Restated Project Scope and Project Plan

EML 4551C – Senior Design – Spring 2012 Deliverable

Team # 7

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Project Sponsor

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Reviewed by Advisor(s):

Needs Assessment

America has an overflowing supply of “trash”, which contain a significant potential for future use. There is also a great need to turn to cleaner and more sustainable energy sources worldwide. This “trash” can provide the components necessary to design and construct a machine capable of generating energy, entirely out of recycled materials. These materials also have the benefit of being low-cost and easily obtained, which creates a feasible opportunity for third world countries with low financial resources. In order to help the environment and the people in third world countries, a low-cost energy generating system will be designed and constructed, which will be composed entirely of recycled materials and promote green energy.

Project Scope

Problem Statement

Using readily available parts from the trash of the “developed world”, design and construct a family-sized generator that runs off renewable resources (wind power, solar power, hydropower). It must be cost-efficient, easy to assemble, very robust and require very little maintenance. The generator must also be capable of withstanding severe weather to promote long term durability.

Justification/Background

In many countries around the world there are people with scarce means of acquiring power. This is mostly due to the lack of financial funds for a centralized power generation facility, or lack of parts that can be combined into a system that can harness energy from natural resources. A power generator would be a very valuable commodity for them and would greatly enhance their standard of living.

With planet Earth’s current energy crisis there is a huge surge towards using renewable resources to supply power. Around the globe people are turning to wind, solar and hydro power in order to reduce the amount of carbon emissions they are creating as well as obtain “free” sources of energy. Most common wind applications consist of wind turbines which harness the mechanical energy of wind turning a turbine. Mechanical energy is then converted into electrical energy with the use of either a motor generator or an alternator. Hydropower is another abundant renewable resource that uses falling or moving water to rotate a turbine and produce mechanical energy. This mechanical energy can then

be converted into electrical energy, similarly to wind power. Solar power can provide a substantial amount of energy due to the Sun; however, solar photovoltaic cells as well as solar thermal systems are very expensive.

Green energy systems made from new materials have a high cost, and the price is most commonly justified by large scale implementation. For the purpose of this project it is of great importance to provide a small scale device that would be affordable and effective in generating energy. Another advantage of designing the kit in a first world country is the vast majority of trashed or recycled components that are available. These components contain great value that in their current state is overlooked and kept in permanent storage. This abundance in parts is a key element in designing a low cost system.

Objective

The following are a list of objectives provided by Cummins that must be met with final design and construction of the power generation device:

- Power generation unit must be capable of generating 100 W•h/day
- Power generation unit must be capable of storing 300 W•h
- Output of unit must be 12 V Direct Current

Methodology

To begin the design and construction of our power generation system, extensive research has been conducted to answer the following questions: Which renewable energy source will meet our objectives most efficiently? Based on the renewable energy source selected, what are the three best locations in third world countries that are capable of providing this specific energy source? What “trash” or recycled materials are readily available for constructing this system that will meet our financial requirements?

Completion of this background research will involve online sources for energy theories and geographical information, as well as physical observations in junkyards and dumpsites for material selection.

Theoretical calculations have been performed to determine the size and specifications of the mechanical and electrical components. Since the theory is completed, team members will decide on which materials will be purchased and manage our budget. Upon purchase and construction, extensive testing will be performed since the equipment will consist of used and refurbished components. Some educated trial and error will also be practiced to enhance efficiency on small scale components.

To finalize the design and initialize the construction of a fully-functional power generation system to meet our objectives, we have implemented a systematic decision making process. This decision making process will classify each component into four categories: Electrical production efficiency, cost, ease of manufacturing and durability. Using this method we can ensure a working product with high consideration of all possible concepts.

Constraints

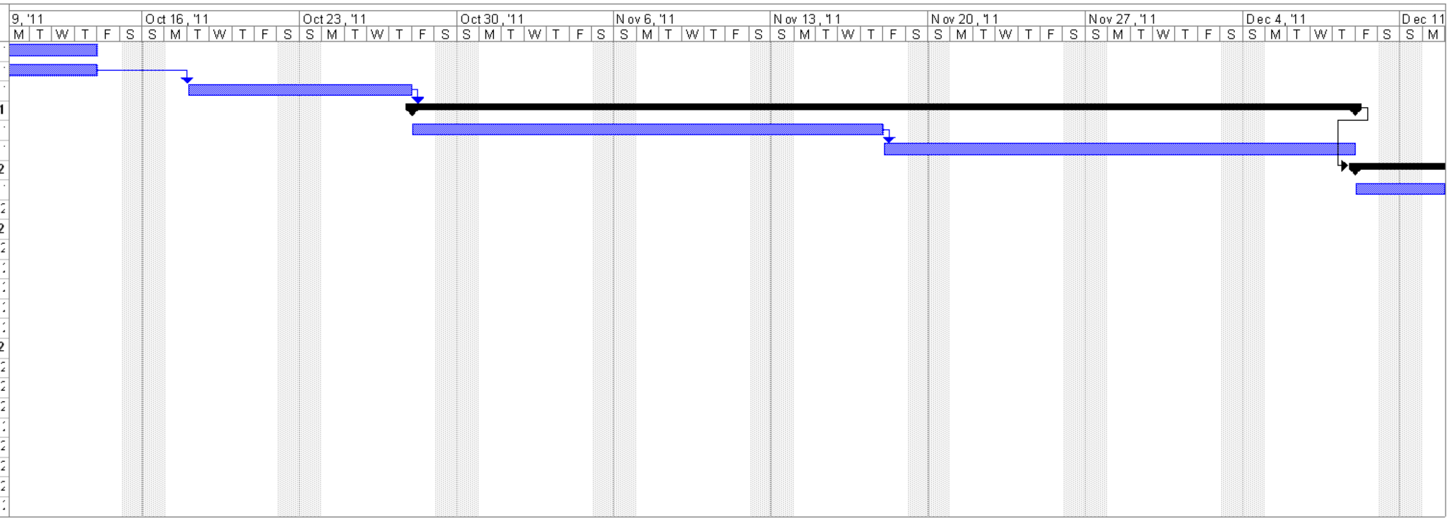
The following constraints must also be satisfied with the design and construction of the power generation system:

- Three geographic locations for implementation of the power generation unit must be selected in third world countries
    - Each location must be 100 Km away from the ocean and 500 Km away from each other
- Final Cost of the power generation kit must be under (US) $50.00
    - Price does not include construction, materials, or labor costs at destination
    - Does not include refurbishment costs for recycled materials

Expected Results

At the end of this design project, a fully functioning, renewable energy based generator will be developed. The system will be capable of producing 100 W•h/day and have a storage capacity of 300 W•h. The final kit will cost $50 (US) or below, and it will be easy to assemble using everyday tools that the indigenous people have on hand. Furthermore, the system will be robust and reliable enough to meet the needs of a small family in a developing region. Working together as a team, in a time effective manner will ensure the success of the project.

ID	Task Name	Duration	Start	Finish
1	Project Specification	4 days	Mon 10/10/1	Thu 10/13/1
2	Project Plan	4 days	Mon 10/10/1	Thu 10/13/1
3	Concept Generation and Selection	8 days	Tue 10/18/1	Thu 10/27/1
4	**Design Review**	**30 days**	**Fri 10/28/11**	**Thu 12/8/11**
5	Interim Design Review	15 days	Fri 10/28/1	Thu 11/17/1
6	Final Design Review	15 days	Fri 11/18/1	Thu 12/8/1
7	**Component Testing**	**26 days**	**Fri 12/9/11**	**Fri 1/13/12**
8	Testing Components	11 days	Fri 12/9/11	Fri 12/23/1
9	Analysis	14 days	Tue 12/27/1	Fri 1/13/12
10	**Prototype Construction**	**24 days**	**Mon 1/16/12**	**Thu 2/16/12**
11	Build	14 days	Mon 1/16/1	Thu 2/2/12
12	Test/Analysis	10 days	Fri 2/3/12	Thu 2/16/1
13	Team Evaluations #3	3 days	Tue 1/17/1	Thu 1/19/1
14	Progress Report Presentation	3 days	Tue 1/17/1	Thu 1/19/1
15	Mid-Point Review Presentation	3 days	Tue 2/14/1	Thu 2/16/1
16	**Final Build**	**20 days**	**Mon 2/20/12**	**Fri 3/16/12**
17	Final Construction	11 days	Mon 2/20/1	Mon 3/5/12
18	Final Analysis	9 days	Tue 3/6/12	Fri 3/16/12
19	Team Evaluations #4	3 days	Tue 2/28/1	Thu 3/1/12
20	Instructor-Team Visit	3 days	Tue 3/13/1	Thu 3/15/1
21	Final Report	13 days	Tue 3/20/1	Thu 4/5/12
22	Final Presentation Project Review	13 days	Tue 3/20/1	Thu 4/5/12
23	Operations Manual	13 days	Tue 3/20/1	Thu 4/5/12
24	Open House	1 day	Thu 4/12/1	Thu 4/12/1



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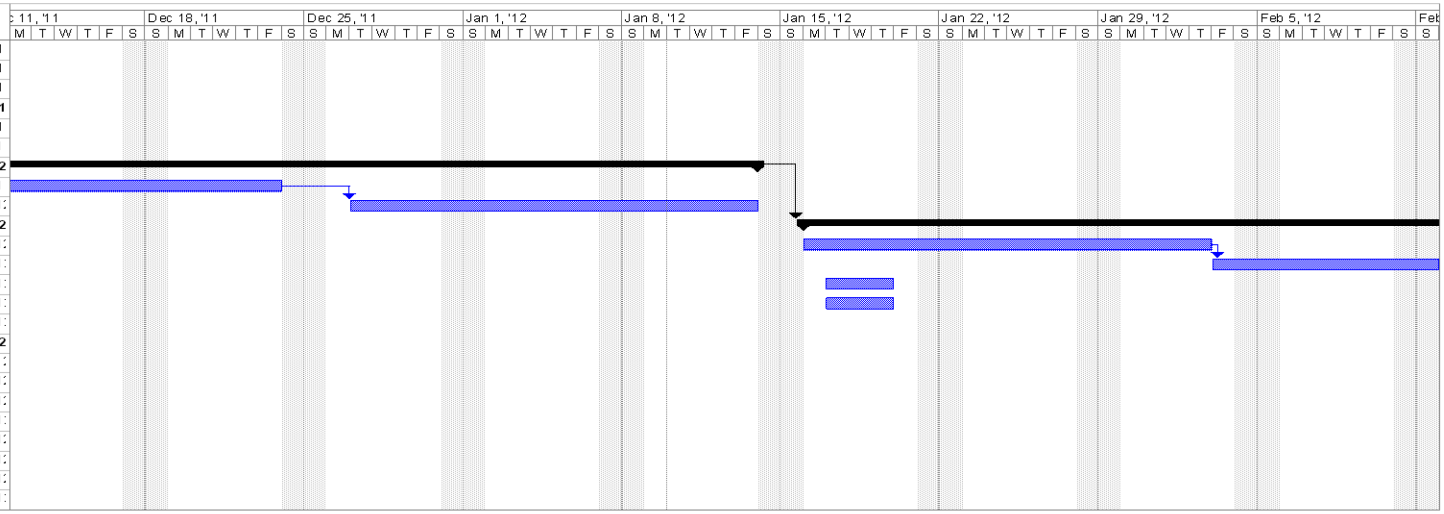

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