

Project Green Light

[Final Design Report]

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ABSTRACT

Incandescent light bulbs are up to 75 less efficient than compact fluorescent light bulbs; as incandescent light bulbs are used in homes and businesses, they contribute to global warming through coal consumption and, more generally, drawing excess energy off the power grids (Energy Efficient Light Bulbs). Although the initially high cost of compact fluorescent light bulbs turns potential buyers away, the bulbs pay themselves back quickly. Project Green Light is designed to address the multi-faceted problem of incandescent light bulb inefficiency and consumer wariness of compact fluorescent light bulbs. In particular, Project Green Light aims to inform Charlottesville residents living in low-income housing¹ about their energy options, helping to reduce their electric bills and carbon footprints.

Project Green Light revolves around three central objectives: light bulb exchange and research, education, and relationship building. Through a partnership with the Albemarle Housing Improvement Program (AHIP), Project Green Light will replace the incandescent light bulbs with compact fluorescent light bulbs in 30 partner families' homes and begin a targeted educational campaign in the greater Charlottesville campaign. Ultimately, our findings will be communicated to a larger audience through a documentary and report in order to influence others to make energy efficient changes.

The foundation has been laid for the implementation of Project Green Light.

Contacts at three local elementary schools (Clark, Johnson and Venable) and two

¹ According to the U.S. Department of Housing and Urban Development, to qualify for low-income housing in Charlottesville, Virginia, a three-person family must have a total annual income of \$30,850 and \$49,300. A four-person family must have a total annual income of \$34,250 and \$54,800 and a five-person family must have a total annual income of \$37,000 and \$59,200. These household incomes are nearly \$20,000 less than the median American household income of each family size (FY 2008 Income Limits).

community centers (Piedmont Housing and Friendship Court) have agreed to work with the project. Additionally, we have partnered with AHIP's Ravi Respeto and Timothy Beatley, a professor in the Department of Urban and Environmental Planning, who have been instrumental in providing guidance on grant writing and making connections within the community.

INTRODUCTION

In a conversation with the Albemarle Housing Improvement Program's Director of Development, Ravi Respeto, at the onset of our project, we found that many

Charlottesville residents living in low-income housing are using inefficient incandescent light bulbs and unnecessarily wasting money. The United States government has recognized the inefficiency of the incandescent light bulb, establishing a nationwide goal of phasing out incandescent bulbs by 2012 with the Energy Independence and Security Act of 2007 (DWSA). Compact fluorescent light bulbs (CFLs) use about 75 percent less energy than incandescent bulbs, can last up to 10 times longer, and can save up to \$40 in electricity costs per light bulb over their lifetime (Light Bulbs).

Did you know?

The energy used in the average home can be responsible for more than twice the greenhouse gas emissions of the average car (One Billion Bulbs).

Unfortunately, we believe that the initial cost of compact fluorescent light bulbs is a strong deterrent for many families. Incandescent light bulbs are initially cheaper than CFLs, at \$.56 as compared to \$3.50. The benefits of an incandescent light bulb's low initial cost are rapidly overcome, however; after 7,000 hours of use, incandescent light

bulbs cost \$41.80, while compact fluorescent light bulbs cost only \$12.95 (Fluorescent Light Bulb Versus Regular Incandescent). (See fig. 1 for complete cost v. hours graph).

Objectives

To address both facets of the problem—the inefficiency of incandescent light bulbs and consumer unawareness of the financial benefits of compact fluorescent light bulbs—Project Green Light will combine an educational campaign throughout the greater Charlottesville community with a study of thirty partner families who have agreed to replace the incandescent bulbs in their homes with compact fluorescent bulbs. Ultimately, we expect to create excitement about energy efficiency in the Charlottesville community and help our partner families, as well as those families which we reach through classrooms and community centers, save \$10 to \$15 per month on their electric bills. The project is designed to eliminate the stigma surrounding the compact fluorescent light bulb—we want people to use CFLs in their home despite the initial high cost because they are energy efficient and ultimately affordable.

Main goals:

- Ensure that low-income Charlottesville residents know the benefits of compact fluorescent light bulbs, particularly their long-term financial paybacks
- Track the energy usage of those who switch from incandescent light bulbs to compact fluorescent light bulbs and use that information to educate others
- Establish a working relationship with community centers, those who frequent them, and elementary school students in Charlottesville to teach them about energy efficiency and learn about their energy habits

- Establish a lasting relationship with our partner families, while helping them save \$10 to \$15 per month on their electric bills
- Discover energy habits in Charlottesville and present them in a final documentary and report to a larger audience in order to influence others to practice energy-efficient habits

Stakeholders

Project stakeholders are individuals or groups within or outside an organization that sponsor a project, have a vested interest in the success of a project, or have a positive or negative influence upon the completion of a project (Establish and Manage). Project Green Light's primary stakeholders are those directly impacted and those who stand the most to gain: those whose light bulbs will be replaced by compact fluorescent light bulbs, the children in the classrooms we will be teaching in, and meal attendees at the soup kitchens and community centers we host meals at. We expect that each of these stakeholders, particularly those whose light bulbs will be replaced, is willing to participate and open-minded about the information we present. Each stakeholder stands to be positively impacted by our project; learning about energy efficiency can make their homes more efficient and reduce the cost of their electric bills with relatively little effort. The "powerless stakeholders" are similar to the primary stakeholders—they are the future generations left with an energy crisis because our generation has unsustainably consumed energy.

There are indirect stakeholders, as well. These include the grant sponsors, AHIP, the electric company that provides energy for the homes, the recycling company that will receive the incandescent bulbs, and the university community that we are representing

when we go out into the larger Charlottesville community. The stakeholders responsible for paying for our project will want to ensure that we are using our money responsibly. There may be unforeseen consequences if the incandescent bulbs can't be properly recycled or if the minimal amount of mercury in the CFL bulbs turns out to be problematic for the recipients. Overall, however, we do not anticipate making energy inefficiency any worse in Charlottesville homes unless we inconvenience our stakeholders unduly.

In order for our project to be successfully implemented all of the stakeholders need to come together in support of the program and work with us to create a lasting impact.

INITIAL STEPS

Multiple avenues were considered prior to selecting a program design to pursue for Project Green Light. Our goal was to find the most effective and efficient solution to the problem of inefficient energy usage and unawareness in Charlottesville. Originally, we turned to the models of several similar existing programs around the United States. Kelsey Petrie had worked with the program Project 20/20 of Brown University, which provides free compact fluorescent light bulbs to low-income housing residents in Rhode Islands; Project 20/20 physically replaces every incandescent light bulb with a CFL in the households they interact with. The goal of the project was to save the residents money on their electric bills while simultaneously eliminating harmful carbon emissions from the environment. Petrie had a rewarding experience volunteering and planning with Project 20/20.

Although Project 20/20 was our initial inspiration—one of our possible approaches closely mimics their program—other options were considered, as well. Project Porchlight provides one free compact fluorescent bulb to each home it comes across and educates the families at the same time. Project Porchlight is designed to increase awareness and disperse information, leading to small changes across a large population rather than making huge impacts on individual families.

Did you know?

Project Porchlight has changed 3,588,000 incandescent light bulbs (<http://www.projectporchlight.com/>).

Potential solutions

The possible solutions to our problem that we considered took both of these above projects into account, as well as other solutions that we individually created. Our initial list of possible options included the following:

- 1) Our project could work solely through the Charlottesville government, ideally the office of the mayor, to initiate an educational campaign that would target low-income households. We would identify low-income households with the help of our community partner and the standards as defined by the U.S. Department of Housing and Urban Development.
- 2) The project would seek to change individual families' energy habits by replacing the incandescent light bulbs in their homes with the more efficient compact fluorescent light bulbs. This project approach would require an outside source of funding to purchase compact fluorescent light bulbs. Families would be identified with the help of a community partner, such as AHIP.

- 3) The project would partner with 30 to 40 families living in low-income housing and replace their incandescent light bulbs while collecting data about their energy usage and learning about their energy habits. We would use the statistics and information from our research and apply it to an educational campaign targeted towards the larger Charlottesville community.
- 4) The project could collaborate with local energy companies to implement an incentive for Charlottesville residents to reduce their energy consumption. This incentive could come in the form of an increase in electricity costs, a tax break, or a tax break.
- 5) Our project could work solely with community centers such as churches, schools and soup kitchens to spread awareness in Charlottesville's low-income community about easily accessible, efficient energy solutions.

SELECTING THE APPROACH

Several criteria were integral in helped to eliminate implausible solutions. These criteria are, in order of priority:

The solution will be:

- 1) **Cost-effective and within the constraints of our budget.** Our budget is dependant upon the grants or funds received upon application; ultimately, Project Green Light should cost no more than \$10,000.
- 2) **Able to connect to the community and establish personal relationships.** We believe that establishing trusted relationships within a community is an integral

part of a community service program, particularly in a project where education plays an important role.

- 3) **Able to produce results within a year.** Many grants, such as the Jefferson Public Citizens grant, are approved for the duration of a year, and we wanted all those involved in the project to bring it to a conclusion without unnecessarily lengthening it.
- 4) **Have a positive impact throughout Charlottesville.** If the project cannot feasibly have a positive impact on members of the community beyond those we directly interact with, then the project cannot be considered a success. The approach selected must be able to spread through word-of-mouth or another organic, natural method.

Project selection

Possible solution 1) would be effective in reaching a large part of the community, and working through the Charlottesville government gives our project legitimacy. However, this type of project would not foster individual relationships with community members or produce concrete results within a year. Additionally, a governmental campaign would not be cost-effective, as a full-scale marketing campaign would be costly. We decided not to choose possible solution 1.

Possible solution 2) would create personal relationships with community members and produce noticeable relationships within a year in terms of household electric bills following light bulb conversion. However, purchasing compact fluorescent light bulbs on a large scale (hundreds to thousands) would not be cost-effective; we did

not anticipate that a research grant would fund purely philanthropic work. We decided not to choose possible solution 2.

Possible solution 3) is significantly more cost-effective than possible solution 2—only a set number of light bulbs will be purchased for a smaller number of partner families, and a scaled-back, targeted educational campaign is financially feasible. We would be able to foster close relationships with the partner families and establish trust in the community; the advocacy and input of the families will be central to the campaign and our “marketing” aspect. This solution will produce results within a year through the collection of statistics from the partner families. We chose possible solution 3.

Possible solution 4) would be relatively cost-effective but would require significant commitment from the energy companies and would be difficult to implement within a year. We did not choose possible solution 4.

Possible solution 5) would be effective in reaching a large segment of our target audience and allow us to form trust relationships with the Charlottesville population, but we would be unable to gather data on the effectiveness of switching from incandescent light bulbs to compact fluorescent light bulbs.

We selected possible solution 3) because we felt that this solution combined possible solutions 1, 2 and 5 to reach beyond the limits of each of the previously proposed solutions to create a far-reaching, effective solution. A targeted educational campaign and light bulb replacement program will be able to reach a segment of the population that stands to gain the most from learning about energy efficiency, because efficiency is closely correlated with saving money.

APPROACH IN DETAIL

We will be working with the Albemarle Housing Improvement Program, an organization that assists low-income Charlottesville residents with locating and maintaining decent housing. Our mentor is Ravi Respeto, the Director of Development. At the University of Virginia, Professor Timothy Beatley of the Department of Urban and Environmental Planning has agreed to work with our project for its duration.

AHIP secured a discount for compact fluorescent light bulbs bought in bulk at Lowe's Home Improvement, and is compiling a list of thirty partner families willing to exchange their incandescent light bulbs for compact fluorescent light bulbs. All families that receive CFLs will be interviewed about their energy consumption habits and will take a survey in order to help us gather qualitative data about Charlottesville residents' energy habits. We will also collect each family's electric bills in order to track the decrease in energy consumption corresponding with the switch from incandescent light bulbs to compact fluorescent bulbs. We plan to interact with the partner families three to four times a year; these interactions will include the initial interview and installation, a check-in shortly after installation, an invitation to an event for the partner families should they choose to participate, another check-in, and the final follow-up one year after installation.

Both the qualitative and quantitative data gained from our research working with the partner families will be used in a broader campaign aimed at educating residents living in low-income housing in Charlottesville. This campaign includes working through community centers, schools, and soup kitchens that cater to the low-income population. Whenever we interact with the community, we will use both a modified Local Energy

Alliance Program (LEAP) energy habits survey and personal surveys to measure how educated Charlottesville residents are about their energy options.

Through the project, we will share information on sustainable energy practices through a combination of flyers, PowerPoint and tri-fold presentations, personal interactions with community members, and talks in classrooms and community centers. We expect our most effective ways to reach people will be through flyers and the talks that we hold during meals and in classrooms.

Schools

A 2010 Mintel study found that “kids and teens often influence what their parents purchase... and play a key role in determining what type of foods and entertainment will be purchased for the family household” (PR Buzz). Recognizing the increasing influence children have over their parents, Project Green Lights targets children as key players in the movement to increase energy efficiency in the home and everyday lifestyles; if children learn about energy efficiency at school at a young age, they are likely to go home and share their new knowledge with their parents, and influence them to change their habits.

We will be teaching several interactive, hands-on classes in both the fall and spring semesters at Clark, Johnson and Venable Elementary Schools. Specifically, we will be working with third grade students at the schools. Plans include passing prizes for correct answers to game-show styled lessons, filming energy habit surveys, crafts and distributing compact fluorescent light bulbs.

Community Centers

We are working with Shelley Murphy of Piedmont housing and hosting seminars and meals in Friendship Court, a community meeting place in the Piedmont housing low-

income housing complex. We are also coordinating with the Holy Comforter Church soup kitchen to host an educational meal. Plans for co-sponsorship of meals include a PowerPoint presentation when technologically possible, distribution of compact fluorescent light bulbs to interested meal attendees, flyer distribution and personal interaction with attendees.

Constraints

Our research methods are limited in their scope—we cannot expect to reach every member of the Charlottesville community and analyze their energy habits. Additionally, we are only tracking the energy electricity bills of our 30 partner families, though we expect to see an apparent trend in usage decrease.

Our budget presents the primary constraint. We initially planned to replace the light bulbs in more homes, but realized that we could not obtain enough funding; instead, we turned to a project model more focused on education, using the data from our partner families to teach more families about the benefits of incandescent light bulb replacement.

Reaching an audience in Charlottesville that we can expect to educate presents our second challenge. Though we initially intended to hold seminars that Charlottesville residents could attend in the evening, we doubted whether they would attend without an incentive. Instead, we decided to sponsor educational meals at established soup kitchens, reaching a recognized segment of the population.

CONCLUSION

Currently, the foundation of Project Green Light has been laid, and the planning and brainstorming aspects of the design are complete. The project is fully ready for implementation. The grant and funding applications have been written and must simply be reconfigured for the specific grants we apply for. Currently, the only barriers to

success that we anticipate are the obtainment of funds that are integral to implementation. However, with the groundwork laid down we believe we have a strong proposal with few weaknesses.

Documentation

Project Green Light will be documented in many ways: through quantitative graphs and models created with Microsoft Excel software to depict the changes in energy consumption of the partner families, to the qualitative survey results collected from community interactions. Extensive visual documentation of the project will be conducted in the form of a documentary film about energy consumption in low-income housing and residents' views of such issues. The film will also chronicle the successes and failures of the campaign and incorporate the opinions of the program participants that have been changed as a result of the project.

Determining Success

We can determine the success of the project by graphing the energy usage of the partner families over the course of the year; if the residents' electric bills are reduced by a significant percentage (from five to ten percent) from the project's inception, then we can consider Project Green Light a success in that respect. The success or failure of the meals hosted at community centers and classes taught in the elementary schools cannot be determined by such numerical standards. Rather, we will assess whether residents have gained knowledge about their energy options through a combination of post-surveys and interviews. If the majority people feel better informed or have changed their opinion about the value of compact fluorescent light bulbs and other sustainable practices, then our educational campaign can be considered a success.

Dissemination

We will share our findings with our community partner and the Charlottesville government through a final documentary filmed throughout the duration of the project. The documentary will incorporate filmed interviews with both students about their perceived energy habits, “man-on-the-street” interviews about energy consumption and production in Charlottesville, and our partner families’ perceptions about the changes they’ve made since entering the program and changing their light bulbs from incandescent light bulbs to compact fluorescent light bulbs. We will also compile a short report on energy habits and usage in Charlottesville, particularly focused on the effects switching incandescent light bulbs to compact fluorescent light bulbs can have in the home. The report will be distributed around both the University and in select areas around the Charlottesville community. We also hope that AHIP and the Charlottesville government will further publicize our documentary, and that it is shown at the University of Virginia after completion. Both the documentary and report are intended to influence others to change their energy habits and raise awareness about the benefits of practicing a sustainable lifestyle.

FUTURE WORK

Our next step is to apply for grants and obtain funding. There are multiple grants offered through the University of Virginia, such as the Jefferson Public Citizens Grant, the Harrison Award, and smaller research grants in the range of \$500-\$700 available to undergraduate students. Grants from the government and private groups are also available. Once funding is obtained Project Green Light can be fully carried out (see app. for full timeline). Grants will be applied for this spring and funding will hopefully be received within the year. The main resources we need at this point in project implementation are databases in which to find grant opportunities and people who can aid

us in our search, such as the Office of Undergraduate Excellence at the University. Resources such as these will aid our group in gathering the information and funds we need to continue our work and take Project Green Light from the planning stages to implementation.

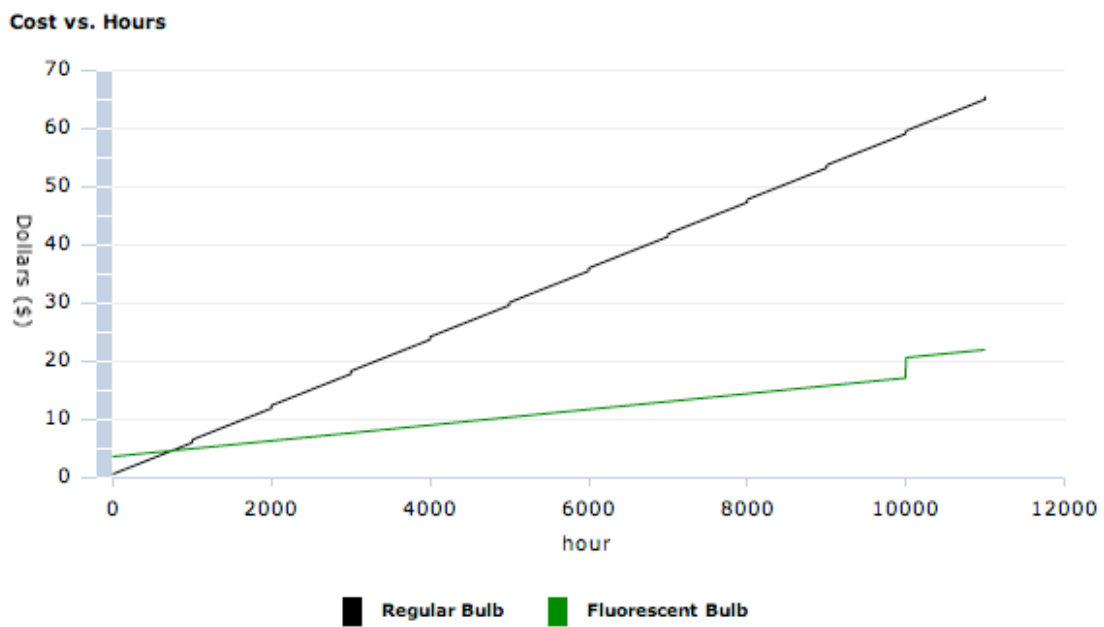
LESSONS LEARNED

The main obstacle our group encountered during the planning phase was contacting and engaging the community members we wished to work with, particularly administrators in the schools and members of the Charlottesville government. Perseverance and contacting additional members of the community, such as turning to other teachers when several teachers never responded, was the best way to address this problem. As we are likely to encounter this problem again, we have realized that it is crucial to contact people much earlier than it seems necessary to, in order to have time to send follow-up emails, phone calls, or to set up meetings within a reasonable timeframe.

Ultimately, we have not been able to implement our project due to a lack of funding; however, we have designed a project that should meet all of our original goals once implemented. While the budget has been a primary constraint, we hope to receive funding within this school year. The lack of funding—and consequential inability to implement our project—has taught us a valuable lesson about sustainable change. While a solution to a problem may be feasible, it may not be pragmatic with the resources available. Often, it seems that sustainable change needs to start even smaller than we had envisioned in order for the change to be truly effective. If we were to begin our project again, we would design a program that requires fewer resources, in order to allow for

easier implementation. Small-scale change can grow to become large-scale change if the message is powerful or effective enough.

APPENDICES



(fig 1.)

Timeline for Project Green Light upon receiving funding

Month(s)	Scheduled for Completion
January-April	AHIP distributes list of families, we compile questions, contact families
May	Light bulbs purchases, interviewing families, collecting families' electric bills prior to replacement, purchasing craft supplies for schools and campaign materials
June-August	Light bulbs replaces, interviews conducted. Next electric bills collected, meetings with teachers, incandescent bulbs recycled
September-November	First of classes taught in schools and community centers, check-in with partner families, distribute some bulbs among schools/community centers
December-January	Break for winter break, ask for partner families electric bills during this period
February-March	Next round of classes taught in schools and community centers, go back to partner families' houses for interviews, surveying around town
April	Compilation of final report, wrap-up, thank-you notes sending

BUDGET

*There are three budgets prepared. The first is a budget prepared for the Jefferson Public Service Grant. The second is a budget prepared for a smaller, unnamed research grant, cutting out stipends and readjusting the educational campaign. The third budget scales back all aspects of the project, eliminating as many costs as possible.

Project Green Light	Expenditure
	<u>3 Elementary Schools</u>
\$800	• Stickers, pins (150)
\$800	• T-shirts (20)
\$800	• Fluorescent light bulbs
\$500	• Craft supplies
\$2000	Community centers/soup kitchens
\$900	Flyers/Brochures
\$2200	Light Bulbs

Project Green Light	Expenditure
	<u>3 Elementary Schools</u>
\$600	• Stickers, pins (150)
\$600	• T-shirts (20)
\$800	• Fluorescent light bulbs
\$400	• Craft supplies
\$2000	Community centers/soup kitchens
\$800	Flyers/Brochures
\$2200	Light Bulbs
\$200	Supplies for installation
\$300	Damages fund
\$400	Emergency
Total:	\$8,300

Project Green Light	Expenditure
	<u>3 Elementary Schools</u>
\$400	• Stickers, pins (150)
\$600	• T-shirts (20)
\$600	• Fluorescent light bulbs
\$300	• Craft supplies
\$1500	Community centers/soup kitchens
\$600	Flyers/Brochures
\$2200	Light Bulbs
\$200	Supplies for installation
\$300	Damages fund
\$400	Emergency
Total:	\$7,100

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