Final Project Report

Electri-City: Energy Management in Public Buildings

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CERTIFICATION

April 23, 2014

We, the undersigned, certify that this is an accurate Final Report, and we are in agreement that this report is an accurate representation of the Project.

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I certify that this report is an accurate representation of the Project and I approve it.

Dr. Charles Kim ____________________________________

Executive Summary

The following proposal presents a step-by-step guide for local governments who wish to accomplish reductions in excessive energy consumption within municipal buildings. This method does not focus on a specific region, budget, or technology. Instead, it focuses on the broader obstacles that can deter mid-sized cities from making energy efficient investments. Various case studies are proposed as possible solutions that midsized cities may execute. The process begins at the initial desire for energy efficient retrofits and advises on how to gather support and funding. It then outlines how to conduct data collection and implement benchmarking practices within mid-sized cities. Next, a discussion on how to evaluate the feasibility of alternative projects, properly implement the most promising projects while mitigating risk, and finally verification of results will need to occur. If utilized, mid-sized cities investment in energy efficient projects on behalf of the public will benefit local communities, promote growth of local markets, and contribute to the city's budget through innovative energy efficient investments in public buildings.

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1. Introduction

1.1 Objective

The Better Buildings Case Challenge was designed for students as a part of President Obama's Better Buildings Initiative. This initiative is looking to improve the energy efficiency of buildings across the country by 20% by the year 2020. Teams that have been accepted into the competition will be given a case to find solutions to the energy problems of that case based on this idea. Our particular case will focus on the energy consumption and regulation of a medium sized city.

1.2 Background

Real innovation in energy efficient investments within cities is rare as it is challenging to gain funding and support, and often times viewed as a risky investment without guaranteed payback. Many cities are not ready to make the entrepreneurial investments needed to create important and lasting changes in energy consumption within their cities. To overcome these abstract roadblocks cities must realize their authority over land use, city planning, purchasing power, and ability to not only motivate their communities, but also their local markets. [17]. In the United States 30% of commercial buildings' billed energy usage is wasted, unidentified energy. The Better Building's Challenge initiative to reduce energy Consumption, especially in Mid-Sized Cities by 20% by the year 2030, is one way federal government is addressing this issue. This proposal will propose ways to reduce energy, promoting a return on investment, and additional savings with time, methods to collect, organize, and analyze utility data, benchmarking techniques, and minimization of risk and exposure, along with roles and responsibilities local governments can implement.

2. Problem Formulation and Current Status of Art

The first step in achieving energy efficient investments is to understand the city's level of dedication to reducing energy consumption. This includes realizing which groups are for and against reductions in energy consumption. Mid-sized cities can be classified based on three grades; A, B, and C. A city's grade is determined by groups in support of energy efficient investments, budgetary constraints and available resources; such as programs, expertise, and the amount of available workforce that can ensure the success of programs.   Grade A has the largest opportunity to make energy reducing investments, and grade C has the least.

- Grade A: Supportive Local Government, Satisfactory Funding, Supportive Community
- Grade B: Neutral Local Government, Limited Funding, Neutral Community
- Grade C: Opposing Local Government, Deficient Funding, Opposing Community

Once a city knows their grade, they can better determine an action plan and the level susceptible to exposure/risk. Although a city's current grade may be discouraging, there are many ways to improve grade:

Local Government

Methods to mitigate opposition within local governments include government restructuring, utilizing energy management offices, and climate action plans (CAP). Government restructuring includes consolidating offices, and hiring new employees, to ensure that energy efficient matters are handled within one subdivision of the local government rather than multiple offices which can slow decision making and project execution. It is also important that areas of the local government understand their role in energy efficient projects and that sustainability is rooted in the decision making process, inclusive of policy, funding, and programs. Energy efficiency must also be engrained in the facility management's decisions.

Supportive municipals should formulate specific targets and performance measures for the city in their policies, which can be employed by developing or updating a Climate Action Plan (CAP). A CAP is a strategic plan that outlines how to best meet energy reduction goals and successfully implement sustainability programs. The CAP will provide implementation timelines for specific target reductions and assessments of costs and benefits. Cities who have utilized climate action plans — Chicago, Pittsburgh, and Cambridge — all have determined both their short and long-term goals, began implementing them and continue to revise the CAP when necessary. If a city is to encourage the energy policy and Climate Action Plan that will address actions, it must do so in a way that replicates the preferences of its community.

Roles & Responsibilities

- Energy Management Office

The city's energy management office should be the 'heart' of execution for energy efficiency throughout the city. Employees at the office should be utilized in specific divisions, depending on their background, to ensure the most elite service is provided to the people of the city. As the energy managers, we suggest that there be a department that consists of three to five qualified and experienced personnel in the management office who will initiate an energy policy for the city. This policy should clearly state the city's goals pertaining to energy consumption, cost, and savings. The department will also meet regularly with the facility management staff to encourage and provide the best practices for achieving energy efficiency in renovated and new building designs. This will ensure that each facility manager understands that their role in practicing and improving energy efficiency as it is vital to the city's long-term goals in energy savings.

There are six full-time employees who already work at the management office who can be used to ensure that every aspect of the energy consumption, saving, and costs are continuously being evaluated. These employees will meet with the energy policy department and energy managers to inform them of energy efficiency progress or decline. Additionally, roughly 50% of the city's energy consumption is caused by street lighting, which will require a designated staff member at the energy management office to manage and evaluate the progress to ensure that the alternative solution is beneficial to the city's goals and energy costs. The 2% budget allocated to employee salaries and administrative costs, along with a portion of the additional 2% of the city budget from special projects can cover the cost of the additional office staff. [1] As the city commences the process in reducing its overall energy consumption, it should aim to satisfy these key steps as a part of the Energy Star Guidelines for Energy Management: Make a Commitment, Create Action Plan, Implement Action Plan, Evaluate Process, and Recognize Achievements [2].

Case Studies

- Chicago, Illinois is determined to achieve an 80% reduction in its greenhouse gas emissions level (GHG) by the year 2050 with an initial goal of a 25% reduction by the year 2020.
- Cambridge: Committed to reducing its energy consumption by 20% for buildings and vehicles by adopting and following the U.S. Green building Council's Leadership in Energy and Environment Design (LEED) standards.
- Pittsburgh, Pennsylvania owns over 300 buildings, including recreation centers, police stations, and offices and expects to reduce overall energy use by at least 20% in the next five years.

Funding

Funding is naturally a major factor in reducing energy consumption. Cities with limited funding for energy efficient innovation must look for creative ways to push their energy reduction agendas. This includes investigating public and private investors and groups who offer free services such as local utilities and state representatives. Methods of financing include applying for grants sponsored by the state and local governments, in addition to utility company's grants and funding programs. Also identifying potential rebates and subsidies that the city may be eligible to receive.[1, p17] There are also other resources that are available for use without funding. This includes local utilities, state energy offices, and energy service companies that offer energy experts who will evaluate buildings and offer suggestions for energy savings.[1, p11]. Energy Management Office's (EMO's) with smaller budgets may also investigate community energy programs and Local Energy Alliances (LEA), that offer revenue, financial mechanisms, and energy performance contracting [1, p30] that may help achieve the city's goal of energy efficiency.

Cities with satisfactory budgets for energy efficient innovation have a larger pool of solutions to consider when reducing energy consumption in public buildings. These cities may analyze benchmark data and determine which buildings are the largest energy consumers and analyze the feasibility and potential profits that may come from investing in reducing energy consumption. This is especially important since their funds may allow them to fully finance projects on a large enough scale that the energy efficient improvements may replenish initial investment funds and promote long term additions to funding. Extensive projects that cities with satisfactory budgets may be allowed to implement include lighting controls and redesign; energy management systems; building automation technologies; energy efficient heating, ventilation, and air conditioning equipment; commissionin;, and green retrofits.

Case Studies

- Jackson, Wyoming: Voter passed tax programs producing 3.7 million dollars in Energy efficiency in public buildings.
- Boulder, Colorado: Tax produced 1.8 million dollars to fund efforts to reduce energy consumption, inclusive of CAP and energy efficacy programs.
- Brainbridge Island, Massachusetts: Local Government partnered with local credit union to create a loan program for energy efficient improvements.
- Massachusetts and Pennsylvania: Two states, among others, with loan and rebate programs for energy reduction in municipal buildings.

Community

Public outreach is the best method to educate local communities about the benefits of energy efficiency and how reducing energy consumption affects them. Outreach can take place through seminars and community projects. The community must be made aware of the city's efforts to make a difference in energy consumption. It is the city's job to promote benefits and highlight how the local community can make a difference as well.

Case Studies

- Salt Lake City, Utah: Utilized social marketing and community networking to promote energy behavior change.
- Oberlin, Ohio: The city collaborated with education institutions to develop curricula on energy efficiency and other clean energy projects.

Supportive Partnerships

There are many options for local governments who need to find support from private organizations. The most well-known example of such groups are Local Energy Alliances (LEA). LEA's aid local governments in finding programs, funding, and companies who offer free services and expertise. The list of states including Virginia, North Carolina, California, and Georgia, continues to grow.

Case Studies

- Bedford, New York: Utilized utility resources to achieve eligibility for state and federal energy programs.

- Jackson, Wyoming: City formed a formal Governance Partnership to achieve energy efficient goals.

Once mid-sized cities have determined the challenges they may face in implementing energy retrofits, they mat being the process of reducing excessive energy consumption in public buildings, using the following energy reduction flow chart for public buildings in mid-sized cities.

3. Constraints and Criteria for Design Requirements

To accomplish the goal of this case, a scalable, sustainable, and replicable energy data tracking and energy management strategy for the city's portfolio of owned public buildings must be recommended. The strategy proposed must address the following: (1) the key roles and responsibilities across the city organization; (2) how building energy data will be collected and used; (3) how energy efficiency projects will be discovered, prioritized and financed and; (4) how to empower and incentivize operations and maintenance staff to manage energy use and associated costs, and maintain energy savings over time.

The city would also like to highlight successful programs to stakeholders, so defining program goals, timelines, and methods for communicating results is important. A reasonable strategy will address actions going forward 10-20 years and include milestones. The proposed idea should consider which city decision-making formats and processes create opportunities to integrate energy efficiency recommendations and how energy goals might become engrained in the culture of the city's decision-making.

Changes to city policy can be recommended in proposals but must be supported by realistic strategies. It can also be assumed that any department restructuring activities, such as reorganizing responsibilities and positions to better align financial incentives and decision-making power, would not contribute to program costs. The mayor's office is open to restructuring the energy management function to increase energy efficiency if it will significantly contribute to reaching the 20% reduction goal in a cost-effective manner.

4. Solution Generation and Selection of Top Design

The following approach was taken to generate our solution:

Evaluation

In the first phase, evaluation, energy management offices must develop and understand a building portfolio, budget and available programs. Creating a building portfolio involves gathering information on the buildings through insurance records, tax records, and facility management offices. It is important to know the building's functions and know the departments that occupy them. The energy management office must provide it's available budget. Lastly, the EMO's should finish which, if any, programs the local government is eligible for such as; grants, loans, rebates which may enhance the city's budget.

Energy Consumption Data Collection

The most financially feasible and time effective method to address issues with utility data collection include software that is either directly managed by the city's energy management office or managed by a hired third party. There are various applications for data collection, and this proposal will discuss those that are best for public buildings. The first is Energy STAR Portfolio Manager, which is a joint venture between the Department of Energy (DOE) and the

Environmental Protection Agency (EPA). This application allows for the manual input of water and energy consumption. It allows local governments to track and assess energy and water consumption, square footage, building type, energy use intensity, ENERGY STAR score, areas of savings, prioritize investments, and green-house gas emissions across a building portfolio.[5:p3] Green Button technology provides electricity cost with easy access to energy usage data, is provided by utility companies to customers, and can be uploaded to third parties. Currently 23 utility companies in the U.S. have implemented green button technology, and 17 others have vowed to implement. If it meets budgetary constraints, the city may also hire a third party to perform and organize data collection, such as B3 Benchmarking software, developed by Weidt, and Ameresco AXIS Invoice Management which are both specific to municipal buildings for the purpose of benchmarking. Ameresco AXIS Invoice Management is geared towards helping commercial and industrial companies, governments and institutions simplify and identify new opportunities for energy and cost savings during utility bill processing that lower utility costs and reduce environmental impact [15]. It offers comprehensive data reporting for each location in an organization and fully automates utility bill management and information capture with advanced technology that provides faster access to accurate data. For location account assurance, they provide clients with the certainty that all account and meters are correctly identified and billed during opening and closing of facilities. Ameresco AXIS also conducts energy data analysis, which includes comparative analysis, correlative analysis and rate review analysis.[15] Lastly, there are the advancements from Johnson Controls in software in managing and monitoring energy consumption, which can be applied to public buildings.

Case Studies

- Minneapolis, Minnesota: Utilizes Energy STAR Portfolio manager, for over 600 buildings, 102 of which are publicly owned. Minneapolis also offers videos, websites, and training seminars to help educate facility managers on how to properly utilize Portfolio Manager and increase the accuracy of data entered [5: p3].

Benchmarking

Benchmarking is a process that allows cities to measure and track energy consumption, identify improvements, prioritize investments, and evaluate effectiveness of implemented energy efficiency measures. The benefits of benchmarking include increased energy performance, awareness in local communities, motivating market forces to invest in energy efficient technologies. Benchmarking is initially conducted over a twelve month period, so that seasonal, hourly, and monthly energy consumption trends can be evaluated.

Case Studies

- Minnesota & Iowa State: Together the two states determined nearly 23 million dollars in potential savings in public buildings.
- Houston, Texas and Chicago Illinois: Through benchmarking implementation, increased the demand and completion in the market place for energy efficient buildings without the use of subsidies.
- Minneapolis, MN: Implemented benchmarking policy in public buildings, over 25, 000 square feet (sqft), requiring buildings to report annual energy and water consumption. The city was able to learn that there is 11% variability in energy intensity based on the age of the buildings in their building portfolio. Minneapolis educated facility managers on how to input benchmarking data through websites, videos, and workshops. The benchmarking policy also increased demand in energy efficient services, jobs, and investments in existing buildings.

Feasibility Assessment

The first step in feasibility assessment is goal setting and quantitative analysis. Cities must determine how they will achieve goals, the specific actions that need to be taken for success, and ensure that energy efficiency and sustainability is embedded into comprehensive city planning projects. The city must also calculate expected savings replenished from projects after initial investment, and how it will contribute to the city's budget. Organizations that can be consulted include local utilities, state energy offices, and energy service companies; which often offer energy experts. Another important aspect to consider is life cycle cost analysis, which provides a net value after evaluating initial investment, maintenance, and operation costs in comparison to expected savings. When evaluating feasibility, emphasis should be placed on catalytic projects that promote long term regional change.

Implementation

To mitigate risk and exposure of midsized cities, each city should have a representative in project management. This representative should handle scheduling, planning, contracts, budgeting, the bidding process, and construction through project close out. There are three options cities may consider, including hiring a city representative, a firm that specializes in project management, or consult a representative from the state government. Hiring a representative for local government should only be considered if the city has a long term plan for implementing efficiency projects, and finds that the employee will contribute value greater than the cost of their salary and benefits. Firms make a good choice for communities that are implementing a few projects at a time.

Case Studies

- Jones Lang LaSalle, Project development Services: Represents state of Michigan in Renovations of historic Cadillac Place; including payment structures, occupancy during construction, coordination among multiple parties, and tight budgets and timeframes.
- CBRE, Public Institutions and Education Solutions Group: Represents State of Texas, including planning, construction management, and transaction representation.

<u>Verification</u>

Verification of results is a continuation of the benchmarking process, where new trends and savings are determined. The actual return on investment in comparison to the expected and scheduled return on investment should also be evaluated. The city should state their achievements and failures, and understand what actions caused these outcomes. The city should also state their new goals based on the data they have received form benchmarking and the recognition of new trends.

Case Studies

- Madison, Wisconsin, Bainbridge Island, Washington, Salt Lake City, Utah : Each city monitored and documented numerical data, and compared results with their stated goals. They also shared the results with the public so they are made aware to the progress of the city and how it impacts their community.

In addition to the above strategy, we had a decision matrix we needed to compile in order to decide on the best way to track our data for the purposes of executing this plan on a small scale. More information is provided to discuss the types of simulations discovered that could help with this as well as a decision matrix on the final decision:

Building Information Modeling (BIM)

To provide a visual and demonstration of the solutions we will be implementing, the team has decided to use a simulation software that would allow our audience to easily see the impacts that our solution has on the city. There are two kinds of software that may be combined together to provide us with the best results: electrical component specific simulation and overall building simulation. Combining the different simulation types would allow us to determine how different components utilize energy and then apply all of these changes/results to a building simulation to view the overall results.

Electrical Component Specific Simulations

The electrical component specific simulations focus on the different devices within a building that would impact a portion of its energy efficiency. Such simulations that could be used for this are Trane Trace 700, ETAP, and SKM Power Tools. Trane Trace 700 is a simulation software that directly analyzes HVAC systems. Given that HVAC systems are a major portion of energy consumption, it is important to understand how it affects overall energy efficiency. Therefore, this simulation would be great to combine with a building simulation to be described later. [15] ETAP is used for power management and would allow the user to monitor the energy being used and create predictive simulations to reduce future energy-related issues. [16] SKM Power Tools focuses on analyzing circuits. This software allows the user to compare alternative solutions and concentrates mainly on load analysis and voltage drops. This software will most likely be a last resort if the team is not able to get the others. [14]

Overall Building Simulations

The overall building simulations allow the team create a virtual building and display how our solutions will affect the energy efficiency of the building. One such software that could be used is Home Energy Efficient Design (HEED). This simulation would focus more on the residential buildings within the city since our buildings within the medium sized city have been split into three categories. It allows us to change the components of the building to see how they affect the energy being consumed and the amount of money that could be saved (or lost) with these changes. [11] Another program we are interested in using is actually a plug-in for SketchUp. This plug-in, called OpenStudio, in conjunction with EnergyPlus on SketchUp allows us to see where the loads of the building are and can therefore determine where we need to reduce our energy consumption. EnergyPlus alone is an energy analysis and thermal load simulation program. It calculates the loads of the building based on information provided from the user and determines what these values should be to minimize energy consumption. The information that we provide to the program will be generated from one of the electrical component specific simulations. Based on the versatility of this software, this is our first choice for our Building Information Modeling. [12] Integrated Environmental Solutions offers a simulation software that would also allow us to perform the duties that we would like to. We would be able to test different design options to, again, make conclusions for the best way to electrically configure the building. With further research, we will determine which simulation will fit our needs the best and is the most feasible for what we wish to present. [13]

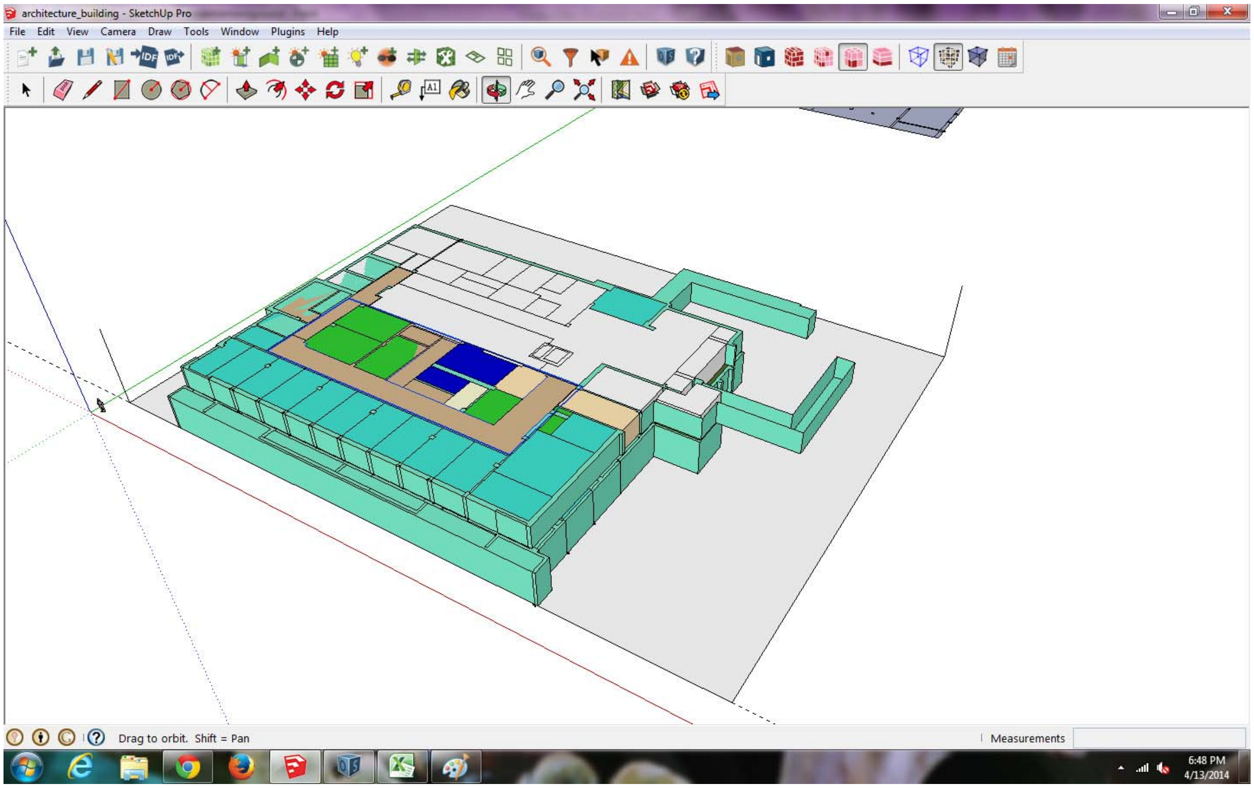
Building Information Modeling Simulation Comparison

	3	4	1	5	2	15
	20%	27%	7%	33%	13%	100%
Option	Cost	Reliability	Speed of Calculations	Versatility	Ease of Implementation	Score
Trane Trace 700	20	80	80	100	60	72
ETAP	40	100	100	80	90	80
SketchUp	80	100	100	100	80	93
HEED	100	50	75	40	65	60
						0

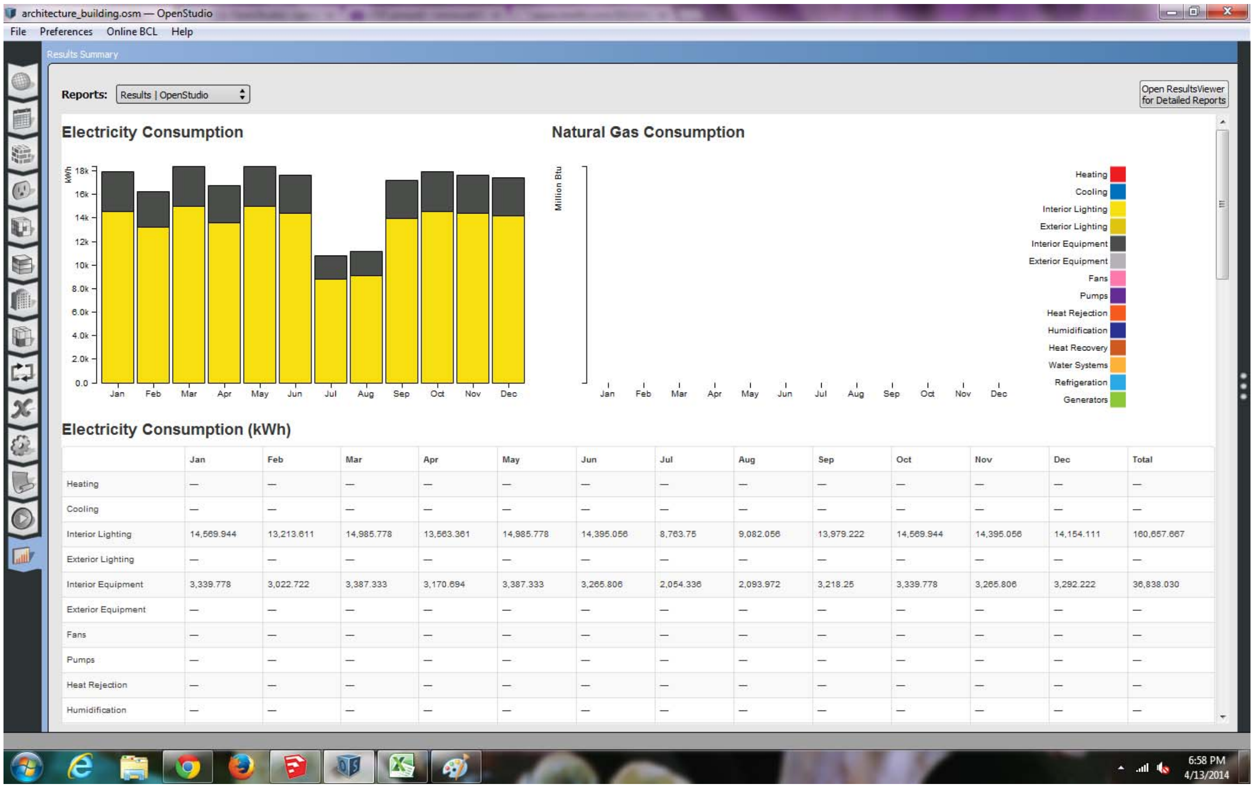
5. Implementation of Top Design

The following images will display how we used our process and implemented onto a micro-scale project that is the Howard H. Mackey Building:

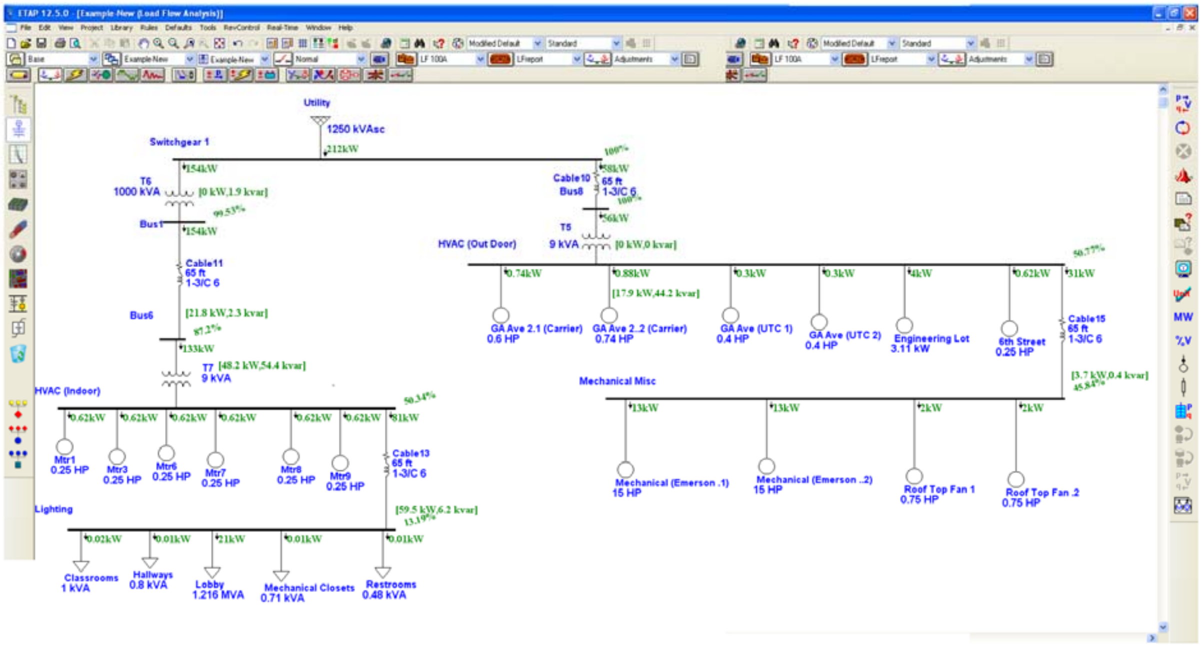
This image displays all the data that was gathered in order to have impressive solutions. Data such as the loads in the buildings, the size of the windows and they kind of HVAC system used were very helpful in making sure we came up with the best solution for this case.



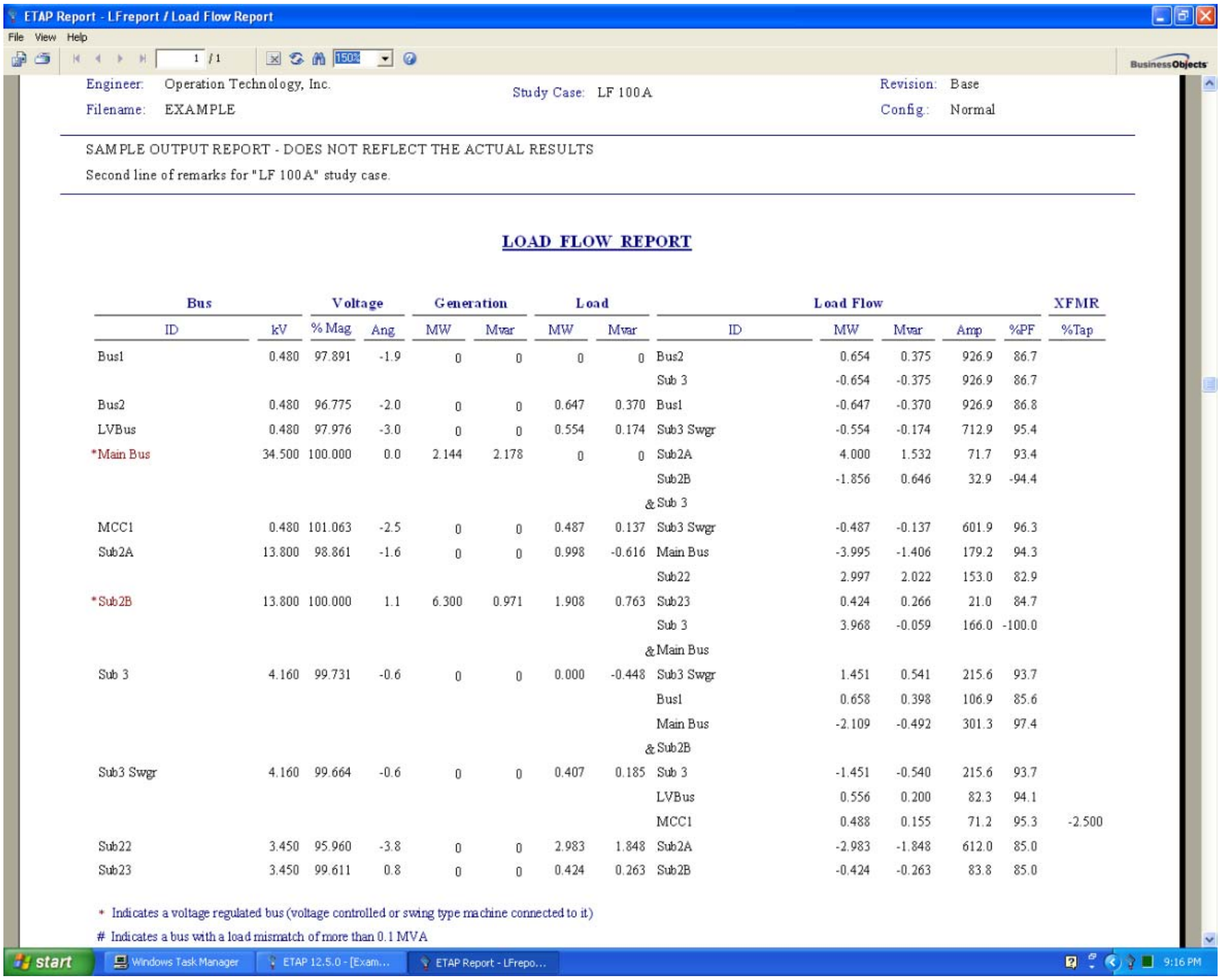
The use of SketchUp was very useful in getting a visual of the data we were gathering. SketchUp allowed us to categorize the different rooms within the building, then input load values based on that type of room.



After all loads are included into the software, it is able to run a simulation then output the energy usage. This graph alone is great for tracking the energy because you can see the usage throughout the year and make adjustments that way.



ETAP allowed us to very and track our data differently. For this software, there is no overall visual provided of the building. Loads are simply added to the sketch as displayed above.



ETAP Report - LFreport / Load Flow Report

File View Help

Engineer: Operation Technology, Inc. | Study Case: LF 100A | Revision: Base
Filename: EXAMPLE | Config.: Normal

SAMPLE OUTPUT REPORT - DOES NOT REFLECT THE ACTUAL RESULTS
Second line of remarks for "LF 100A" study case.

LOAD FLOW REPORT

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag	Ang	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	%Tap
Bus1	0.480	97.891	-1.9	0	0	0	0	Bus2	0.654	0.375	926.9	86.7	
								Sub 3	-0.654	-0.375	926.9	86.7	
Bus2	0.480	96.775	-2.0	0	0	0.647	0.370	Bus1	-0.647	-0.370	926.9	86.8	
LVBus	0.480	97.976	-3.0	0	0	0.554	0.174	Sub3 Swgr	-0.554	-0.174	712.9	95.4	
*Main Bus	34.500	100.000	0.0	2.144	2.178	0	0	Sub2A	4.000	1.532	71.7	93.4	
								Sub2B	-1.856	0.646	32.9	-94.4	
								& Sub 3					
MCC1	0.480	101.063	-2.5	0	0	0.487	0.137	Sub3 Swgr	-0.487	-0.137	601.9	96.3	
Sub2A	13.800	98.861	-1.6	0	0	0.998	-0.616	Main Bus	-3.995	-1.406	179.2	94.3	
								Sub22	2.997	2.022	153.0	82.9	
*Sub2B	13.800	100.000	1.1	6.300	0.971	1.908	0.763	Sub23	0.424	0.266	21.0	84.7	
								Sub 3	3.968	-0.059	166.0	-100.0	
								& Main Bus					
Sub 3	4.160	99.731	-0.6	0	0	0.000	-0.448	Sub3 Swgr	1.451	0.541	215.6	93.7	
								Bus1	0.658	0.398	106.9	85.6	
								Main Bus	-2.109	-0.492	301.3	97.4	
								& Sub2B					
Sub3 Swgr	4.160	99.664	-0.6	0	0	0.407	0.185	Sub 3	-1.451	-0.540	215.6	93.7	
								LVBus	0.556	0.200	82.3	94.1	
								MCC1	0.488	0.155	71.2	95.3	-2.500
Sub22	3.450	95.960	-3.8	0	0	2.983	1.848	Sub2A	-2.983	-1.848	612.0	85.0	
Sub23	3.450	99.611	0.8	0	0	0.424	0.263	Sub2B	-0.424	-0.263	83.8	85.0	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)
# Indicates a bus with a load mismatch of more than 0.1 MVA

After running the software, ETAP will display results such as these. These results are different from those in SketchUp in that they don’t show the trends over time but they do show the load flow.

6. Performance Analysis and Evaluation of the Project

Given that our project is all theoretical, there are no concrete results of our “design”. What we do have are the case studies that have been proven to work in the various mid-sized cities across the country in addition to the data collected and simulations developed based on the Mackey Building. We believe that overtime, this system will prove to be worth the investment due to the support we have from the case studies as well as the microscale solution we developed. There is no guarantee that is 100% fool-proof, but it is a step in the right direction as far organizing a working energy management system.

7. Conclusion

The main goal of our proposal is to create a plan that reduces energy consumption at a low cost, and we are confident that our proposed solutions will accomplish that. We decided it would be more efficient to use the method of applying real-world events and technologies to our proposal. By researching, we discovered different real-world examples and used these examples to develop appropriate solutions. Events such as New York City placing LED bulbs in all of their streetlights inspired changes being made to our city. We also used our electrical engineering background to our advantage. We were able to establish the best power source for our city and propose the implementation of a bi-directional system for monitoring the energy use. As engineers, we were able to consider factors such as phase voltage and current when developing solutions, and we were also well aware of the different technologies that are being used today such as smart grids and renewable energy power sources. With this knowledge and technique, our proposal will result in a sustainable, measurable and practical energy solution that meets all of the requirements and can be completed in ten years. To address the issue of excessive energy consumption in public buildings this proposal recommends a process for mid-sized cities to follow, as well as methods to overcome challenges that may prevent cities from implementing energy efficient retrofits. These recommendations do not focus on a specific region, budget, or technology, but instead provide solutions to the macro challenges that hinder mid-sized cities from making innovative investments in energy efficiency; inclusive of mitigating risk and exposure for local governments, funding, data collection, implementation, and verification. If the energy reduction process is implemented within midsized cities the continuing benefits include a rise in property values, tenant satisfaction, a reduction in the maintenance expenses within buildings, job creation and economic development through the motivation of renewable careers and technological development within local markets, increased city budget, and an increased awareness of energy efficiency within the local community.

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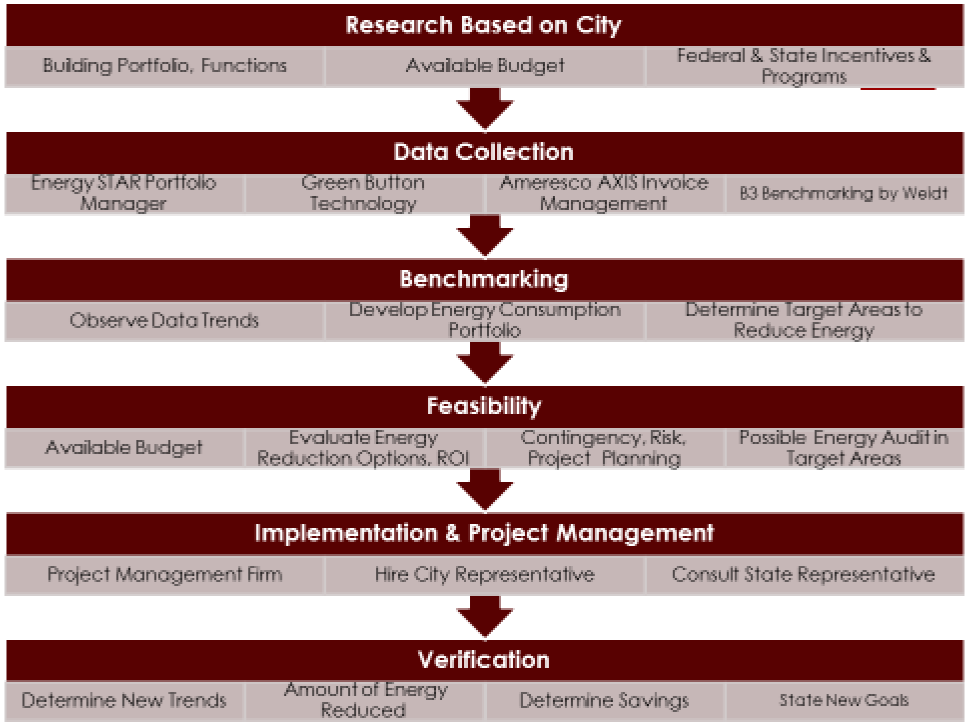
U.S. Green Building Council.(n.d.) *LEED v4 for Building Operations and Maintenance*.p 33-35. Retrieved from http://www.usgbc.org/sites/default/files/LEED%20v4%20ballot%20version%20%28OM%29%20-%2013%2011%2013.pdf **11**

The Weidt Group(n.d.).Benchmarks, Targets Ratings and Labels. B3 Benchmarking. Retrieved from http://twgi.com/benchmarkstargetsratingslabels.htm **7**

9. Appendix



This image shows an overall flow of our proposed idea.

A.Resumes

Monica P. Burnett

Phone: (281) 381-0281
Email address: monicab963@yahoo.com

Education

Fall 2010-present: Howard University, Washington, DC

- GPA: 3.83/4.0
- Expected Degree/Graduation Date: B.S. Electrical Engineering/May 2014

Work Experience

ExxonMobil Pipeline Company (Internship Program – Summer 2013)

- ***Program description:*** *Provides experiences necessary to successfully function within the company's future endeavors.*
    - Wrote a programmable logic controller program that would communicate with various devices at a field site
    - Configured the flow computer that would communicate with the programmable logic controller program

JPMorgan Chase & Co. (Technology Summer Internship Program – Summer 2012)

- ***Program description:*** *Prepares and trains participants for the firm's information technology organization.*
    - Served as liaison between the business organization and information technology organization

Princeton Plasma Physics Laboratory (Engineering Apprenticeship – Summer 2011)

- ***Program description**: Develops fusion as energy source for the world, and conducts research along the broad frontier of plasma science and technology*
- **Project sponsored** by *Office of Fusion Energy* Sciences of the *U.S. Department of Energy.*
    - Constructed a plasma speaker prototype and designed a Faraday Cage to house plasma speakers

Leadership

- Phi Sigma Rho National Sorority (Spring 2011 – present)
    - Sorority for women in technical studies whose mission is based on friendship, scholarship, and encouragement
        - President (Fall 2013 – present)
          Oversee all activities of the chapter, ensure the chapter has fulfilled all national responsibilities, and represent the chapter at all university activities as well as organizational activities.
        - First Vice President (Fall 2012 – Spring 2013)
          Maintain order in the organization, make sure bylaws are followed as well as update them each semester, and oversee the Standards Board.
        - Membership Educator (Spring 2012)
          Educate the new candidates for membership on every aspect of the organization and teach the importance of sisterhood as well as life lessons that may be applied in personal or professional situations.
        - Scholarship Chair (Fall 2011 – Spring 2012)
          Inform organization of upcoming scholarships, put on academic programs open to the university, and gather and keep record of the organization's academic information.
- Eta Kappa Nu (Spring 2011 – present)
    - Eta Kappa Nu is the electrical and computer engineering honor society dedicated to encouraging and recognizing excellence in the IEEE-designated fields of interest
        - Vice President (Spring 2013 – present)
          Work alongside the president to reinstate the Eta Kappa Nu chapter at Howard University.
- National Society of Black Engineers (Fall 2010 – present)
    - NSBE's mission is to increase the number of culturally responsible black engineers who excel academically, succeed professionally, and positively impact the community
        - Conference Planning Chair (Fall 2012 - Spring 2013)
          Prepare lodging and travel arrangements for the general body to conferences.

6511 Wood Pointe Drive
Glenn Dale, MD 20769

Alexis M.Wells

240.401.6117
Alexis.Wells25@yahoo.com

Objective

Seeking a career in energy efficient and sustainable design and manufacturing of power systems and renewable energy technologies; which will incorporate quality assurance.

Education

Howard University, Washington, DC   Electrical Engineering Major   Graduate Spring 2014

Relevant Skills

- Short-Circuit Analysis, Protective Device Coordination, and Arc Flash Hazard Analysis using SKM Power Tools
- Calculate incident energy at energized equipment and apply appropriate personal protective equipment
- Conduct energy and waste management audit
- Design energy model using Trane TRACE 700
- Operate electrical and mechanical energy analysis equipment
- Project Management: budgeting, scheduling, client/project liaison, base building, interior build-out, pricing, RFI, RFP, change orders
- Governmental accounting techniques
- Software: LabVIEW, SKM Power Tools, MATLAB, ETAP, Microsoft Office Suite, Mathcad
- Programming Languages: C++, HyperText Markup Language, Java Script

Research, Howard University, Washington, D.C. 2013-2014

Compare functionality, efficiency, and emissions of pellet stoves to certified renewable energy credit (REC) technologies, propose the implementation of sensors for metering, allowing pellet stoves to qualify for RECs.

2012-2013

Program data acquisition instrument to measure ambient temperatures and energy loss of a heating system within a home. Data to be displayed on the internet for remote observation and analyzed to evaluate the efficiency of electrical control systems.

Project and Development Services of Jones Lang LaSalle Summer 2013

In project management, facilitated communication between tenants or owners and project groups, to ensure work was completed within a reasonable time and budget, and guaranteed clients satisfaction with final products. Completed and submitted lighting survey which saved the property owner money through energy rebate programs.

Power Systems Engineering Group of Eaton Corporation, Warrendale, Pennsylvania Summer 2012

Updated the Warrendale office and Power Systems Experience Center electrical systems through power system studies, which ensured that systems were reliable, safe, and operated efficiently.

Energy Solutions Group of Eaton Corporation, Alpharetta, GA Summer 2011

As part of the commissioning team, designed energy model and conducted energy audit. Also led testing of lighting systems and fire alarm systems, and participated in the testing of switchboards, solar panels and inverters.

Innovative Partnership Programs Office, NASA Goddard Space Flight Center, MD 2007-2010

Managed procurement accounts of Goddard researchers to ensure proper and timely use of research funds, which allowed the IPP office to evaluate funds before the end of the fiscal year.

Leadership Positions and Volunteer Work

Hammonds Research Group Laboratory Manager **2012-Present**

College of Engineering Architecture and Computer Science Student Council Policy Board Head **2012-2013**

Alternative Spring Break: Week long volunteering with impoverished individuals and children **2012**

VENESSA WOODSON

Vwoodson4@gmail.com | (347) 731-7199

Permanent Address:
243 Westervelt Avenue
Staten Island, NY 10301

Current Address:
2251 Sherman Avenue, NW
Washington, DC 20001

EDUCATION

Howard University, Washington DC August 2010 - Present

- Bachelor of Science in Electrical Engineering, **GPA: 3.34/4.0**
- Expected Graduation: **May 2014**

EXPERIENCE

Dominion Virginia Power (Information Technology Internship) May 2013 – August 2013

-***Program Description***: Prepares and trains participant for the IT Enterprise Operation's Voice Group

- Assisted the IT Infrastructure Architect with activities that helped maintain, support and add to the voice network.
- Assisted on project to relocate 200 out-of-state employees to a new facility. Project required a telephone system (PBX) upgrade as well as the addition and programming of 200 licenses, telephones and voice mailboxes.
- Worked with Six Sigma Process Maps and SIPOC.
- Utilized Microsoft Project to identify project tasks, activity durations, and personnel assignments.

ORGANIZATIONS

National Society of Black Engineers, Howard University August 2010 - Present

-Member of Conference Planning Chair committee

National Council of Negro Women, Howard University August 2012 - Present

-Member of program committee; created programs and hosted events

The Society of Women Engineers, Howard University August 2010 - Present

- Participate in charity events and meetings

Phi Sigma Rho National Sorority, Howard University April 2013 - Present

-Executive Board Position: Treasurer

COMMUNITY SERVICE

America's Promise Mentoring Program Aug 2011 – Dec 2011

CEACS Mentoring Program September 2012 - Present

Capital Area Food bank April 2013

HONORS

Eta Kappa Nu Honor Society, Howard University April 2012 – Present

-Executive Board Position: Secretary

Tau Beta Pi Honor Society, Howard University

SKILLS: **Mobile Studio Software, Pspice Software, Microsoft Excel, Microsoft Project**