Project Specification and Project Plan

EML 4551C – Senior Design – Fall 2011 Deliverable

Team # 7

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Reviewed by Advisor(s):

Introduction

The purpose of this project is to engineer a power generation package that implements renewable energy sources available in third world countries. The package must be constructed from entirely recycled materials, which will maintain a low cost and diminish the amount of trashed materials in an effective way. Specific locations where the device will function must be chosen under given constraints from the sponsoring company: Cummins. These constraints will ensure that power generation can be accomplished at a small scale efficiently from completely clean and renewable sources.

Product Specification

The power generating package will be composed of three essential components, which are: a rotating component, an alternator, and a power storage device. These three components are the building blocks for the package and will be responsible for converting renewable energy into kinetic mechanical energy, and finally into electricity.

Rotating Component

The rotating component will have the primary task in generating power. It will convert the renewable source of energy into mechanical or useful energy. The renewable source will consist of either water, or wind power and this will require a turbine blade assembly. It is essential to design a highly mechanically efficient rotating component to conserve as much useful energy as possible from the renewable source. This rotating device should be constructed to respond to a small scale system. If wind energy is chosen as the source, the turbine assembly needs to be sensitive to wind speeds at ground level. If water is chosen as the source, the turbine assembly needs to be sensitive to adequate potentials from water flow. During this initial phase of power generation the quality of energy needs to be as high as possible to meet the given constraints as efficient as possible.

Alternator

Whether the renewable energy source chosen to use is wind or water power, the “alternator” in the project is needed to convert rotational mechanical energy into electricity. This can be done by various components including an automobile alternator. The best reason to use an automobile alternator would be that it already supplies 12V DC current which is exactly the output needed. Automobile alternators are readily available and can be purchased at relatively low costs. There are also other highly economical and efficient options. They include the use of electric motors running in reverse and supplying electricity. Research needs to be performed to determine which choice will be best considering the amount of mechanical energy generated from the rotating component.

The selection of our alternator will be influenced by the cost constraint. Since the project has a $2000 budget with a $50 ultimate cost; detailed testing will be performed to choose the best overall system.

Power Storage Device

The power storage system needs to hold an average capacity of at least 300Wh at 12V DC. Reapplying the automobile concept used for the alternator, automobile batteries are a possible choice as they hold a 12V charge. The biggest problem with this type of battery is the price. A rechargeable battery is an

efficient way of storing power, but it must fit with the given financial constraints. Alternative batteries need to be further researched to select one that meets both the power storage and financial constraints. A capacitor is another option for storing the power that must be researched further to determine if it is a viable power storage device.

Quality Function Deployment

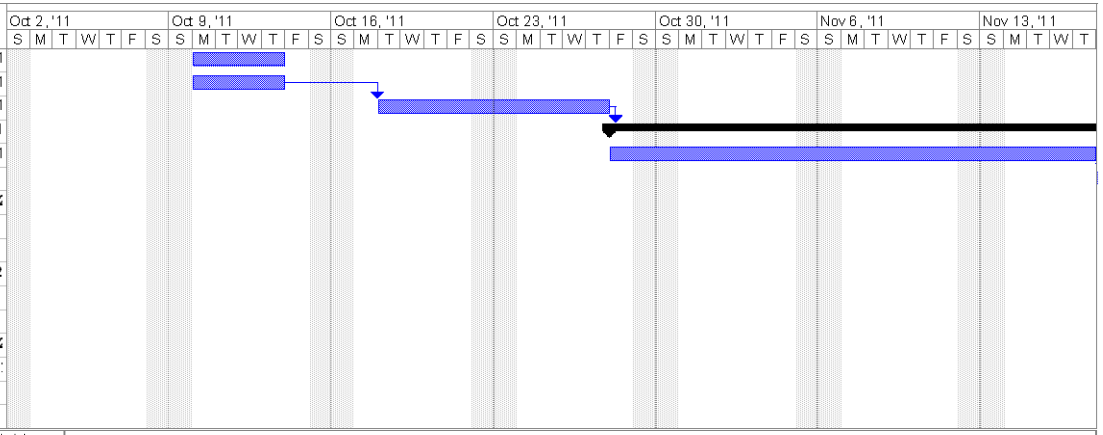
Engineering Specifications

Customer Needs	Power Storage	Mechanical Energy (Rotating)	Component Efficiency	Material Strength	Friction
300 W*Hr	X	X	X		
100W*Hr/day	X	X	X		
<$50	X		X	X	
Simple Assembly		X			
Low Maintenance	X			X	X
Easily Replacable Components	X	X		X	
Durability				X	X
	W*Hr	J	%	Pa	N

Whenever an "X" is present in the table, both the customer needs and engineering specifications coincide.

Project Plan

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 Selectior	8 days	Tue 10/18/1	Thu 10/27/1
4	**Design Review**	**30 days**	**Fri 10/28/1**	**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 12/9/1**	**Fri 1/13/1**
8	Testing Components	11 days	Fri 12/9/1	Fri 12/23/1
9	Analysis	14 days	Tue 12/27/1	Fri 1/13/1
10	**Prototype Construction**	**24 days**	**Mon 1/16/1**	**Thu 2/16/12**
11	Build	14 days	Mon 1/16/1	Thu 2/2/1
12	Test/Analysis	10 days	Fri 2/3/1	Thu 2/16/1
13	**Final Build**	**21 days?**	**Fri 2/17/1**	**Fri 3/16/1**
14	Final Construction	11 days?	Fri 2/17/1	Fri 3/2/1
15	Final Analysis	10 days?	Mon 3/5/1	Fri 3/16/1
16	Final Report and Presentation	8 days	Mon 3/19/1	Wed 3/28/1



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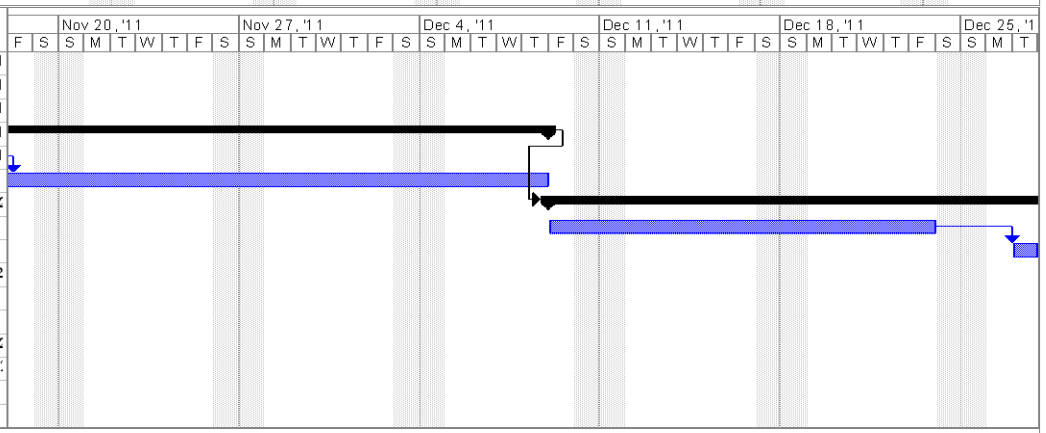

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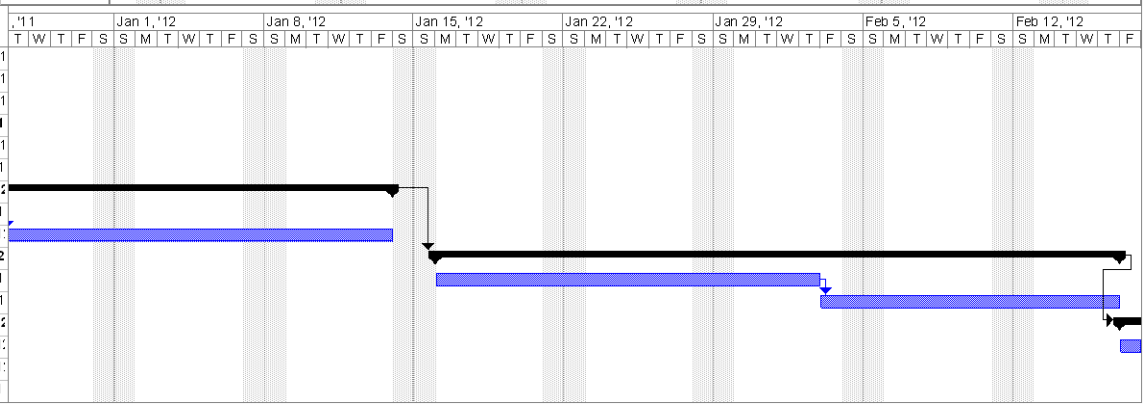

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