

I PRO 337 Project Plan
Fall 2008

Zero Energy Lab

Advisor: Nancy Governale-Hamill

1.0 Abstract

The IPRO 337 team's objectives for this semester are to make further progress in updating the top floor of Machinery Hall into a lab for future energy and lighting technology research. The research conducted this semester will help us transform the space into a more sustainable working environment. Since the ultimate goal is rather ambitious, our goal for this particular semester is to implement an energy plan which will become the basis off of which the future IPRO's will continue towards the ultimate goal. We also intend to clear the space so that the developed plan can be tested.

2.0 Background

IPRO 337: Zero Energy Lab is a project dedicated to devising a comprehensive zero energy solution for the Zero Energy Lab atop Machinery Hall. In the past, the IPRO team investigated potential technologies and methodologies including the use of photovoltaic arrays and wind turbines for power generation, battery systems for energy storage, passive cooling and heating systems, desiccant systems, and various devices native to the laboratory environment. These technologies presented unique challenges and issues to the team, as many of the systems that were to be put into use were (and still are) either experimental or have not been used in this fashion. Several things came out of the previous IPROs, including a proposed solar cell / hydrogen fuel cell hybrid system to supply energy to the Zero Energy Lab, a passive climate control system, and the idea that the Zero Energy Lab could be a place where individuals from all aspects of science and engineering could come together, collaborate, and educate one another.

Last semester, the goal for the Zero Energy Lab was to create testing mechanisms for various renewable and green technologies and methodologies. Different groups investigated different aspects of these technologies and methodologies and divided these into various categories such as lighting, technology, and furnishings. By the end of the semester, the team began the ZEL-rating evaluating system method for testing new technologies. The team also worked out some of the costs for improving the lab areas and found possible subcontractors to work on the spaces.

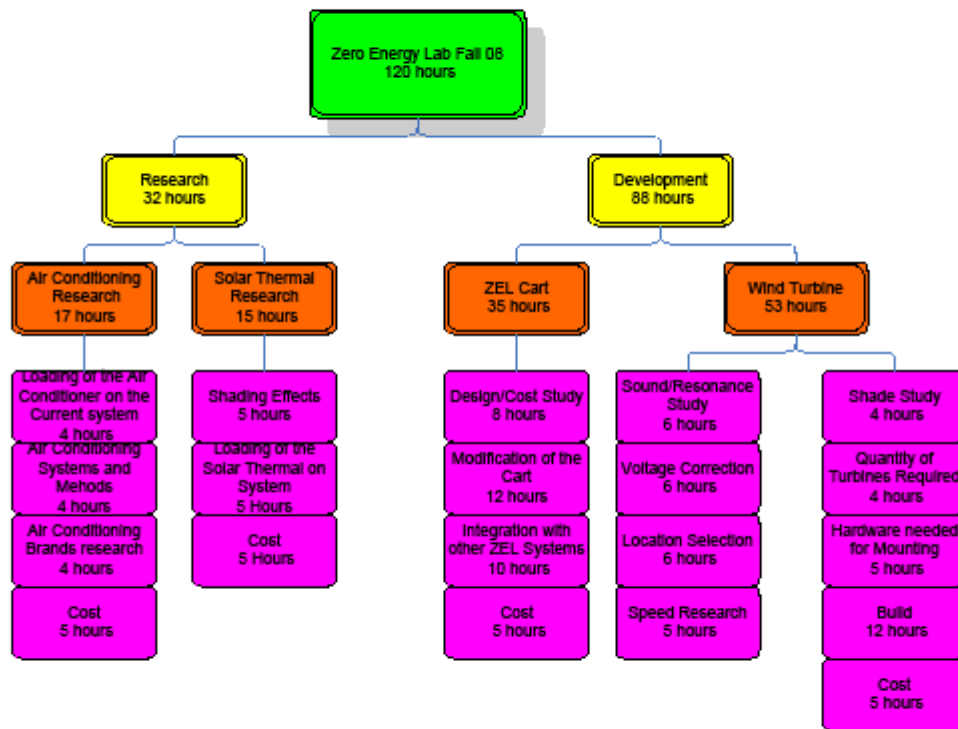
3.0 Objectives

To achieve the established goals, team cooperation will be highly emphasized. For this fall semester, the team has set forth the following objectives:

- Research energy generating technologies to push the zero energy lab closer to the ultimate goal of being totally off grid.
 - Wind power
 - Solar thermal
 - Continuation of photovoltaic installation
- Research and test various energy efficient equipment for main stream use.
- Research environmentally friendly temperature control systems to create a hospitable

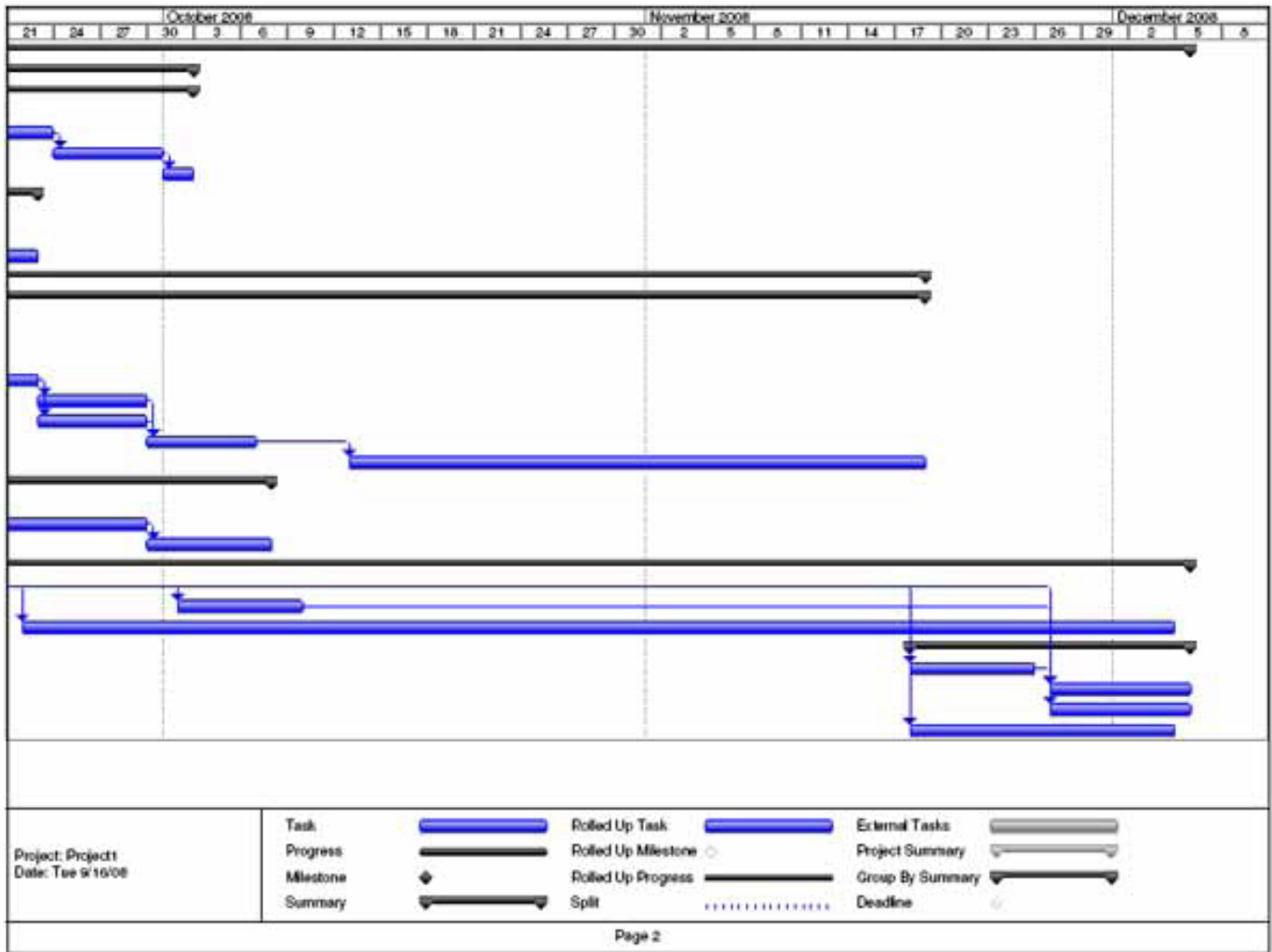
- space where research and tests can be conducted
- Continue developing a website to display the development progress of the Zero-Energy Lab and provide information regarding “green technology”
- Clean and prepare the 6,000 ft² space for future inhabitants. This will be in addition to preparing the budget, cost analysis, and schedule for the work to be completed in the lab.
- Research and implement the use of a mobile battery bank which will reside in the lab as a means of testing power distribution methods in the lab space.
 - Obtain mobile battery bank
 - Build off its existing technology

4.0 Methodology



ID	Task Name	Duration	Start	Finish	Predecessors	September 2008											
						19	22	25	28	31	3	6	9	12	15	18	21
1	I PRO-337	74 days	Tue 8/26/08	Fri 12/5/08													
2	Research	23 days	Tue 9/2/08	Thu 10/2/08													
3	Air Conditioning Res	23 days	Tue 9/2/08	Thu 10/2/08													
4	System and Metri	10 days	Tue 9/2/08	Mon 9/15/08													
5	Load study	6 days	Tue 9/16/08	Tue 9/23/08	4												
6	Brand Research	5 days	Wed 9/24/08	Tue 9/30/08	5												
7	Cost Analysis	2 days	Wed 10/1/08	Thu 10/2/08	6												
8	Solarthermal	15 days	Tue 9/2/08	Mon 9/22/08													
9	Shading Effects	5 days	Tue 9/2/08	Mon 9/8/08													
10	Loading on existi	5 days	Tue 9/9/08	Mon 9/15/08	9												
11	Cost	3 days	Thu 9/18/08	Mon 9/22/08	10												
12	Development	61 days	Tue 8/26/08	Tue 11/18/08													
13	Wind Turbine	61 days	Tue 8/26/08	Tue 11/18/08													
14	Shade Study	5 days	Tue 8/26/08	Mon 9/1/08													
15	Windspeed Rese	8 days	Tue 9/2/08	Thu 9/11/08	14												
16	Location Selectio	2 days	Fri 9/12/08	Mon 9/15/08	15												
17	Quantity Study	5 days	Tue 9/16/08	Mon 9/22/08	16												
18	Sound Resonanc	5 days	Tue 9/23/08	Mon 9/29/08	17												
19	Voltage Correctio	5 days	Tue 9/23/08	Mon 9/29/08	17												
20	Cost	5 days	Tue 9/30/08	Mon 10/6/08	19,18												
21	Build	27 days	Mon 10/13/08	Tue 11/18/08	20												
22	ZEL Cart	22 days	Mon 9/8/08	Tue 10/7/08													
23	Design / Cost Stu	6 days	Mon 9/9/08	Mon 9/15/08													
24	Modification	10 days	Tue 9/16/08	Mon 9/29/08	23												
25	Integration with Z	6 days	Tue 9/30/08	Tue 10/7/08	24												
26	Deliverables	69 days	Tue 9/2/08	Fri 12/5/08													
27	Project Plan	14 days	Tue 9/2/08	Fri 9/19/08													
28	Midterm Presentation	6 days	Thu 10/2/08	Thu 10/9/08	27												
29	Website	54 days	Mon 9/22/08	Thu 12/4/08	27												
30	I PRO Day	14 days	Tue 11/18/08	Fri 12/5/08													
31	Abstract / Poster	6 days	Tue 11/19/08	Tue 11/25/08	27												
32	Exhibit	7 days	Thu 11/27/08	Fri 12/5/08	31,27												
33	Presentation	7 days	Thu 11/27/08	Fri 12/5/08	28												
34	Final Report	13 days	Tue 11/19/08	Thu 12/4/08	27,28												

Project: Project Date: Tue 9/16/08	Task		Rolled Up Task		External Tasks	
	Progress		Rolled Up Milestone		Project Summary	
	Milestone		Rolled Up Progress		Group By Summary	
	Summary		Split		Deadline	
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5.0 Budget

Submitted Budget

Category	Requested	Approved	Reimbursed	Explanation	Status	Edit
Equipment	\$ 1100 2008-09-18	Awaiting Approval	None	Mobile Energy Station, Consulting with engineers...	Pending	Revise
Services	\$ 330 2008-09-18	Awaiting Approval	None	Banners, IPRO Day printing, ad-free blog	Pending	Revise
Travel	\$ 100 2008-09-18	Awaiting Approval	None	Site visits to green projects	Pending	Revise
TOTAL	\$1530	\$0	\$0			

6.0 Team Structure and Assignments

Team Structure:

Name	Major / Year	Skills / Strengths	Experience	Team
Abdelmalek Aouissa	Electrical Engineering 4 th	AutoCAD, Revit, Photoshop, InDesign, Adobe Illustrator, Pspice , Mathematica,	Tutoring, Research,	Air conditioning, wind turbine
Chris Chiu	Architecture 4 th	CAD, Photoshop, 3D modeling	CAD Drafting, Model Shop work, hand drafting	Wind turbine
James Dodgen	Architectural Engineering 4 th	Patient, energetic, hard working		Wind turbine team
Jennifer Gambrell	Architecture 5 th	3D modeling, Photoshop/Illustrator	CAD Drafting, Model Shop work, tutoring	Air conditioning, solar thermal
Adam Kadzban	Computer Science, Psychology 3 rd	Java, C, Python, motivated	Robotics, tutoring	Golf cart
Andy Kedzuch	Architecture, MMAE 5 th	Fabrication, Paint, CAD, 3D rendering		Wind turbine
Evan Larkin	Computer Science 4 th	Computer tech support, construction, troubleshooting	Tutoring	Golf cart
Scott Lowe	Architecture 5 th	AutoCAD, 3DSMax, Photoshop/Illustrator	Solving architecture problems	Wind turbine
James (Jim) Meyer	Electrical Engineering 4 th	Teamwork skills		Golf Cart
Brian Rojas	Aerospace Engineering 3 rd	Logical, calculating and analyzing data	Illinois Tech Robotics	Air conditioning, solar thermal
Oba Vincent	Electrical Engineering 3 rd	Photohop, Java, C#, Python		Air conditioning, golf cart
Clark Wolfe	Electrical Engineering 4 th	Teamwork skills, works well under stress	Tutoring	Wind turbine, golf cart
Farouk Yaker	Chemical Engineering 4 th	AspenTech Hysys, Ni LabVIEW, MS Office, diverse background	Researching Lithium-Ion batteries	Wind turbine, solar thermal

Subteams:

Team	Duties	Members
Air conditioning (research)	Loads Systems Brands Cost	Jennifer, Brian, Oba, Malek
Wind	Shade interference study Speed study Output voltages Location Hardware Quantity Cost	James, Chris, Scott, Farouk, Clark, Malek, Andy
Golf Cart	Modifications Integration with current system Battery characteristics Cost	Clark, Oba, Jim, Adam, Evan
Solar thermal (research)	Shade study Loads Cost	Jennifer, Brian, Farouk

Team Roles:

Our team decided that we were only going to assign one role – the slide maker. After the first few class meetings, we realized that we had very good team cohesion. In light of this, we decided that a formal team structure would be abandoned in favor of minor record keeping. After every class period, we made a PowerPoint slide to record what we did that day. This job was assigned to Adam Kadzban.