to accommodate the schools' busy schedules allowing participants to login and speak directly with their coaches and collaborate with their peers to discuss new engagement strategies, future plans and energy saving ideas. To further accommodate the schools' busy schedules, TVA created an SEM experience that was more attainable by utilizing virtual meetings and relying on the Environmental Protection Agency's free ENERGY STAR® Portfolio Manager (ESPM) tool to baseline and benchmark the schools and teach them how to track their energy usage. This differs from the more robust and complicated regression model used in our industrial SEM program where product manufacturing volume must be tightly monitored. An additional benefit of teaching school energy teams ESPM, is that they can continue to track energy use and hold themselves accountable even after their engagement with School Uplift concludes.

Keeping the schools' students, faculty, and staff in the driver's seat of their individual energy management goals allows this program to thrive. Providing participants access to dedicated energy coaches, along with use of several collaborative platforms, gives power to each of the districts to foster change immediately and for the long-term future of their district and community.

Cohort Snapshot

Since starting the pilot program two years ago, TVA has served over 50 schools amongst 24 school districts with the School Uplift program (Figure 1). TVA has completed two cohorts of schools and is currently actively administering a third cohort which wraps up in May 2023. Each cohort spans one calendar year. In Table 1, below, we have provided a snapshot of our cohorts' performance.

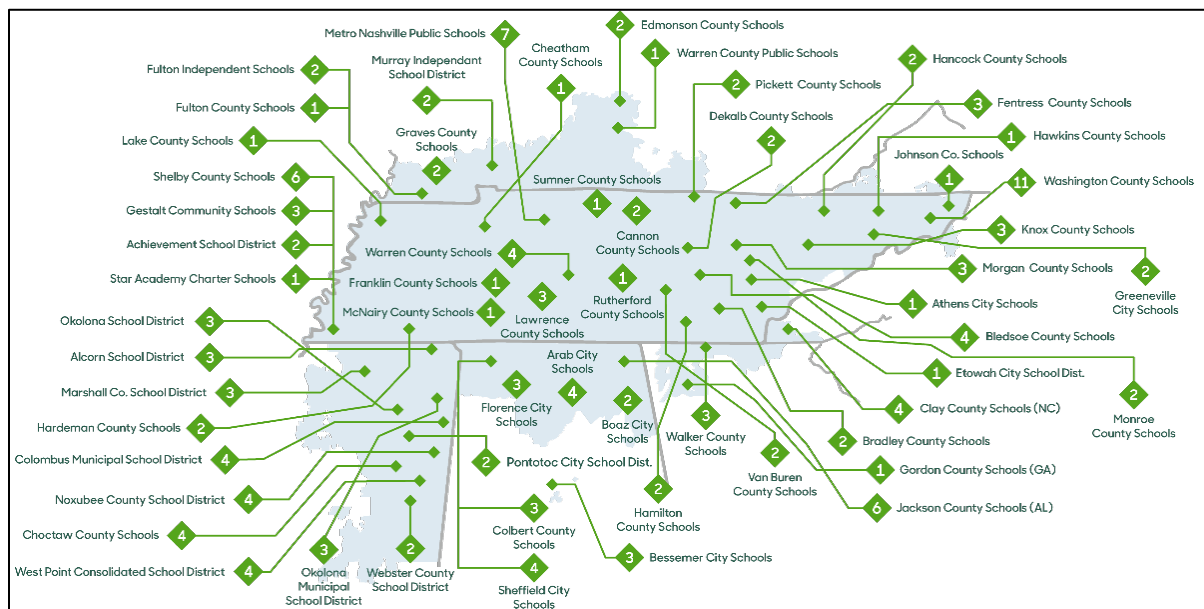


Figure 1. School Uplift Participants. Source: TRC Companies, 2020-2022.

Table 1. Cohorts 1-3 detail

	# Participating Schools	Time (1 year)	*% Poverty rate ages 0-17 over State average poverty rate (%)	Total est. SEM Savings \$ (All schools) ¹	Total est. SEM Savings kBtu (All schools)	Total Baseline kBtu (All Schools)
Cohort 1	11	2/1/2020 – 4/1/2021	100%	\$122,527 ²	4,181,857 ²	31,791,235
Cohort 2	43	5/1/2021 – 4/30/2022	76.7%	\$294,298	11,872,145 ³	137,492,744
Cohort 3	92	5/2/2022 – 4/30/2023	64%	TBD	TBD	

*Sources: USDA, Percent of total population in poverty, 2019, TRC Program Implementation Statistics, 2022.

¹ This is based off an average utility rate of \$0.10/kWh. Gas costs are estimated at \$1.00/therm.

² Negative savings and gas savings were omitted from totals.

³ Cohort 2 includes gas savings. Three schools were omitted from this total due to poor data quality.

Structure and Site Assessments

As participants in this program, each school creates an energy team of at least three to four people with various roles. Amongst each school's energy team, the participants spend about four to five hours per month working on SEM activities such as engagement strategies, awareness campaigns, entering energy data into ESPM, energy coaching calls, energy team meetings, and other collaborative activities.

We conduct a total of five workshops over the course of the year that are each two hours long and provide two sessions per workshop to allow flexibility of those who may not be able to attend the first. The sessions are also recorded as an additional option for those who miss a live session to complete at their convenience or share with additional members or stakeholders within their schools. We also provide pre-recorded webinars the participants can take at their convenience on topics mentioned in the workshops to provide more insight.

After our kickoff workshop, the participants communicate with the program engineers to schedule a Site Assessment. The purpose of this assessment is to gather low-cost and no-cost energy conservation measures (ECMs) and other behavioral modifications the school can employ to save energy. The information is gathered in a proprietary tool created to calculate energy savings on all ECMs. The engineers then create a list of opportunities for the schools with associated estimated savings in dollars and energy. This list is known as the Opportunities Register. Participants will use the Opportunities Register to implement projects that were identified in the Site Assessments. In Cohort 2, almost 2.5 MWh of energy savings were identified, or about \$312,000 of annual savings through those low-cost no-cost measures. Of the more than 500 total ECMs found, the schools initiated 118 measures. The most common implemented ECMs were:

- Continuing to retrofit LED lighting as fluorescent fixtures and ballasts burn out
- Reinsulating hot water piping

- Reinsulating refrigerant lines
- Installing computer energy management software
- Replacing weather stripping at both exterior doors and walk in coolers and freezers
- Initiating shut down procedures and checklists: classrooms at the end of days, kitchens going into breaks, and tablet/computer charge carts going into breaks

During Site Assessments, we asked the schools if there have been any unusual complaints from students or staff, as well as what they would do if they had funding to complete upgrades in hopes of gathering ECMs that are less obvious. We received several usual answers such as HVAC or lighting but did receive some unique ideas based on the needs of the staff, and we believe it helps with engagement as well as customer service through our program.

As shown below in Table 2, we have identified the top 10 most common ECMs that were identified in Cohort 2.

Table 2. Top 10 Most Common ECMs (Cohort 2)

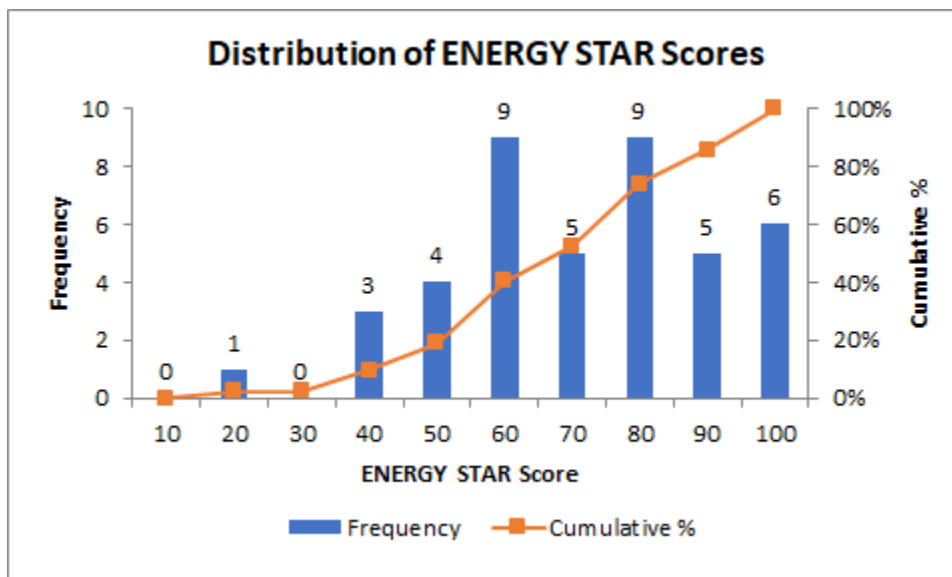
ECM Type	ECM Description	Implementation Steps	Cohort 2 Frequency
Lighting	Upgrade existing interior fluorescent lighting fixtures to LED fixtures throughout school building	Procure and install LED lighting.	29
Plug Loads	Install occupancy sensing vending miser controls to all refrigerated beverage vending machines to reduce power consumption during periods of low occupancy	Procure and install vending machine controls (Vending Miser).	28
Custom	Institute classroom shutdown procedure and educate teachers/students on how to comply. Procedure should include ensuring all windows are closed, lowering window blinds, turning off classroom lights, unplugging all decorative lighting and appliances (such as microwaves, coffeemakers, etc.), and shutting down all computers/displays.	Create and implement daily, weekly, extended break, and summer shutdown checklist as part of preventative maintenance schedule.	26
Kitchen	Unplug all unnecessary Ice Machines during periods of extended breaks (such as summer/winter break)	Implement school shutdown checklist and include ice machines as part of the ECMs.	26
Lighting	Install Occupancy sensors to control lighting throughout school building. Install wall mounted sensors for small spaces and ceiling mounted sensors for all large areas.	Procure and install occupancy sensors and necessary infrastructure (wiring, mounting).	25
Plug Loads	Install Computer Management software capable of remotely turning off or forcing sleep mode on all machines after a period of inactivity or after school hours to prevent accidentally leaving computers/displays on.	Contact IT department to implement remote computer controls.	22
Kitchen	During extended breaks, consolidate all refrigerated/frozen goods into walk-in coolers and unplug all reach-in refrigeration units	Implement school shutdown checklist and include refrigeration consolidation as part of the ECMs.	21
Domestic Hot Water timers	Install timer controls on domestic hot water (DHW) system to reduce energy use during periods of low occupancy or extended breaks	Procure DHW timer or controlled valve and implement into existing system. Ensure timing or controls are updated to match current occupancy schedules (kitchen/general).	20
Building Envelope	Replace worn weather stripping on all exterior doors to reduce heat loss. No air gaps should be visible around perimeter of doors.	Procure and replace weather stripping on exterior doors as needed.	18
Controls	Implement HVAC setback scheduling on programmable thermostats or BAS (consider weekends and holidays)	Complete setback scheduling in house.	16

ENERGY STAR Portfolio Manager

Each school is responsible for entering their monthly energy usage into ENERGY STAR Portfolio Manager, which allows them to see how they perform against other schools by viewing their ENERGY STAR Score. An ENERGY STAR Score is a measurement ENERGY STAR created that ranks how well a property is performing relative to similar properties in a similar climate zone, and in this case K-12 schools. It is on a 1-100 scale and considers several data points such as energy consumption, hours of operation, climate, and building size. Between our two cohorts, we calculated the 5th and 95th percentile to remove any outliers (7 total) to ensure quality data. In Table 3, below, results show that the average Cohort of schools in TVA territory are near but slightly below the national average ENERGY STAR Score. The Site EUI is significantly lower than the national average. This tells us that the schools use a comparable amount of energy to other schools but use less per area than other regions of the United States. This could be climate related as Tennessee schools do not use as much heating energy as other parts of the country.

Table 3. ENERGY STAR Scores

Cohorts1 & 2	ENERGY STAR Score	Site EUI kBtu/ft ²	Count
Actual Average	67.9	40.4	50
95th Percentile	98	Projects above this removed	
5th Percentile	34.3	Projects under this removed	
Revised Average	68.6	39.3	44
National Average	67	48.5	



Going Beyond Energy Savings to Improve Quality of Life

In addition to traditional savings opportunities, our program included Quality of Life measures. The goal was to let the schools know that not only can this program focus on the school buildings, but also on the students, staff, and the general learning environment. The best overall measures are ones that include both energy and carbon savings as well as a positive quality of life improvement. A well-known example of providing savings and improving quality of life is LED lighting retrofits. In the energy efficiency field, it is known that LED lighting provides significant energy and carbon savings but also has been shown to increase alertness in students and improve test scores. (Mogas-Recalde and Palau, 2021). In underserved schools, with older than average equipment, these positive impacts may be even more prevalent. Some additional opportunities recommended in our program are:

- Reducing HVAC sounds in a specific classroom
- Adding acoustical dampening to a band room that is situated next to a library
- Adding dimmer switches/controls to new lighting near projectors/smart TVs for presentations
- Checking CO2 levels/teaching schools about CO2 industry standards, if they are too high additional fresh air will help the learning environment (Haverinen-Shaughnessy, Moschandreas and Shaughnessy, 2011). Note: this will unfortunately increase energy consumption, but baselines can be adjusted to reflect code requirements
- Fixing drain pans to reduce ice in freezers.

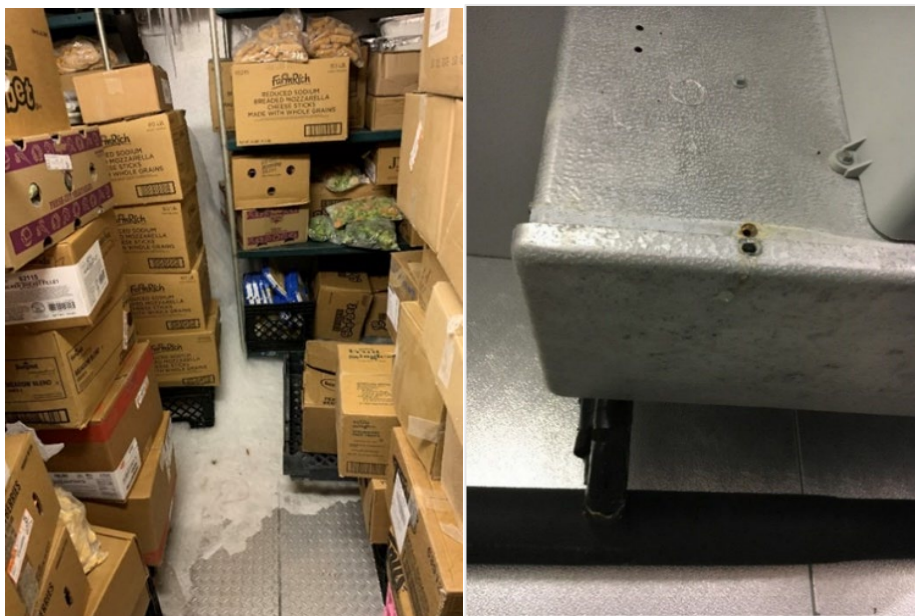


Figure 1:(left) Ice buildup in walk-in freezer, creating kitchen staff danger. Figure 3: (right) Worn down condensate pan. Currently a slip hazard but could progress with additional damage or volume. *Sources:* TRC Companies, 2022.Projects Implemented

To date, only Cohort 1 has completed their grant funded energy projects. The projects allocated \$1.2M in grants. Three schools from Cohort 1 were selected for building energy

upgrade grants, including Pickett County Elementary School, Bledsoe High School, and Van Buren High School.

Pickett County K-8 replaced the outdated RTU system for hallways and classrooms, two packaged terminal air conditioners (PTACs) with ventilation for classrooms, and LED lighting in classrooms, hallways, offices, gymnasiums, and exterior. Although dimmer switches do not provide much savings, the school purchased these as a Quality of Life improvement to make it easier for presenting on their smart devices in the classroom. Their final project was replacing the walk-in freezer door, ensuring not only savings but less infiltration and possibilities of ice buildup in the freezer. Combined, these measures are expected to save the school an estimated 120,000 kWh annually (1,200,000 kWh lifetime), and \$12,000 in annual savings.

Bledsoe High School implemented LED lighting in their hallways, classrooms, and auditorium, installed two water source heat pumps, a gas-fired HVAC unit for the auditorium, and replaced their end-of-life cooling tower with a new unit. The cooling tower replacement was a key point of interest for Bledsoe High School. The replaced tower allowed for additional cooling load to the school based on system efficiency and previous system wear-down, increased energy efficiency through upgraded mechanical equipment and cleaner water quality, and load modulation from the installation of variable speed drives on the cooling tower motors. These measures were attainable due to the grant and saved them an estimated 104,000 kWh and 550 therms annually (1,700,000 kWh and 8,250 therms lifetime), and \$10,900 in annual savings.

Van Buren High School is a combined school with Spencer Elementary School attached in the same building. The high school implemented LED lighting and the replacement of a variety of packaged HVAC equipment in the hallways, classrooms, and the gym. Similar ECMs were completed on the elementary school side as well. Combined, these measures saved an estimated 152,000 kWh annually (1,570,000 kWh lifetime), and \$15,200 in annual savings.

The total energy savings for the schools are projected to be 375,000 kwh annually (4,500,000 kWh lifetime). The benefits from this program incorporate both energy savings and non-energy benefits to the school. Beyond energy savings, these underserved grant recipients are replacing equipment that was long past the service life expectancy. Some equipment replaced had been abandoned in place causing added energy consumption, which was necessary to improve the indoor air quality and create a healthier learning environment. Due to these unique scenarios in underserved schools, a simple payback analysis is insufficient in evaluating the cost effectiveness. These schools could not afford to take advantage of energy efficiency incentive offerings and these grants represent a massive \$1.2M capital expense reduction that also decreases annual operations and maintenance expenses. Because of their participation in School Uplift, all of these savings can now be reinvested into the learning environment.

Participant Engagement and Fostering Change

Engaging all building occupants is important because they all use energy. During the one-on-one monthly coaching calls, engagement strategies and ideas were discussed to help the Energy Champion compile a list of potential ideas to review with their internal energy teams. The result of beginning these conversations early in the SEM process allowed for the development of unique and personalized engagement and awareness ideas to come to life.

Although TVA and its affiliates provided materials such as clings, posters, and a binder with monthly engagement activities to implement in their schools, many participants took the initiative to come up with their own Engagement Campaigns (Table 3). These engagement activities are what foster change both within the school and with students and staff members as they go back into their community.

Table 3. Engagement campaigns

Activity	Description
Shutdown Checklists	Utilization of provided shutdown check lists, some schools created their own door hanger system or checklists that the students were able to audit their teachers at the end of each week.
Newsletters	Implementation of monthly newsletters inside and outside their schools.
Social Media	Facebook, Twitter and School websites utilized to spread awareness with facts and current activities going on in the schools to save energy.
Energy Club	Created or re-established clubs funded by PTA/PTO donations that allow schools to implement projects.
Videos	Schools created their own awareness videos to share with their school and communities. ¹
Press Releases	Online and print press releases to local news.
Poster and Essay Contests	Various contests held throughout the school that involved energy related topics.
Green Day	Schools actively practiced energy savings activities, some even handed out shirts to people seen doing something that will save their school energy.
Curriculum	Various Local Power Companies have presentations they did for schools they serve, which could include what energy is, energy vampires (large energy users), energy careers, energy safety, and more.

During the pandemic, many schools had turned to social media and other group communication tools to share important school news and updates. Schools quickly realized that these tools and similar technologies could be leveraged with School Uplift allowing the program to be introduced to students, staff, and community instantly. Platforms such as instant alerts, Facebook, Twitter, school newsletters and websites gave a direct path to sharing the hard work and achievements the energy teams made and engaged the entire district community in real time. Taking it a bit further, the high school students engaged in two areas. The first area was in mentorship with the elementary students by collecting energy data and transforming that data into easy-to-read graphs for the elementary students to color in poster forms. The second area was with positive engagement from high school students during after school sporting events. Partnering with high school sports allowed the students to share in the message of energy efficiency with ideas such as: homecoming parades highlighting the SEM program, Green Out nights for students and fans showing their outward commitment to energy reduction and teams committing their energy pledges with banners made and displayed in the gymnasiums during contents.

¹ Students in a media class from a school out of Sheffield, Alabama created their own video on what School Uplift entails and the activities to come out of strategic energy management, which can be found here: <https://youtu.be/ZnYqi2q5dcQ>

Furthermore, the key to successfully implementing these activities was the students. The engagement campaigns really began to evolve when the student interest and creativity emerged. Students have a powerful voice and can foster behavior changes now that affect the future. Even the teachers became more engaged as they witnessed student excitement. Because the students are a large part of the program, awareness of strategic energy management now goes beyond the walls of their schools bridging the school to home gap and furthering energy education in communities. Connecting the lessons learned to the community at large can foster a cultural shift in how society uses energy.

Other ways we fostered change include:

Maintenance schedules. Some schools had Operations and Maintenance (O&M) schedules, but they were unused or outdated, while many of them did not have these at all. As a part of this program, they have learned to make schedules that fit the needs of their facilities.

Collaboration. We provided a program that allows schools throughout the Tennessee Valley to connect and learn solutions that helped other schools. We observed this through peers learning of new technologies to implement or strategies to improve engagement. One unique example was when a school installed a new Wi-Fi enabled HVAC control system that another peer heard them talk about, leading the second school to inquire with their school board to implement a similar strategy as they had no central control system in their facility.

Program engagement. When Energy Team members from the schools presented in workshops or spoke during energy coaching office hours sessions, participation increased, and schools were more likely to engage with their peers. We learned that most schools preferred the early morning workshop sessions, and those that attended the early morning sessions were also the most engaged.

Lessons Learned and Best Practices

Recruitment

Buy-in. During the recruitment of our first cohort, we found selling the program to schools was a little more difficult than we originally thought. As we previously established, we were targeting underserved schools in a specific region of Tennessee to pilot the program. Traction was slow as many of the schools were not familiar with the program or the concept of SEM, which further informed us to the valuable impact it could have for the Valley's schools. Recruiting in 2020 was very much hampered by the onset of the COVID-19 pandemic and subsequent regulations and school shutdowns. We originally aimed to recruit 20 schools but reduced to 11 as schools struggled to obtain buy-in from the district level as well as time from the staff and faculty within the school. We then instituted small gift cards awards for high performing energy team members, which resulted in higher engagement. To improve for the next pilot cohort as we scaled the program, TVA partnered with LPC partners to recruit the schools at the Director of Schools level where we would request board approval. Although the schools were not investing money, but time, getting buy-in at the highest level has made the participation and engagement more successful. The main reason for the drop in Cohort 1 was listed as time because if a school is understaffed or over scheduled, it can be difficult to bring in a new program to train a school of faculty, staff and students.

Program Design

Gamification and Grants. Offering grants to recruit participants significantly helped improve the value proposition of School Uplift. After providing education and knowledge on SEM, the grants were a bonus for those that are putting in the work and have saved energy without capital investments. After Cohort 2, we plan to increase the number of schools enrolled to about 100, which could lead to lower engagement due to the lower chances of winning. After receiving feedback from the community and those in the field, we could see that many schools are grateful for any amount of money to help their students. To level the playing field and keep competition healthy for a larger group, we plan to lower the amount of our secondary grant and spread it amongst more schools to allow a larger percentage of the schools that complete all program activities to receive a smaller grant. They will also still compete for the larger grants.

Flexibility. During our program, we interact with schools and their staff on a regular basis, and it is important to be courteous and flexible. We found that working with the staff to schedule office hours, webinars, Site Assessments and IGA's gained direct attention from the program contacts. Some of the methods of courtesy we have established with the schools are:

- Asking the school contact to make teachers aware of the day we may be entering their classrooms. This will allow the teachers to know about interruptions ahead of time.
 - School Resource Officer (SRO) personnel will also be aware of daily guests at the school.
- Being polite by asking the teachers and/or our escort if we needed something or needed to get into a certain space.
- Interact with students accordingly. They are curious and may ask us what we are doing, so it may be ok to answer their questions, but not present the entirety of the program to them and take up valuable class time.
- Work around their schedule. If the maintenance team escorting our engineer receives an important call, we wanted to wait for them to complete their business or wait for the school to provide another escort if the maintenance team must leave immediately.
- Record all workshops and webinars for their viewing. It allows the participants to revisit the material or share with other team members who were unable to attend.

Support. TVA is proud to have extensive administrative assistance to the school by providing access to Energy Coaches, Program Coordinator, LPC personnel, Customer Relations Managers, Preferred Partner Network contractors, and many others. The schools always have access to someone that can direct them through the program and aid as needed.

Workshops. Traditionally in our SEM programs, workshops were a six-hour in person event, which could pose an issue with scheduling several schools to join at the same time, especially with COVID-19 restrictions. To accommodate the multiple obstacles of scheduling, we found that offering two-hour virtual workshops, that were typically scheduled right once classes were in session, was feasible for the schools. In Cohort 2, on average, we would only have three school districts absent between the two sessions we offered, and they would make them up within the next week. Utilizing an online conferencing service where we can record, ask polling questions, break out into groups, track registration and views, and share easily has allowed us to scale this program to a larger group of schools, while keeping the quality of

participation the same if not better as being in person. Certainly, school energy teams not needing to travel to and from workshops has reduced their time investment tremendously as well.

Additional Resources. In Cohort 1, we were working against the COVID-19 pandemic shutdown, which caused most of the schools to lose engagement or struggle to come up with ways to get their schools engaged in the program. To avoid this as the pandemic continued for Cohort 2, we created and put together several engagement tools and activities for the schools to access for free. Some of these resources include a video on SEM, Energy Dashboard that comes with an energy converter kit, social media and newsletter content, an operations and maintenance (O&M) binder, and an Energy Team tool kit. As we conclude Cohort 2, we are creating more content to further support our past, current, and future participants. Although this content was available to Cohort 2, many of the participants created their own awareness and engagement campaigns prior to us providing them with these materials. We also provide a School Uplift website for our participating schools to find more information about the program along with several marketing materials created and provided by TVA.

Assessments

Scheduling. As the cohorts have progressed, the number of schools has increased with our success. As such, it was necessary to come up with a strategy to make sure that all the Site Assessments, IGAs, and office hours were completed within the correct timeframes. During Cohort 2, with 43 schools, it was the first time that time constraints stretched the program team. There were many schools, with varying opportunities to perform assessments and meeting times. Setting up a general timeframe worked initially, with more specifics being added with each conversation with the schools. One of the most helpful ideas that was instituted during the Site Assessments was to “batch” the schools in groups. This helped reduce the number of trips taken at a time, gave the ability to schedule 2-3 schools per day for an area, and allowed a certain amount of time to schedule reports in between groups. Attempting to schedule all the assessments at one time with report writing after could have resulted in forgotten details after performing so many assessments back-to-back. Making sure the program captured as many details as possible was integral in the success of the Site Assessments and the reports that were generated for the schools. An unassumed, yet positive, side effect of the local groups of schools was being able to share information among familiar schools who knew a lot of details and contacts between themselves. As the program found out during open dialogue segments in the webinars and online calls, the schools reacted very positively towards idea sharing amongst other schools in the cohorts.

Safety. Being aware of your surroundings and environment during site assessments is critical. The site assessments for this program occur during the months of May through August in the southeast United States, and at schools with varying conditions. We know that we can expect temperatures up to, and sometimes over, 100°F with our regional humidity contributing additional risk of heat stroke. Combined, these factors can result in heat indexes of 125°F and beyond, which can worsen on rooftops. Most schools have their HVAC units located on the roofs of their buildings, which may be asphalt or black EPDM lining. This can push the air temperature over 120°F, and the heat index over 140°F. In another example, with the same weather, a site assessment can occur with the HVAC units on the roof, but with a

white EPDM or even a cool roof liner. The temperature and heat index will stay about the same, but with the reflectivity of the surface, now the engineers are seeing up to 1.5x the amount of light they normally would. This could lead to tired eyes, squinting and not seeing tripping hazards, as well as time for engineers' eyes to adjust while coming back into the buildings and watching out for students and other potential hazards. Some additional circumstances and solutions that were provided were:

- Performing roof equipment assessments in the mornings during hot days
- Utilizing Vuzix Glasses and other virtual audit applications (Facetime, Microsoft Teams, Zoom, etc.) to complete Site Assessments as necessary to reduce travel risks from COVID-19
- Providing a cooler in cars for hydration, car interiors have been found to reach over 135° in the summer
- Bringing a pair of sunglasses as PPE for roof equipment assessments
- Avoiding roofs during inclement weather
- Standing aside in hallways or entering an empty classroom during class exchanges
- Performing kitchen assessments either well before, or after lunch periods
- Keeping your eyes peeled for nature and safety. How close to the roof edge are you? Are there any bee or hornet nests on the equipment you're assessing? Does the roof have puddles on it?

Opportunities and Challenges

Data Quality. Two of the most critical pieces of information required to receive accurate metrics from ESPM are gross square area (GSA) and energy consumption data. In cases where the school personnel did not know the square footage of their facility (such as in cases where multiple expansions had been constructed and added over the years), approximations were made using satellite imagery. Ideally, this information would come from building plans. Many schools also struggled to capture the entirety of their energy usage. This often included both misreporting the number of energy meters as well as misreading utility bills. Ideally, after receiving the initial information request forms from the schools, the engineering team would be able to validate the number and location of meters during the onsite inspection. When this was not possible, collaboration with both school personnel and the energy providers (the LPC and/or gas company) was required to ensure consumption data for the entire school property was captured. Once the correct number of meters was determined, it was also critical that schools understood how to properly read their utility bills to extract service periods and usage.

COVID-19. The COVID-19 pandemic had profound effects on the education systems across the world. In the United States, many schools implemented shutdowns beginning in March 2020 and lasting several months, sometimes to the end of the calendar year. This caused a halt in the implementation of Cohort 1 as schools were completely shut down for several months, and as they reopened the schools had to focus on how to restructure their curriculum and run classes virtually. Revamping the program to better fit this challenge was necessary to keep the program successful.

Other considerations brought about by the pandemic include energy changes due to increases in fresh air ventilation rates, replacing air filters with higher MERV ratings, kitchens

remaining open to provide lunches for children despite no classes taking place in the building, and alternating which grades/classes take place in person or remotely. There are a few potential solutions to account for these effects. The simplest option is to collect enough utility data both before and after the major effects of COVID-19 take place to compare energy usages while skipping over potentially skewed usage trends. Another option is to take a representative sample of schools and create a baseline model for each using pre-COVID data. Using this model, a hypothetical '20-'21 year can be simulated assuming no COVID effects. This simulated data can then be compared with actual '20-'21 consumption to arrive at an average percentage difference. The percentage can then be applied as a blanket modifier to the remaining schools' raw data. The third option is to generate a baseline model with pre-COVID data for all schools. These models can then be used to simulate '21-'22-year consumption data for each school without the effects of participation in the Uplift program. Comparing this simulated data with actual '21-'22 consumption illustrates the avoided energy found by implementing energy conservation measures as recommended by the program.

Conclusion

The help of all School Uplift stakeholders, the student engagement, and the flexibility we offer is what makes this program successful. As we roll out Cohort 3 of School Uplift, we will continue to make a positive impact on K-12 schools in the Valley by taking the lessons learned and the challenges as opportunities to improve the program and make a larger impact on our communities.

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