ENG5530 Fall 2007 Term Project Final Report

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Submitted to: Dr. Sutherland, Karl Haapala, & Jill Jensen

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Executive Summary

This term project was completed as part of the ENG5530 Graduate Colloquium on Sustainability. The project goal was to incorporate the Academic Quality Improvement Program (AQIP) carbon counting project into an undergraduate student enterprise. In the face of growing concerns regarding climate change, greenhouse gas emissions, and sustainability, it is proposed to establish a Campus Sustainability Enterprise (CSE). The CSE will initially focus on efforts to reduce the eco-footprint of Michigan Technological University (MTU). With these goals in mind it was necessary to find out how to create this new enterprise and build the framework for it to function and address sustainability issues.

The results of this semesters work are a proposal to create the Campus Sustainability Enterprise at MTU, an organizational chart, and a MS Project database. The organizational chart will outline the functional structure of the enterprise. The MS Project database will be used to plan the initial activities of the enterprise and track the results of the work performed by the enterprise members.

Introduction

This term project was completed as part of the ENG5530 Graduate Colloquium on Sustainability. The project goal was to incorporate the Academic Quality Improvement Program (AQIP) carbon counting project into an undergraduate student enterprise. To better describe sustainability here is a quotation from Wikipedia [1] “Sustainability is a characteristic of a process or state that can be maintained at a certain level indefinitely. The term, in its environmental usage, refers to the potential longevity of vital human ecological support systems, such as the planet's climatic system, systems of agriculture, industry, forestry, and fisheries, and human communities in general and the various systems on which they depend." Michigan Tech is now participating in the AQIP program so it is essential to understand how MTU, AQIP, and sustainability are related.

AQIP is a new method to obtain accreditation through the Higher Learning Commission (HLC) of the North Central Association (NCA). This new accreditation program allows Michigan Technological University to choose which projects to spend money on. These will be projects that are considered to be important by the university and of which under the old method of accreditation may not have been acceptable to the HLC. Although the HLC does not mandate a project topic, or require their approval of the project, they do require the projects to utilize a continuous improvement process. With the ability to choose its projects Michigan Tech has decided to focus its efforts, in part, on making the MTU campus more sustainable.

Problem Definition

In the face of growing concerns regarding climate change, greenhouse gas emissions, and sustainability, it is proposed to establish a Campus Sustainability Enterprise (CSE). The CSE will initially focus on efforts to reduce the eco-footprint of Michigan Technological University (MTU). With these goals in mind it was necessary to find out how to create this new enterprise and build the framework for it to function and address sustainability issues.

Approach

The first step was to meet with the enterprise program director, Mary Raber, to discuss the process for forming a new enterprise at MTU. From this meeting a set of guidelines were obtained for writing a proposal to create a new enterprise. Following these guidelines a draft proposal was created and submitted to the leadership of ENG5530 for review.

To obtain input from the Sustainable Futures Institute (SFI) Director, John Sutherland, and graduate students working in the SFI two separate meetings we organized. At each of these meetings ideas,

requirements, and proposed methods were presented to the members of team 1. At the second meeting a review of the draft proposal was performed which resulted in excellent feedback and great progress forward. Some of the suggestions that were received from the meeting were broadening the scope of the proposal to incorporate sustainability issues beyond the carbon footprint initiative, possible sources of funding, budgetary guides, enterprise organizational material, and the proper wording and formatting for the introduction and background sections to better sell the ideas being presented. After this meeting several other iterations of the proposal were created and distributed for review via email.

As the semester progressed it became obvious that additional documents were needed to define how the enterprise would be organized and to plan its activities during the initial stages of its existence. To satisfy these needs an organizational chart with roles and responsibilities were developed. To satisfy the planning need a task list was generated and implemented in Microsoft Project. Once these documents were created several iterations of the proposal, organizational chart, and Gantt chart were sent out via email to the team members and SFI director for review. From these review sessions much feedback was received regarding the structure of the organizational chart, member's roles and responsibilities, and final tweaking of the proposal document.

Results

The results of this semesters work are a proposal to create the Campus Sustainability Enterprise at MTU, an organizational chart to outline the functional structure of the enterprise, and a MS Project database. Please see Appendix A, B, and C respectively for copies of each.

Under the direction of the SFI director feedback is being sought from several other key individuals on the enterprise proposal. After this feedback is received the proposal will need to be submitted to and approved by the Enterprise Advisory Board before the enterprise can begin official operations. The organizational chart provides the basics for operation of the enterprise and will guide the members as to what tasks each team and position will be responsible for. The MS Project database contains several key elements that will assist in guiding the enterprise. Within the MS Project database the task durations, relationships, and deadlines were established to provide a high level plan of operations for the first 1.5 years of the enterprise.

Future Work

In the near future the developed proposal will need to be submitted to the Enterprise Advisory Board for approval. It is expected that this proposal will be approved without hesitation and official operations can begin. Student workers will need to be found to perform tasks over the spring 2008 semester.

The following is a brief list of important tasks for the spring semester.

- Develop CSE educational curriculum
- Organize CSE leadership
- Complete CA-CP model
- Identify Improvements and refinements to the model
- Start work on computer and FTP file storage

All of the tasks that will need to be performed can be found on the Gantt chart created by the MS Project database and attached to this document.

Works Cited

[1] "Sustainability." Wikipedia. 13 Dec. 2007. 13 Dec. 2007 <http://en.wikipedia.org/wiki/Sustainability>

Appendix A – Enterprise Project Proposal

Campus Sustainability Enterprise Proposal

Prepared by: Adam Manty & William Marcinak

Fall Semester 2007

Background

In the face of growing concerns regarding climate change, greenhouse gas emissions, and sustainability, it is proposed to establish a Campus Sustainability Enterprise (CSE). The CSE will initially focus on efforts to reduce the eco-footprint of Michigan Technological University (MTU). AQIP is a new method to obtain accreditation through the Higher Learning Commission (HLC) of the North Central Association (NCA). This new accreditation program allows Michigan Technological University to choose which projects to spend money on. These will be projects that are considered to be important by the university and of which under the old method of accreditation may not have been acceptable to the HLC. Although the HLC does not mandate a project topic, or require their approval of the project, they do require the projects to utilize a continuous improvement process. With the ability to choose its projects Michigan Tech has decided to focus its efforts, in part, on making the MTU campus more sustainable. The following is a brief outline of the history of the AQIP actions relevant to CSE.

- Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator v5.0 selected as the initial tool for quantifying the amount of carbon released by MTU
- Student workers currently working to populate the CA-CP tool
- The limitations, assumptions, and data from the initial CA-CP results will form the basis for the CSE projects

Mission Statement

The Campus Sustainability Enterprise (CSE) will develop the analytical tools and knowledge necessary to support sustainability decision making and to design and implement sustainable solutions on the Michigan Tech campus.

Development

Initially, the CSE enterprise will focus on identifying the most significant sources of carbon emissions from all campus activities. This effort, supported with available tools[1], will guide the enterprise team in outlining specific projects to propose to the MTU administration. Members of the CSE then will develop and execute solutions with the goal of reducing the carbon footprint of the MTU campus. Students will need to conduct in-depth analysis, e.g., cost-benefit analysis, to provide merit for their proposed solution in bringing the MTU campus closer to sustainable levels of carbon use. In addition to carbon footprint reduction efforts, it will be necessary to seek carbon footprint modeling improvements. This may require identifying modeling tool alternatives or developing an in-house model better suited to the needs of MTU. Though the initial focus is on the campus carbon footprint, the CSE is committed to the broader definition of sustainability and will seek ways to make MTU a sustainable campus.

[1] Clean Air-Clean Planet, Version 5 http://www.cleanair-coolplanet.org/toolkit/content/view/43/124/

Goals/Objectives

- Gather data, perform model sensitivity analysis, and complete carbon footprint modeling effort for the MTU campus
- Using model results, sensitivity analysis, and cost benefit analysis, identify potential carbon footprint reduction strategies
- Test and implement carbon footprint reduction strategies on the MTU campus
- Identify improvements or refinements to carbon footprint modeling methods and tools
- Develop a carbon footprint reduction methodology that can be applied to other campuses, industrial areas, and built environments
- Apply the sustainability body of knowledge to projects for both internal (MTU) and external (corporate, NGO, governmental) clients
- Market and disseminate modeling and sustainable solutions

Potential Funding

- MTU Enterprise Program
- U.S. Energy Star program
- Integrys/UPPCO
- Alumni
- Various Foundations
- Pella Windows
- Dow Corning
- NSF (National Science Foundation)
- Enterprise Finance Team
- USDA NRI Competitive Grants
- USGS
- EPA

Educational Component

Areas within the model could represent a project team within the enterprise and consist of approximately 5 people per team. A proposed organizational structure for the Enterprise is shown in Appendix A[2]. Areas representing project teams could be as follows: electricity and heating, transportation, agriculture, solid waste, and refrigerants and other chemicals. As a member of a project team within the enterprise, a student will be involved with several areas including model analysis, developing solutions, obtaining university (client) backing to the proposed solution, and implementing the developed solution. The work of the CSE will provide knowledge necessary to aid in the decision-making efforts in support of sustainability goals.

One of the most frequent challenges faced by sustainability efforts is getting individuals to "buy into" or accept the needed changes and solutions. This enterprise would provide not only the necessary technical and decision making skills, but it would also provide the students with a thorough understanding of the societal challenges faced with when trying to implement these solutions. The enterprise will also hold internal education and professional development sessions to promote the retention of knowledge within the enterprise and to further its member's professional development.

[2] CSE Org Chart (Appendix A)

Students learning outcomes will be measured through several different methods throughout the semester. Attendance will be mandatory at all enterprise meetings. As such, if the student misses more than 1 meeting without a university excused absence their semester grade will be reduced according to the policy determined by the executive leadership. Also, team leaders will be responsible for taking attendance at team meetings and for evaluating the performance of each team member over the course of the semester. The team leaders will be evaluated by the VP pertaining to that work group, and the VP's by the enterprise president. The enterprise president may or may not be evaluated by the faculty advisor along with the faculty advisory board, this will depend on the relationship of the president with the faculty advisory board. Each individual being graded can appeal their grade to the manager one level above if they feel that their grade does not accurately reflect their contributions for that semester.

As a general guideline, each member that is being graded shall be judged on their progress towards the semester goals of the enterprise. For example, a team member may be responsible for a design component of one solution and shall be judged on the progress, effort, and drive towards meeting the goals and objectives of that task. A team leader may be held accountable for the progress of their team as a whole towards the goals set forth for that particular team. The semester schedule and goals shall be set at the end of the preceding semester or during the first week of the current term. Input towards the schedule shall be sought from each team member as well as team and project leaders. After the semester schedule and goals have been decided upon by the team members and team leader, it must then be approved by the VP of that area.

Sustainability is an issue that affects everyone and as such, this enterprise will rely on the skills and knowledge base from a very diverse group of individuals. This enterprise will rely on both the technical skills of various types of engineers and scientists, as well as the business and economics skills of students from the School of Business, public policy skills from the Social Sciences Department, communication skills from the Scientific and Technical Communications programs, and any other interested parties not mentioned in this short, incomplete list. This enterprise should truly be all encompassing of the diverse and varied skill sets of MTU students. An ideal number of students to get the enterprise rolling in its first active semester would be approximately 6-10 dedicated and passionate students.

Finances

Item	Cost
1 Computer	$2,000
Travel	$12,000
Misc. Equipment (TBD)	$10,000
Communications	$10,000
Test Beds for Solutions	$15,000
Professional Development	$2,000
Total	$51,000

As listed previously under potential funding there is the possibility of funding from within MTU through the various existing campus organizations related to sustainability projects. It may be possible for the enterprise to acquire departmental funding if contracted by a specific department to investigate a specific problem area.

Computing and Space Considerations

The computing and space needs of the CSE will likely be rather limited in its first year of operations. Most of the work will be centered on computer modeling through the CA-CP emissions tool or other comparable software, brainstorming solutions, benefit-cost ratio analysis of proposed solutions, life cycle analysis, and implementation of the developed solution. One PC in a small to medium sized office or work station environment should suffice for the initial needs of the CSE.
Any necessary bench level testing can likely be carried out in one of the labs or shops of the home department. It will also be possible for the CSE team members to utilize their home department computing facilities during times when the CSE office PC is being used or when additional computing capacity is needed.

Based upon the success and expansion of the enterprise it may be necessary for the CSE to move into larger quarters sometime in the future. At that time it would be necessary to speak with the home department of the enterprise to look at possible solutions and options within that department. Another solution would be to work with the enterprise program director to find an option housed within the enterprise program and controlled buildings and rooms.

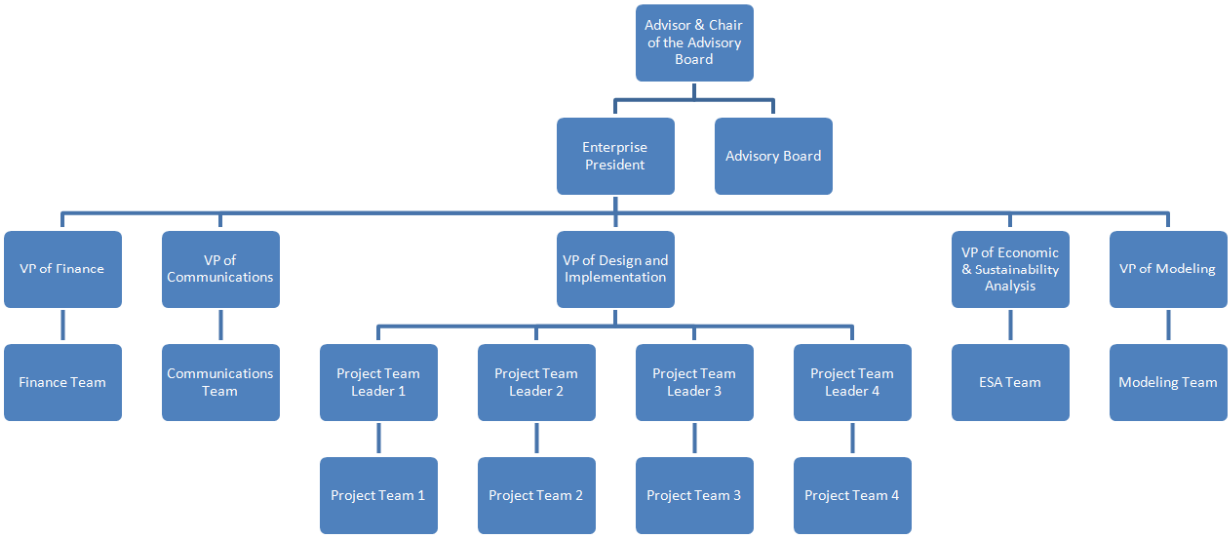
Enterprise Roll-out

In order to get the CSE up and running in Fall 2008, several things will be completed in the Spring semester of 2008. One of the first things that will be accomplished is the development of the CSE educational curriculum and leadership hierarchy. Students will be hired for the Spring semester, with an orientation to the CSE to be scheduled for this first group of students, this orientation will provide the opportunity to split the students up into groups and teams. Once this is done the students will be tasked with first collecting the necessary data in order to complete the CA-CP model. When the model has been completed the model will be reviewed to look for areas for which it can be improved and refined. With this improved and refined model the students will then conduct a sensitivity analysis, this sensitivity analysis will be the basis for which carbon reduction projects may be identified. The projects that are defined for the carbon footprint reduction will then be outlined along with possible alternatives. A tentative Gantt chart[3] for the CSE covering the next year and a half has been developed with most tasks of the CSE being outlined.

[3] Tentative Gantt Chart
Appendix B

Appendix B – Enterprise Organizational Chart

Campus Sustainability Enterprise Organizational Chart



Description of Roles:

Advisor & Chair of the Advisory Board:

This person will be the person in charge of the enterprise and responsible for the group. They will be responsible for the assigning of grades and other official university responsibilities. They should seek to advise and guide the group and oversee the president. They will also chair and lead the advisory board and direct them as to their roles and responsibilities.

Advisory Board:

This board will consist of faculty in the required area specialties. The needed advisors may change based on the current project types but will likely include a faculty specializing in cost benefit analysis, construction materials, carbon cycling, and/or environmental ecology. This team should serve as a reference to the enterprise and play no direct role in the control or organization of the enterprise.

Enterprise President:

This person should hold the position for 1 academic year and be elected by majority vote of the enterprise members. The Official Faculty Advisor must approve the election of this person. The president will be an experienced undergraduate student that has a good working knowledge of all enterprise activities. The president will be responsible for all but not limited to the following: Leading all enterprise meetings, monitoring the progress of all portions of the enterprise to ensure their proper execution, strategic planning of the enterprise, and serving as lead decision maker. The president will serve as the point of contact for all external business concerning the enterprise. The president will also organize educational and professional development seminars within the enterprise.

VP of Finance:

The VP of finance will be in charge of all issues related to budget, accounting, fund-raising for the enterprise, and the issuing of funds as needed for enterprise related purchases. The VP of Finance will work with the Communications Team to identify, target, and obtain project or enterprise sponsors and sales.

Finance Team:

Support the role of VP of Finance.

VP of Communications:

The VP of Communications will be in charge of and responsible for all activities relating to the communications team. The communications team will be responsible for maintaining such communication assets as the enterprise website, ftp storage, enterprise list serve, enterprise

publications, other media to be determined and effectively communicating the needs and accomplishments of the enterprise. The communications team will also lead on campus recruitment efforts. The Communications Team will work with the Finance Team and D/I team to obtain enterprise and project sponsors and sales. The VP will also be expected to act as a working member of the communications team.

The Communications team:

Support the role of VP of Communications.

VP of Design and Implementation:

The Vice President for Design and Implementation will lead the effort to design and implement carbon-reduction technology or policy solutions on the MTU campus. The D/I Team will work with the Modeling Team to identify potential projects, and then will organize Project Leaders and Project Teams to develop, test and implement solutions. (It would be likely the VP of D/I would work as a project team member as well if necessary to fill their time)

D/I teams (Project teams):

Support the role of VP of Design and Implementation

VP of Economic & Sustainability Analysis:

The VP of Economic Analysis will be in charge of and responsible for all activities relating to the Economic & Sustainability Analysis team. The Economic & Sustainability Analysis team will be responsible for performing the economic (benefit cost analysis) and sustainability analysis of each proposed solution. They will need to work closely with each respective project team to analyze the economic & sustainability performance of each project. The VP will also be expected to act as a working member of this team. The needed components of sustainability analysis will likely need to be defined by this VP in conjunction with executive leadership.

Economic Analysis Team:

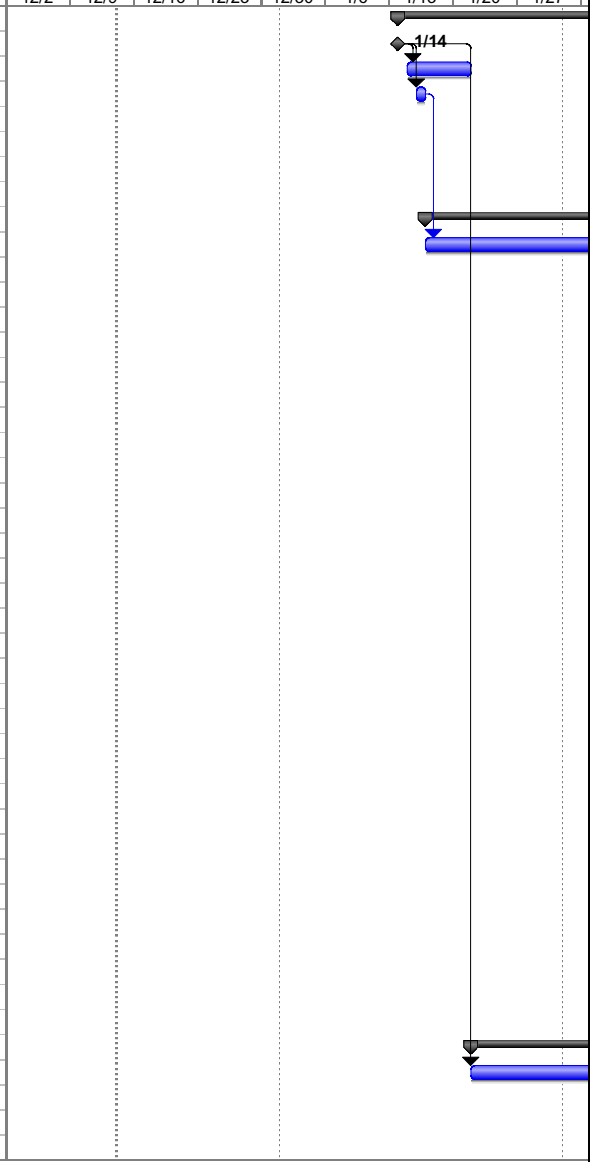
Support the role of VP of Economic Analysis.

VP of Modeling:

The Vice President for Modeling will be in charge of data collection, modeling, model sensitivity analysis, and model improvement, refinement and development. The VP for Modeling will work with the VP for Design and Implementation to identify potential carbon-reduction projects.

Appendix C – MS Project Gantt Chart

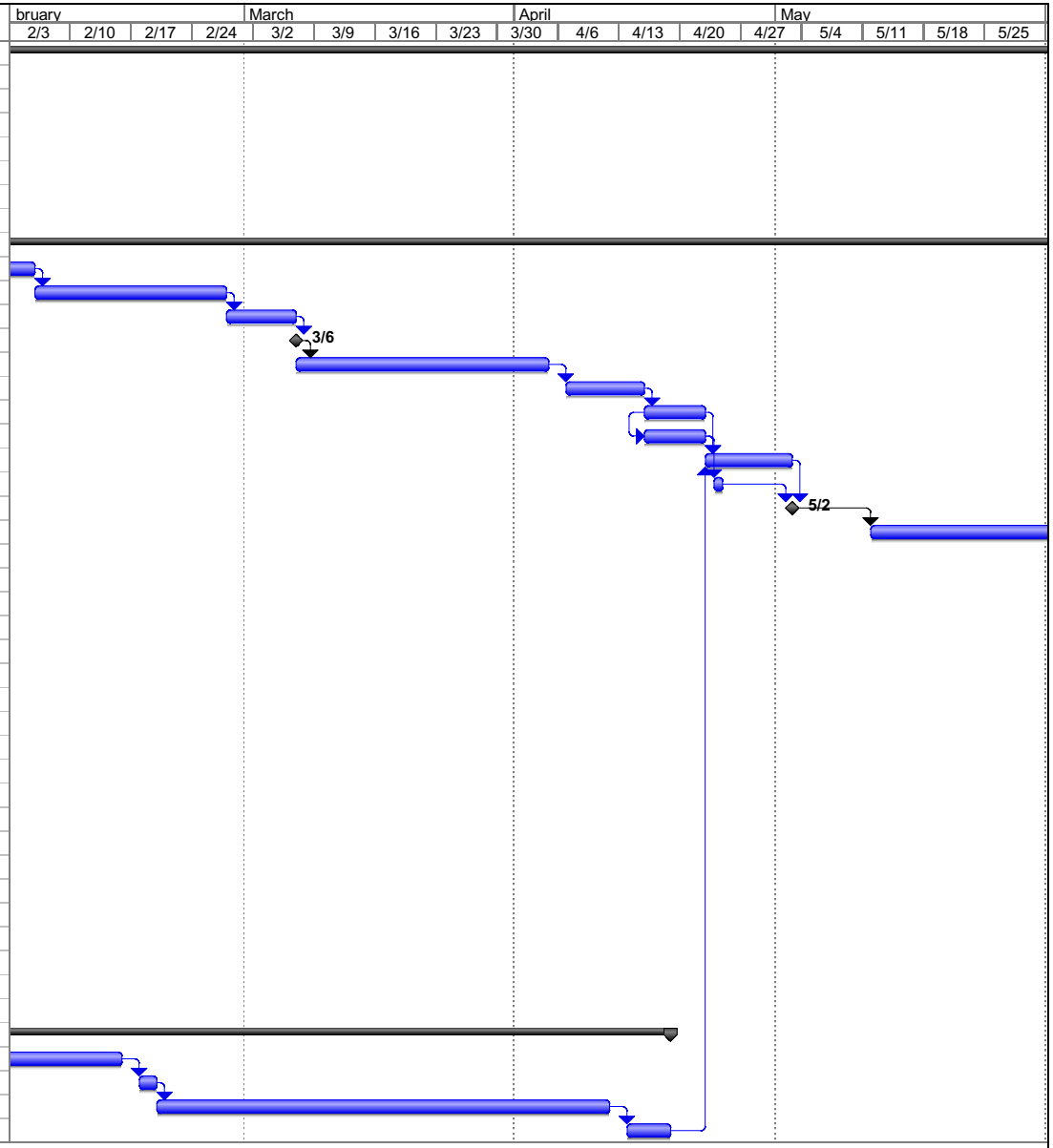
ID	Task Name	Duration	Start	Finish	Predecessors
1	**Enterprise Organization**	**172 days?**	**Mon 1/14/08**	**Tue 9/9/08**	
2	Spring 2008 semester starts	0 days	Mon 1/14/08	Mon 1/14/08	
3	Develop CSE educational curriculum	5 days?	Tue 1/15/08	Mon 1/21/08	2
4	Organize CSE leadership	1 day?	Wed 1/16/08	Wed 1/16/08	2
5	Schedule the orientation for all enterprise members	3 days?	Thu 9/4/08	Mon 9/8/08	22
6	Orientation of first registered student group	1 day?	Tue 9/9/08	Tue 9/9/08	5
7	Organization of first registered students into groups and teams	1 day?	Tue 9/9/08	Tue 9/9/08	6SS
8	Commence full and official operations of CSE	0 days	Tue 9/9/08	Tue 9/9/08	7
9	**Enterprise Work**	**337 days?**	**Thu 1/17/08**	**Fri 5/1/09**	
10	Complete preliminary data collection for Clean air-Cool Planet (CA-CP) model	14 days?	Thu 1/17/08	Tue 2/5/08	4
11	Identify improvements and refinments for CA-CP model	16 days?	Wed 2/6/08	Wed 2/27/08	10
12	Implement improvements and refinments for CA-CP model	6 days?	Thu 2/28/08	Thu 3/6/08	11
13	Model complete	0 days	Thu 3/6/08	Thu 3/6/08	12
14	Perform sensitivity analysis on CA-CP model results	21 days?	Fri 3/7/08	Fri 4/4/08	13
15	Identify carbon reduction projects	7 days?	Mon 4/7/08	Tue 4/15/08	14
16	Outline carbon reduction projects	5 days?	Wed 4/16/08	Tue 4/22/08	15
17	Outline project alternatives	5 days?	Wed 4/16/08	Tue 4/22/08	16SS
18	End of spring 2008 semester wrap up	8 days?	Wed 4/23/08	Fri 5/2/08	46,17,16
19	Report on progress to client (AQIP) - Initial	1 day?	Thu 4/24/08	Thu 4/24/08	17
20	Spring 2008 semester ends	0 days	Fri 5/2/08	Fri 5/2/08	18,19
21	Performe work over summer 2007 semester as able	70 days?	Mon 5/12/08	Fri 8/15/08	20
22	Fall 2008 semester starts	0 days	Tue 9/2/08	Tue 9/2/08	21
23	Perform economic and sustainability analysis of proposed projects & solutions	23 days?	Wed 9/10/08	Fri 10/10/08	8
24	Choose project and solution method for reduction project	3 days?	Mon 10/13/08	Wed 10/15/08	23
25	Project and Solution chosen	0 days	Wed 10/15/08	Wed 10/15/08	24
26	Engineering design work of project solutions	37 days?	Thu 10/16/08	Fri 12/5/08	25
27	Report on progress to client (AQIP) - Mid	1 day?	Mon 12/8/08	Mon 12/8/08	26
28	End of fall 2008 semester wrap up	6 days?	Tue 12/9/08	Tue 12/16/08	27
29	Fall 2008 semester ends	0 days	Fri 12/19/08	Fri 12/19/08	28
30	Spring 2009 semester starts	0 days	Mon 1/12/09	Mon 1/12/09	29
31	Engineering bench level testing of developed project solutions	15 days?	Mon 1/12/09	Fri 1/30/09	30
32	Implement project solution in test bed environment	21 days?	Mon 2/2/09	Mon 3/2/09	31
33	Decide to procede with full scale implementation	4 days?	Tue 3/3/09	Fri 3/6/09	32
34	Engineering work completed	0 days	Fri 3/6/09	Fri 3/6/09	33
35	Implement full scale project solution	16 days?	Mon 3/9/09	Mon 3/30/09	34
36	Monitor and track reuslts of implemented solution	13 days?	Tue 3/31/09	Thu 4/16/09	35
37	Conclude result tracking	0 days	Fri 4/17/09	Fri 4/17/09	36
38	Report on progress to client (AQIP) - Final	1 day?	Mon 4/20/09	Mon 4/20/09	37
39	Disseminate/Publish project results	5 days?	Mon 4/20/09	Fri 4/24/09	38SS
40	End of spring 2009 wrap up	5 days?	Mon 4/20/09	Fri 4/24/09	39SS
41	Spring 2009 semester ends	0 days	Fri 5/1/09	Fri 5/1/09	40
42	**Enterprise Financial Work**	**64 days?**	**Tue 1/22/08**	**Fri 4/18/08**	
43	Research funding opportunities	19 days?	Tue 1/22/08	Fri 2/15/08	2
44	Identify funding opportunities	2 days?	Mon 2/18/08	Tue 2/19/08	43
45	Write funding/grant proposals	38 days?	Wed 2/20/08	Fri 4/11/08	44
46	Submitt funding and grant proposals	5 days?	Mon 4/14/08	Fri 4/18/08	45



Project: CSE_initial_proposed_schedu
Date: Fri 12/14/07

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

ID	Task Name
1	**Enterprise Organization**
2	Spring 2008 semester starts
3	Develop CSE educational curriculum
4	Organize CSE leadership
5	Schedule the orientation for all enterprise members
6	Orientation of first registered student group
7	Organization of first registered students into groups and teams
8	Commence full and official operations of CSE
9	**Enterprise Work**
10	Complete preliminary data collection for Clean air-Cool Planet (CA-CP) model
11	Identify improvements and refinments for CA-CP model
12	Implement improvements and refinments for CA-CP model
13	Model complete
14	Perform sensitivity analysis on CA-CP model results
15	Identify carbon reduction projects
16	Outline carbon reduction projects
17	Outline project alternatives
18	End of spring 2008 semester wrap up
19	Report on progress to client (AQIP) - Initial
20	Spring 2008 semester ends
21	Performe work over summer 2007 semester as able
22	Fall 2008 semester starts
23	Perform economic and sustainability analysis of proposed projects & solutions
24	Choose project and solution method for reduction project
25	Project and Solution chosen
26	Engineering design work of project solutions
27	Report on progress to client (AQIP) - Mid
28	End of fall 2008 semester wrap up
29	Fall 2008 semester ends
30	Spring 2009 semester starts
31	Engineering bench level testing of developed project solutions
32	Implement project solution in test bed environment
33	Decide to procede with full scale implementation
34	Engineering work completed
35	Implement full scale project solution
36	Monitor and track reuslts of implemented solution
37	Conclude result tracking
38	Report on progress to client (AQIP) - Final
39	Disseminate/Publish project results
40	End of spring 2009 wrap up
41	Spring 2009 semester ends
42	**Enterprise Financial Work**
43	Research funding opportunities
44	Identify funding opportunities
45	Write funding/grant proposals
46	Submitt funding and grant proposals



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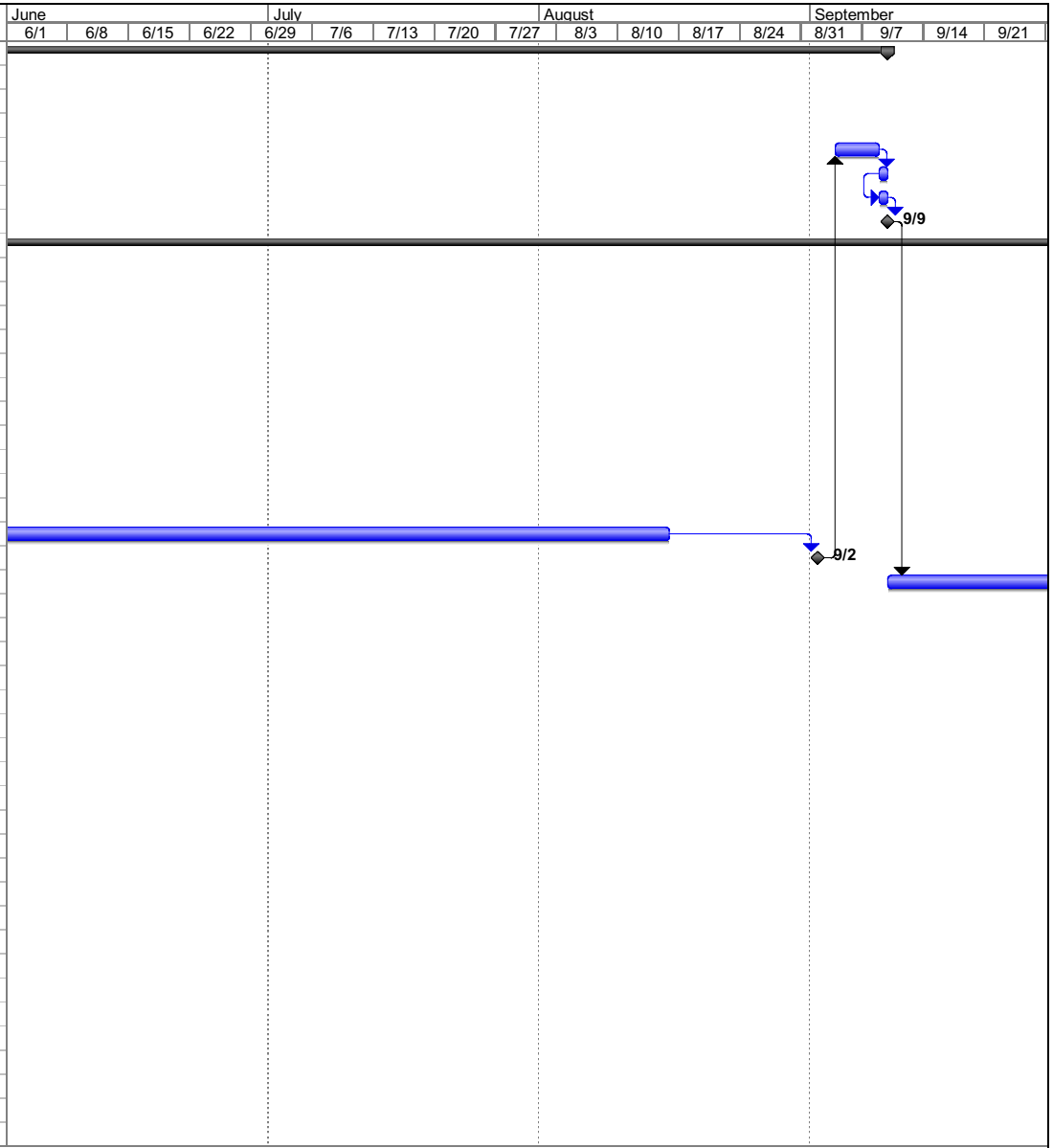

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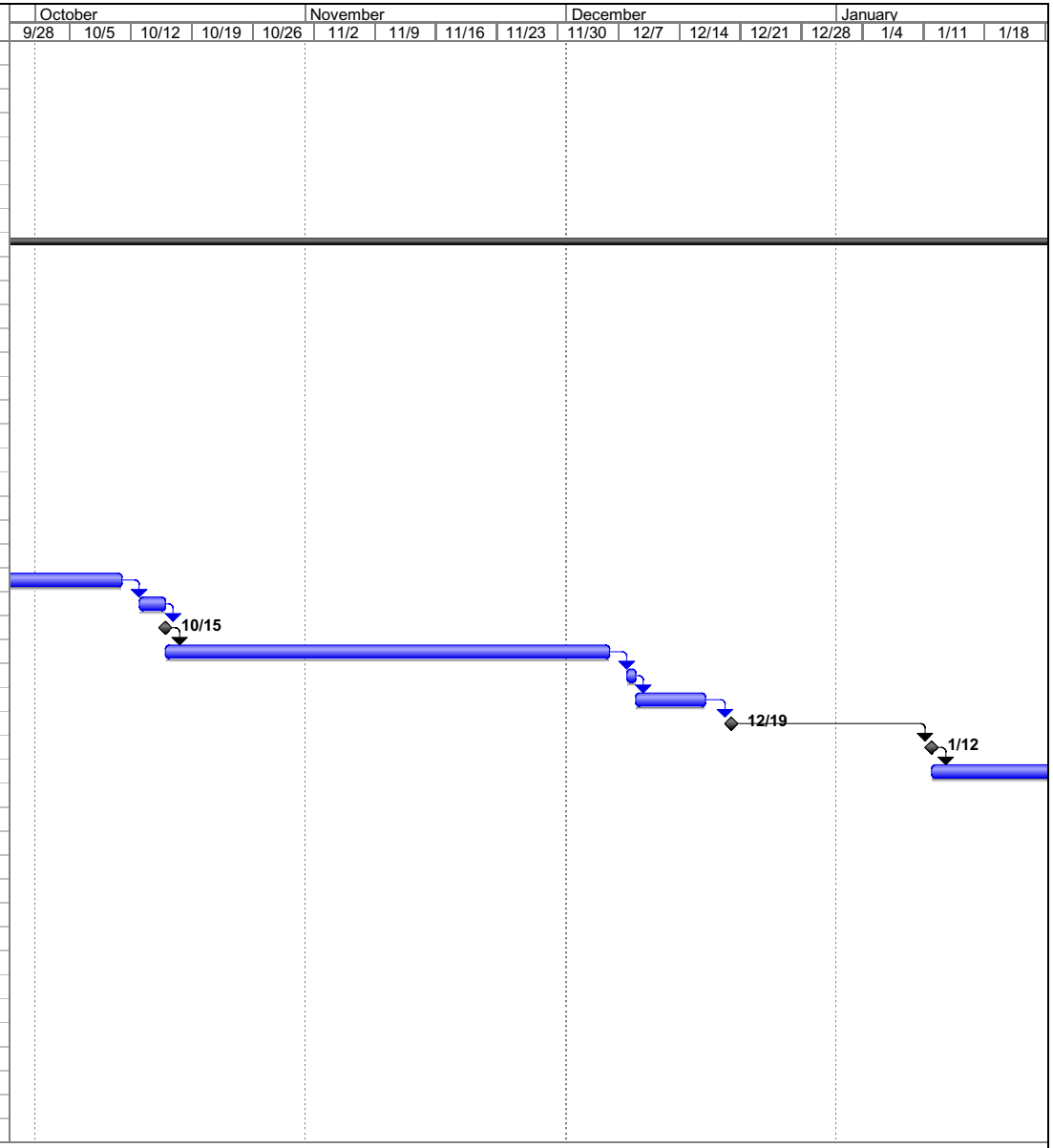
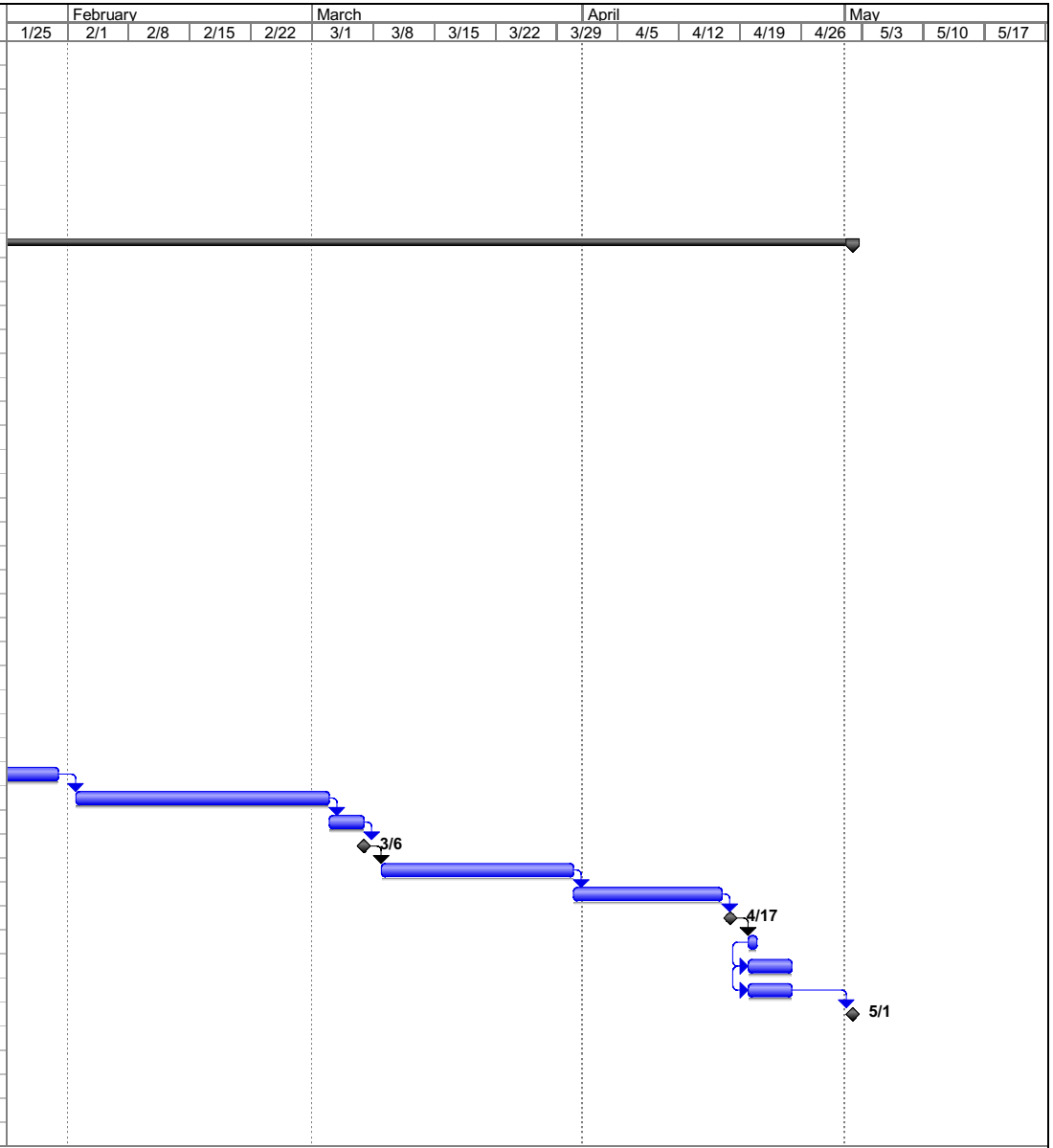
46	Submitt funding and grant proposals



Project: CSE_initial_proposed_schedu
Date: Fri 12/14/07

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

ID	Task Name
1	**Enterprise Organization**
2	Spring 2008 semester starts
3	Develop CSE educational curriculum
4	Organize CSE leadership
5	Schedule the orientation for all enterprise members
6	Orientation of first registered student group
7	Organization of first registered students into groups and teams
8	Commence full and official operations of CSE
9	**Enterprise Work**
10	Complete preliminary data collection for Clean air-Cool Planet (CA-CP) model
11	Identify improvements and refinments for CA-CP model
12	Implement improvements and refinments for CA-CP model
13	Model complete
14	Perform sensitivity analysis on CA-CP model results
15	Identify carbon reduction projects
16	Outline carbon reduction projects
17	Outline project alternatives
18	End of spring 2008 semester wrap up
19	Report on progress to client (AQIP) - Initial
20	Spring 2008 semester ends
21	Performe work over summer 2007 semester as able
22	Fall 2008 semester starts
23	Perform economic and sustainability analysis of proposed projects & solutions
24	Choose project and solution method for reduction project
25	Project and Solution chosen
26	Engineering design work of project solutions
27	Report on progress to client (AQIP) - Mid
28	End of fall 2008 semester wrap up
29	Fall 2008 semester ends
30	Spring 2009 semester starts
31	Engineering bench level testing of developed project solutions
32	Implement project solution in test bed environment
33	Decide to procede with full scale implementation
34	Engineering work completed
35	Implement full scale project solution
36	Monitor and track reuslts of implemented solution
37	Conclude result tracking
38	Report on progress to client (AQIP) - Final
39	Disseminate/Publish project results
40	End of spring 2009 wrap up
41	Spring 2009 semester ends
42	**Enterprise Financial Work**
43	Research funding opportunities
44	Identify funding opportunities
45	Write funding/grant proposals
46	Submitt funding and grant proposals



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