\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**EMF Generator**

**Technical Approach plan**

To be presented on 4/17/2018

Preston Wu

Satiago Pelaez

Joshua Cohetero

Diep Luu

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table of Contents

1. INTRODUCTION .............................................................................................................3

1.1 Problem Statement ..................................................................................................3

1.2 Background .............................................................................................................3

1.3 Needs Statement ......................................................................................................4

1.4 Objective .................................................................................................................4

1. PROPOSED TECHNICAL APPROACH ..........................................................................5

2.1 Architecture Design ................................................................................................5

2.2 Quality Assurance Plan ...........................................................................................6

2.3 Generator Pricing………………………………………………………………….6

1. EXPECTED PROJECT RESULTS ...................................................................................7

3.1 Measures of Success ..............................................................................................7

1. SCHEDULE .......................................................................................................................8
2. SOURCES ………………………………………………………………………………..9

1. INTRODUCITON

Our team has developed a semi-auto charging generator that could eliminate the spending that goes into an electricity bill. Installing just one of our generators in one building under the New York City Housing Authority program can save $50-$100 per family. $100 may not seem like a lot, but take for example Boulevard Gardens, an area under the New York City Housing Authority program. Boulevard gardens houses 960 families, installation of one or more generators would supply electricity to all 960 families in Boulevard Gardens; those generators will save those families a total of 960,000 dollars every month, with the addition of job opportunities that come with the installation and maintenance of these generators. Our generator is designed to be cost-effective, meaning the most ever spent on this generator will be on its initial purchase. Our goal is to halt the growth of the wage gap and promote social mobility for those of the lower class.

[1.1] PROBLEM STATEMENT

Private companies operate the same no matter what industry they are in; they all try to obtain the greatest profit while using the least amount of their resources. In our situation of interest, private electrical companies make a profit off of those living in Government Subsidized Housing, but these families cannot afford to be part of a private companies profit group. The reason these families are residents of the NYCHA is because they are under financial burden and cannot afford to live like the majority of NYC’s population. Using electricity provided by private companies in Government Subsidized Housing places an extra financial burden on these families that are already struggling financially. Our goal is to alleviate them of this one financial burden, having one less financial burden means having that much more financial resource available

[1.2] BACKGROUND

590,216 people of the entire New York population resides in apartment buildings supplied by the New York City Housing Authority. Additionally, there are 257,143 families on a waiting list for public housing. Residents living in Government Housing are mandated to set aside 30% of their gross income to pay rent and pay an additional utility bill. In regard to their utility bill, electricity is one-fifth of the overall bill. The average yearly income of a family surviving on minimum wage is $24,960. A minimum of 30% is set aside for rent, and additional 30% is taken out for yearly taxes. This leaves each family with 40% of their yearly income to pay for utilities, transportation, food, clothing, hygiene products etc. With all these expenses that require immediate attention, these families are left with little to no money to save, minimizing their chances to rise in social status. What if we could eliminate even one of these expenses?

[1.3] NEEDS STATEMENT

Our plan requires a timeframe of 36 months as well as permission to analyze the electricity consumption and landscape of the Housing Departments. 12 months for research and development, 20 months for installation, and 5 months of evaluation and adjustments. During our period of research and development we will be simultaneously developing different generators for 5 different housing departments. These housing departments all vary in size, amount of apartment buildings, and population. These variables all directly affect the amount of electricity that our generators will need to supply, we require time to study and analyze the effects these variables have. Throughout this 36-month period, we will need resources to develop a maintenance team. This team will be composed of residents in the housing department where our generators will be located. By doing so we will give residents in these housing departments job opportunities. We will need a teaching facility, instructors, and other related teaching tools; computers, projectors, textbooks etc.

[1.4] OBJECTIVES

* Develop a generator that doesn’t need require an external power source from a private corporation in order to generate consumable electricity

- Create a device that's both a transformer and a laser driven diode

- Research and Develop for a year

- Test Generator on 5 biggest Fed. Funded Housing. 1 in each borough

* Relieve the financial burden of an electrical bill from families that live in Federal Funded housing
* Find cost for base material
* What's the best material for inductor coil? How much is it per feet + diameter?
* Material for junction boxes (to shield electromagnetic fields)
* How much for industrial sized transformers + laser diodes

1. PROPOSED TECHNICAL APPROACH

This plan will be conducted over the course of 36 months. The first 12 months of this plan will be used for manufacturing and developing the generator; this includes prototyping and fine tuning the generator to fulfill its purpose. By the end of these 12 months the generators will be fully operational and available to our study groups. Upon completing the generators, the following 20 months will be spent on, excavating, assembly, rewiring electrical systems to incorporate the generator, and ensure all procedures meet all safety requirements and are approved by the DOB. We will be working closely with The Department of Housing Preservation and Development, who overlook and maintain the city’s stock of affordable housing. The final 4 months will be used for evaluating and fine tuning to any adjustments that need to be made.

[2.1] ARCHITECTURE DESIGN

To eliminate the cost of the electrical bill, the reliance of an outside power supply given by a private corporation must be eliminated. Our team has designed a generator that is self-reliant, self-charging, and can store as well as distribute electricity. Our generator consists mainly of two parts; a solar panel and a series of coils that simultaneously create and distribute electrical power through the process of induction. The EMF (Electrical Magnetic Field) Generator works by receiving an initial charge supplied by a *single* solar panel placed on the rooftops of the apartments. This initial charge is used to power the motor that will rapidly spin the base coil and as a result, its magnetic field will also start rotating. As the lines of flux rotate along with the base coil, they will begin "cutting" into the sub-coils. As the rotating magnetic field cuts through the sub-coils, they will each have an induced electrical current. These coils will then be connected to cables that will connect to a device that is a combination of a Transformer and a Laser Driven Diode. The Transformer will increase the voltage output from the coil while the Laser Driven Diode simultaneously increases current output. This will in turn increase the total Wattage output from each coil. One of the sub-coils surrounding the base coil will have a cable looping back to the base coil motor, replacing the solar panel as its source of power. This is where the EMF Generator begins to self-charge. Concurrently, there will be a special sub coil attached that will charge an emergency back-up battery in case any type of failure was to occur. This circuit will differ from the other ones because it will have a capacitor incorporated into it, so that once the voltage limit is reached on the back-up battery, the capacitor will ground the auxiliary power circuit, so electricity won't over charge the battery.

[2.2] QUALITY ASSURANCE PLAN

To maintain operational conditions for our EMF (Electrical Magnetic Field) generators, our designated maintenance team will be in charge of any repairs or modifications. To ensure that our maintenance team is capable of diligently handling our generators, they will all undergo an educational process prior to the completion of installing the generators. In the 20 months of installation during our 36-month plan, we will be training the maintenance team over the course of 12 months. At the end of the 12-month cycle, the maintenance team will all participate in a mandatory bar exam to ensure they understand and know the material they were taught. If for whatever reason candidates for our maintenance team fail this initial exam, they will have the opportunity to refamiliarize themselves with the material and retake the exam 2 months later. In the event there are not enough resident volunteers by the end of the 12 month period, resources will be used to hire professionals in that field of work.

In the event that our generator fails due to weather conditions or technical difficulties and the generator stops producing power, we have effective countermeasures in design. While the generator is running and producing electricity, it will simultaneously be storing electricity in an internal battery that will be used when the generator fails to deliver electricity. Upon notice that the generator has stopped producing electricity and is running on its internal battery, the maintenance crew will be notified to resolve the issue. If the issue is not resolved before the internal battery is completely used, the main power supply will then be reverted to a private electrical company that will supply electricity until the generator can be fixed. This will ensure that residents do not lose electricity; in the event of our generator failing and requiring electricity from a private company, the bill that residents pay will be fully reimbursed through our resources.

[2.3] GENERATOR PRICING

* Solar Panels= $10,999-$21,980
* Electric Motor= $1570
* Transformer Laser Diode= $19.95-$59.00

1. EXPECTED PROJECT RESULTS

Within the first week of all the generators being installed, the housing department's electricity will be supplied by our generators in full. In effect this will eliminate the electrical bill from the utilities bill giving families one less financial burden. Generators and maintenance teams will operate to each housing apartments needs accordingly. The larger the housing department, the more generators there will be, as well as an adequately sized maintenance team. As far as electrical performance goes there will be no difference in functionality or usage. Residents will be able to use all outlets and electrical equipment the same way they have been prior to the installation of our generators.

[3.1] MEASUREMENT OF SUCCESS

The absence of an electrical bill in every monthly resident bill as well as a consistent and adequate supply of electricity. By looking the last recorded utility bill of the housing department prior to the installation of the generators; the utility bill should decrease by the following amounts for each of the housing departments.

|  |  |  |
| --- | --- | --- |
| Queens/Ravenswood  2,166 Apartments | $108,300 | $2,166 |
| Staten Island/Stapleton Houses 693 Apartments | $34,650 | $69,340 |
| Bronx/Edenwald 2,010 Apartments | $100,500 | $201,100 |
| Brooklyn/Ingersoll 1,840 Apartments | $92,000 | $100,840 |
| Manhattan/Amsterdam Housing 1,084 Apartments | $54,200 | $100,084 |

The Housing Departments, along with the Borough they reside in and the number of available apartments, are listed on the left side of the chart. According to the Fact Sheet from the NYCHA, the minimum any tenant will pay for the electricity bill will be 50 dollars, and the maximum will be 100. To provide insight on the total amount of money saved, we put the figures in a chart. The center column lists the absolute minimum that each housing department will save per month. The right column gives the absolute maximum amount of money that each housing department will save per month. As supported by the chart, with the money saved in each housing complex, the generator will immediately start paying for itself and relieve residents of their dependence on electricity provided by companies trying to make a profit.

1. SCHEDULE

12 Month- Research and Development

RESEARCH

* Our research team will be making scheduled visits to conduct studies on electricity consumption.
* Electrical Engineers will examine existing electrical systems and check compatibility with our generator's electrical systems.
* Mechanical Engineers will evaluate and inspect the intended installation site as well as the decide upon what materials will be used for construction and innovation.

DEVELOPMENT

* Using the information obtained through the study of each housing departments electricity consumption, Electrical engineers will make adjustments to the EMF generators design to best fit each housing department.
  + The Electrical Engineers will decide upon the what size transformers and internal batteries will be used, what material used to make our coils will provide the best balance between resistance and current, the amount of sub-coil to main-coil ratio to provide the most adequate amount of electricity, and the number of solar panels needed.
  + The Mechanical Engineers will also be relaying information regarding the installation environment and how much workspace is available. This will directly affect the development of the generator as it limits how many generators can be installed and how big the generators can be made.
  + Our generators will be prototyped and tested to ensure that they work in the field. This includes pushing the generator to failure to evaluate the extent of all its parts and systematically develop a schedule for maintenance and part replacement.

20 Month- Excavation and Installation

* The mechanical engineer will organize a construction team and begin excavation. The generators will be contained in their own building, separate from residential buildings.
* In addition to constructing an additional building to house the generators, there will be additional excavation and remodeling done to existing building to incorporate the developed electrical systems and wiring.

4 Month- Analysis and Final Adjustments

* There might be adjustments that may be made due to certain things that could not be tested in a lab or with a prototype. For example; adjustments may be made to the construction of the building to accommodate certain weather conditions. The maintenance team might require more or less staff then initially intended requiring a rearrangement of resources.

SOURCES

Electric Choice (2016, November 28). Percentage of Household Income Spent on Electricity by

State [web log comment]. Retrieved from <https://www.electricchoice.com/blog/percentage-income-electricity/>.

New York City Housing Authority. (2017). *Public Housing 2017 Flat Rent Schedule*. Retrieved

from <https://www1.nyc.gov/assets/nycha/downloads/pdf/Flat-Rent-Schedule.pdf>.

New York City Housing Authority. (2017). *NYCHA 2017 Fact Sheet*. Retrieved from

<https://www1.nyc.gov/assets/nycha/downloads/pdf/factsheet.pdf>

New York City Housing Authority. *Public Housing Rent Calculation Frequently Asked*

*Questions*. Retrieved from <https://www1.nyc.gov/assets/nycha/downloads/pdf/Rent-Calculation-FAQ.pdf>

New York City Housing Authority. (2007). *NYCHA DEVELOPMENT DATA BOOK 2017*.

Retrieved from <http://www1.nyc.gov/assets/nycha/downloads/pdf/pdb2017.pdf>

New York City Housing Preservation & Development. *Subsidy and Payment Standards*.

Retrieved from <http://www1.nyc.gov/site/hpd/section-8/subsidy-and-payment-standards.page>.

Physics. *Applications of electromagnetic induction*. Retrieved from

<http://physics.bu.edu/~duffy/PY106/Electricgenerators.html>