

University of California, Santa Barbara
Donald Bren School of Environmental Science & Management

MESM 2007 Group Project Proposal:
“Voluntary Initiatives for Reducing Greenhouse Gas Emissions from Electrical
Utilities in the United States”

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I. Abstract

Climate change has become an increasingly important issue in both the environmental field and the business sector. Companies are under pressure to reduce their greenhouse gas emissions in an effort to prevent further alterations of the earth's atmosphere. However, the level of regulation across the United States, and even within individual states, is irregular. Nine northeastern and Mid-Atlantic states have joined the Regional Greenhouse Gas Initiative (RGGI) while many other states remain unregulated. This uneven management has led to hotspots of GHG emissions. Because the electric utility sector is responsible for one third of the total amount of GHG's produced in the U.S. today, this study aims to identify and evaluate private initiatives implemented by electric utilities in order to reduce GHG emissions. This project will involve industry research and a survey of electric utility companies in the U.S. (and abroad) to investigate practices and strategies currently in place.

II. Executive Summary

The U.S. electric utility sector is responsible for one third of the total amount of GHG's produced in the U.S. today. Greenhouse gases intensify global warming by trapping heat in the atmosphere. Some greenhouse gases occur naturally in the atmosphere, including water vapor, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Human activities increase levels of these naturally occurring GHG's and also input unnatural GHG's such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Trapping heat in the atmosphere will result in global warming, which is expected to raise sea levels, change precipitation patterns and impact other local climate conditions. Changing regional climates could have effects on water supply, crop yields, livestock, and human health and could also alter forests and other ecosystems ("Climate," 2000).

This study aims to determine the extent to which electric utilities are involved in voluntarily quantifying and reducing their GHG emissions. These voluntary actions may be motivated by several factors including, but not limited to, policy forecasting, enhanced public image, education, financial benefits and competitive advantage. The accumulation of information on electric utility's private initiatives to reduce GHG's will be a useful resource for companies in the industry to implement new strategies and modify existing management plans.

III. Objectives

This project will explore the risks, rewards, opportunities and barriers surrounding voluntary corporate strategies on climate change within the U.S. electric utility sector. The electric utility sector consists of privately and publicly owned establishments that generate, transmit, distribute, or sell electricity primarily for use by the public. For the purposes of our study, we will focus mainly on investor-owned electricity companies. Information gathered from a survey of electric utilities will be used to:

- Create a database of strategies currently used by electric utility companies to reduce greenhouse gas emissions in the U.S.
- Identify motivations and barriers for implementation of GHG reduction initiatives among electric utility companies in the U.S.

This will provide our client, ENSR, with an assessment of GHG emissions reduction strategies currently used by U.S. electric utility companies. Such an assessment can enable ENSR to provide consulting services to utility companies that will be interested in developing similar private initiatives.

IV. Significance

Assessment of existing GHG emissions reduction strategies can be used to provide guidance for electric utility companies. This information may be used to influence the decision making process when consultants and utility managers evaluate approaches to GHG emissions. With the aid of this resource, electric utilities in the U.S. can take meaningful steps toward reducing GHG emissions and mitigating their impact on global climate. As technologies, markets, and policy advances in the future, this resource can be expounded upon to remain current.

V. Background Information/Literature Review

Many chemical compounds found in the Earth's atmosphere act as greenhouse gases. Levels of several important greenhouse gases have been increased by roughly 25% since the beginning of the industrial revolution 150 years ago. Computer-based models have shown that rising concentrations of greenhouse gases result in an increase in the average temperature of Earth. These rising temperatures may in turn lead to changes in weather, sea levels, and land use patterns (EIA).

The possibility that human activities are releasing greenhouse gases at rates that could affect the global climate has resulted in proposals for national and international programs to curtail emissions. The Kyoto Protocol is an international agreement, negotiated in December 1997, by which industrialized nations have committed to making substantial reductions in their emissions of greenhouse gases by 2012. A total of 155 countries have committed to the agreement thus far. Although the U.S. has not ratified the Kyoto Protocol, various state-wide initiatives to reduce greenhouse gases have been implemented. Companies face much uncertainty about potential effects of the Kyoto Protocol in the U.S and possible future regulatory measures.

Faced with such uncertainty, firms have the opportunity to adopt various voluntary strategies to mitigate their GHG emissions. One approach to reducing GHG emissions is through implementing innovative technologies and replacing obsolete equipment. Alternatively, companies can offset their GHG emissions through carbon trading and carbon sequestration. Finally, increasing the use of renewable energy and thus

decreasing the production of fossil-based electricity is another strategy for reducing GHG emissions. Companies can pursue any or all of the above mentioned approaches independently or by interacting with external bodies such as industry stakeholders, NGOs and regulatory agencies. However, because of the novelty of some of these approaches, and the uncertainty surrounding the future regulatory landscape regarding GHG regulation, little is known about the competitive potential of such strategies.

The electric utility industry is complex, with each utility having different electricity generation capacities as well as a different assortment of fuel mix. For this reason, company-specific strategies will need to be considered based on the specifics of the company as well as the company location's regulatory situation.

Background on United States Electric Utility Industry

Electricity generation in the United States has grown dramatically since the 1950's (see Figure 1). Given the nation's growing population, energy intensive commercial and industrial sectors and the increased use of electronic technologies, the electricity demand is expected to continue to increase. How companies choose to generate current and additional electricity will determine the future of the electric utility industry's output of GHG emissions.

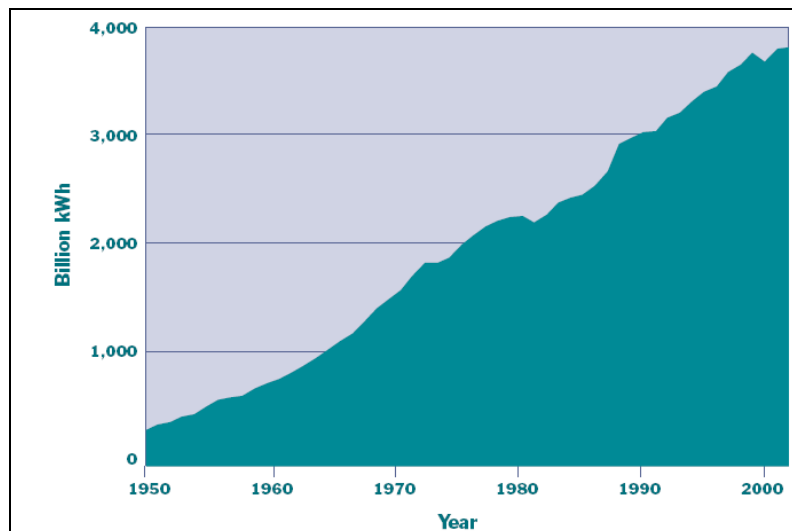


Figure 1: US net electricity generation 1950-2003 (source: PEW)

Major GHG Emissions

Electric utilities produce greenhouse gases when they generate and transfer energy. The majority of these companies currently depend on coal or other CO₂ emitting fossil fuels as their primary source of electricity generation. The electric utility industry also emits other GHG's with much higher global warming potential than CO₂. These include the highly potent greenhouse gas sulfur hexafluoride (SF₆), which acts as an insulator and arc interrupter for circuit breakers and other electrical equipment involved in electricity transmission and distribution systems. SF₆ can escape through seals, especially in older equipment, and can also be released during equipment installation, servicing, and disposal.

In 2004 the Energy Information Administration (EIA) quantified greenhouse gas emissions, in terms of CO₂ equivalent, from fossil fuel combustion in the U.S. Results showed that electricity generation had higher emissions than any other sector (see Figure 2). The majority of GHG's emitted by the electric utility sector came from coal combustion. GHG emissions from the electric utility industry have been consistently greater than any other economic sector in recent decades (see Figure 3).

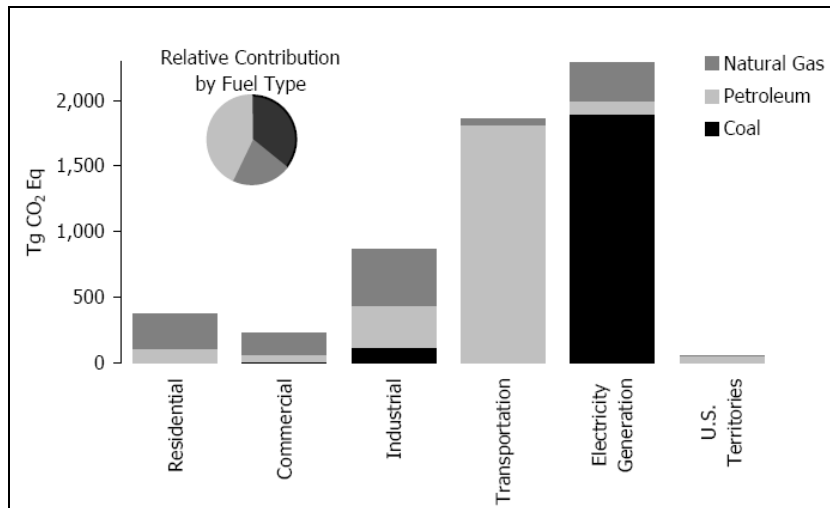


Figure 2: 2004 CO₂ equivalent emissions from fossil fuel combustion by sector and fuel type. (source: EIA, 2006)

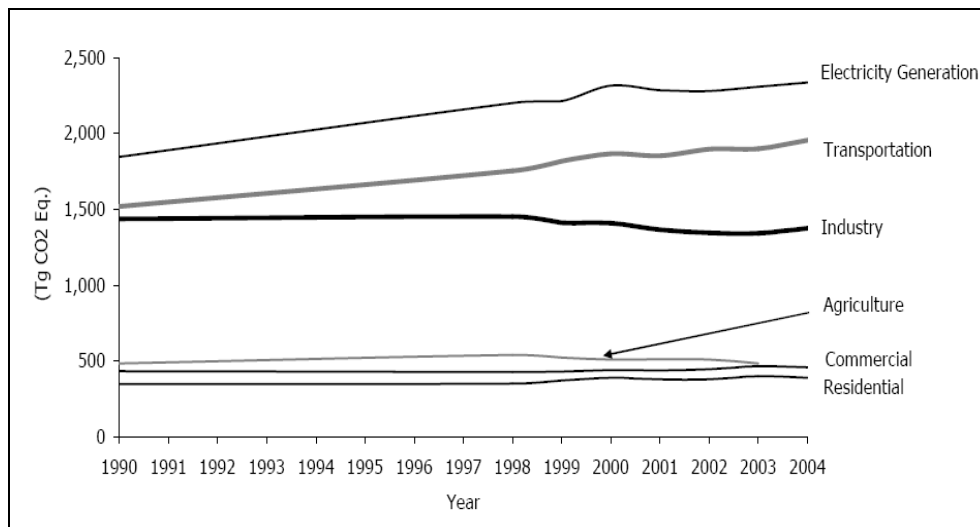


Figure 3: CO₂ emissions by economic sector, 1990-2004 (Source EIA 2006)

Each state and region has different numbers of electric utilities and these companies emit varying levels of greenhouse gases. Differences exist in the regulatory climate within each state, and many companies are involved in reduction programs, either voluntary or mandatory.

External Resources Available to Assist in Private Initiative Development

In the absence of a nationwide GHG reduction program, such as the Kyoto Protocol, a medley of proposals, schemes and facilitating projects have developed at government and non-government levels in order to encourage electric utility companies to adopt strategies to reduce GHG's. In addition, there are initiatives outside of the U.S. that address GHG emissions on a global scale. U.S. electric utilities can use these national programs and international resources for assistance.

GHG Inventory Registries

GHG inventory registries are government, investor and NGO based organizations with which companies can make public their annual GHG emissions. Registries can help companies establish a baseline of GHG emissions against which additional reductions can be measured. As the registration activity is voluntary, all companies are *encouraged* to report their GHG emissions, however many companies choose not to participate in the program. Some of the current voluntary reporting registries are listed below.

Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is one program that focuses on 9 Northeastern and Mid-Atlantic states. RGGI is a cooperative effort by these states to reduce CO₂ emissions. This is the first mandatory cap-and-trade program to control carbon dioxide emissions in the U.S. Beginning in 2009, RGGI will stabilize emissions from power plants in the region at current levels through 2015, and reduce emissions by 10% by 2019. This program is focused on all industries, while we will focus specifically on the electricity sector. However, the organization and management of this program may be beneficial to our study by providing guidelines to regulate the electricity sector.

More information on the RGGI program at:

<http://www.rggi.org/>

The Carbon Disclosure Project

The Carbon Disclosure Project (CDP) has been a very successful campaign to urge large companies worldwide to report their carbon emissions. Some electric utilities (e.g. Duke Energy) participate in the CDP and these utilities will be studied in terms of how they manage their greenhouse gases and the strategies that they implement to reduce these emissions.

More information on the CDP program at:

<http://www.cdproject.net/>

California Climate Action Registry

One local regulatory greenhouse gas initiative is the California Climate Action Registry. This registry is a non-profit voluntary registry established by the state of California to encourage early reductions of GHG's. Organizations that are willing to meet the accounting standards and third party certification requirements of the Registry show their serious intent to address climate change.

More information on the Climate Action Registry at:
<http://www.climateregistry.org/Default.aspx?refreshed=true>

EIA Voluntary Registry

The Energy Information Administration (EIA) was directed by the 1992 US Energy Policy Act (EPACT) to mechanism for “the voluntary collection and reporting of information on . . . annual reductions of greenhouse gas emissions and carbon fixation achieved through any measures, including fuel switching, forest management practices, tree planting, use of renewable energy, manufacture or use of vehicles with reduced greenhouse gas emissions, appliance efficiency, methane recovery, cogeneration, chlorofluorocarbon capture and replacement, and power plant heat rate improvement . . .” For the 2004 reporting year, 226 U.S. companies and other organizations reported to the EIA that they had undertaken 2,154 projects to reduce or sequester greenhouse gases in 2004. The electric utility sector made up 42% of the organizations reporting information. Of the projects reported, 518 were related to the generation, transmission or distribution of electricity.

More information on the EIA program at:
<http://www.eia.doe.gov/oiaf/1605/frntvrgg.html>

GHG Emission Reduction Strategies

Beyond taking inventory and registering one’s GHG emissions, electric utility companies have many GHG reduction strategies to consider. Industry leaders have developed, or are in the process of developing, innovative strategies to reduce GHG’s in attempt to go beyond compliance with current regulations and influence future policy. This advanced planning will provide companies with a competitive edge when policy changes result in the enactment of new regulations.

Fuel Switching

Switching from coal to either natural gas or liquefied natural gas (LNG) can greatly decrease the amount of GHG emissions per unit energy output. Also, increasing the percentage of a utility’s power generation met with renewable energy (e.g. solar, wind, hydro, geothermal, etc.) can avoid GHG emissions that result from combustion of fossil fuels. Though controversial, nuclear power is another possibility.

Carbon Sequestration

Carbon sequestration takes on many forms. One involves capturing the carbon that would otherwise have been released into the atmosphere and sequestering it in carbon sinks such as oceans and geological cavities. Another sequestration method involves using reforestation and afforestation to store carbon in biomass and soils. Several major electric utilities have taken proactive measures and made substantial investments to reduce GHG emissions in domestic and international carbon sequestration projects. UtiliTree Carbon Company, a consortium of 41 electric utility companies, exemplifies how forest sequestration projects can be a credible and effective way to offset GHG emissions.

Similar to UtiliTree, PowerTree Carbon Company is a corporation formed by 25 U.S. electric utilities to fund forestation projects in the lower Mississippi River Valley as a means of sequestering carbon dioxide. PowerTree was formed by the utility industry in cooperation with the U.S. Department of Energy as part of an industry-wide effort to voluntarily address concerns about climate change. PowerTree is a follow-up investment to an early investment program focused on planting numerous trees, which has proven successful in removing carbon dioxide from the atmosphere and storing it in biomass and soils.

More information on UtiliTree can be found at:

<http://carbonsequestration.us/News&Projects/htm/EEI-utilitree.pdf>

More information on PowerTree Carbon can be found at:

<http://www.powertreecarboncompany.com/>

Maintenance and Upgrades

Power plants can reduce their GHG's by upgrading their facilities or by replacing/upgrading their existing infrastructure (pipes, valves, air compressor controls, etc.). Some improvements include reducing venting during combustion, using gas (rather than coal) to start and restart engines, or employing cogeneration systems that capture otherwise wasted heat energy.

Control Technologies

Utilities can utilize power-generating infrastructure with newer technologies such as pressurized fluidized combustion systems or coal gasification. Pressurized fluidized combustion can achieve high efficiency by increasing the pressure of the gas and accelerating combustion. Coal gasification is a process where coal is combined at high temperatures with steam and oxygen, creating combustible gases such as carbon monoxide (CO), hydrogen (H), and other gaseous compounds. This process creates highly concentrated CO₂ emissions which can potentially be captured and removed from the emission stream.

Offsetting

Electric utilities can also reduce their GHG emissions by making changes in non-electricity generating aspects of their operations. For example the utility could convert their fleet vehicles to natural gas, ethanol, biodiesel or other alternative fuels. Utilities could also reduce GHG emissions by using cleaner fueled or more efficient locomotives to transport coal. Additionally, markets exist for trading GHG credits in certain parts of the U.S. Organizations such as terrapass, sell third-party verified credits and use the money gained from that sale to invest in CO₂ reduction projects. This market is relatively young and considered by some to be not completely credible (PG&E). However, offsetting could be a viable GHG reduction strategy as the market for GHG credits evolves and gains stability and credibility.

More information on terrapass found at:

<http://www.terrapass.com/index.html>

Demand-Side Management

Electric utility companies can reduce energy demand by providing their customers with energy saving assistance including such measures as replacing incandescent lighting with compact fluorescents and weatherizing housing. These same measures can be adopted within company facilities.

Fly-Ash Sales

Concrete production is a significant source of GHG emissions. Using fly-ash captured from flue gas to produce concrete can reduce the impact of concrete production on global climate.

Partnerships Developed to Reduce GHG Emissions

In addition to strategies developed individually, electric utility companies have formed partnerships with government agencies, NGOs, and other companies. Collectively, these partnerships can develop strategies and projects to accelerate the reduction of GHG's within the U.S. electric utility industry.

SF₆ Partnership

In 1999, the SF₆ Partnership began with 49 electric utilities as Charter Partners. During the intervening five years, an additional 25 utilities have joined the partnership, such that currently, the program represents over 38 percent of U.S. transmission mileage. In 2004, SF₆ Partners managed equipment on their systems with a total SF₆ capacity (nameplate capacity) of 4,635,465 pounds. The partnership has allowed electric utilities to take progressive and comprehensive actions in addressing greenhouse gases by reducing SF₆ emissions. SF₆ is the most potent greenhouse gas used in the electric power industry (23,900 times greater than CO₂), with an atmospheric residency time on the order of centuries.

More information on the SF₆ Partnership can be found at:

<http://www.epa.gov/highwp/electricpower-sf6/index.html>

International Utility Efficiency Partnerships

The goal of the IUEP program is consistent with President Bush's voluntary climate initiative announced on February 14, 2002, and the International Power Partnerships program, a joint venture between the IUEP and the Department of Energy. IUEP strives to reduce emissions by identifying, coordinating, and providing funding for development of international environmentally-friendly energy development projects.

The IUEP's objectives and goals will be met through two important mechanisms:

- The sponsorship of projects that prove real potential to reduce emissions in the atmosphere
- The development of strong partnerships between the developing world and U.S. manufacturers, developers, and electricity providers.

More information on IUEP can be found at: <http://www.ji.org/>

The Chicago Climate Exchange

The Chicago Climate Exchange (CCX) is North America's only, and the world's first, greenhouse gas emission registry, reduction and trading system for all GHG's. CCX is a self-regulatory, rules based exchange designed and governed by CCX Members. Members make a voluntary but legally binding commitment to reduce GHG emissions. By the end of Phase I (December, 2006) all Members will have reduced direct emissions 4% below a baseline period of 1998-2001. Phase II, which extends the CCX reduction program through 2010, will require all Members to reduce GHG emissions 6% below baseline. As of May 2006 five electric power generators were members of CCX: American Electric Power, Central Vermont Public Service, Green Mountain Power, Manitoba Hydro, and TECO Energy, Inc.

The goals of CCX are:

- To facilitate the transaction of greenhouse gas emissions allowance trading with price transparency, design excellence and environmental integrity
- To build the skills and institutions needed to cost-effectively manage greenhouse gas emissions
- To facilitate capacity-building in both public and private sector to facilitate greenhouse gas mitigation
- To strengthen the intellectual framework required for cost effective and valid greenhouse gas reduction
- To help inform the public debate on managing the risk of global climate change

More information on CCX can be found at: <http://www.chicagoclimatex.com/>

VI. Approach

Analysis of Electric Utility Practices

This study will survey electric utilities to identify practices and strategies to reduce GHG emissions. A few interviews may be conducted in person; the in-person interviews will be most likely conducted with electric utility companies in California such as Pacific Gas & Electric Co. and Southern Edison Co. due to their proximity. The team will also explore several survey distribution options to make the survey process as flexible as possible for the respondents. The options being considered for distribution methods are: hardcopy survey (via traditional mail), emailed survey, phone interview, in person interview (where feasible) and possible internet based survey (e.g. surveymonkey). The survey, cover letter and possible clarification about the survey will be posted on the group website and serve as a reference for utility contacts filling out the survey.

Surveys will be sent out to approximately 200 FERC regulated electric utility companies in the U.S. An email will be sent to each of these companies, requesting them to complete the survey (by their method of choice). The primary point of contact will be the environmental compliance officer, or environmental manager. For phone and in-person interviews the utility contacts will be given an advanced copy of the survey questions allowing them to prepare their answers for the actual interview. These measures are meant to maximize survey response rate.

Each team member will conduct a given number of interviews with the electric utilities using the standard format. The results will be compiled into a database for analysis. The data will be analyzed to determine the proportion of companies throughout the U.S. are currently implementing strategies to reduce their GHG emissions, what the existing strategies are, and the proportion of companies are interested in developing such programs.

Sample Population

This study will focus on investor owned electric utility companies in the United States for the reason that data is readily available for these companies. The population of firms that will be surveyed is composed of approximately 200 investor owned electric utilities. These utilities represent the biggest utilities in the United States and the list of firms will be derived from FERC FORM 1 which request the biggest investor owned utilities to report information on financial performance and other important firm characteristics.

The research team expects a response rate of 20% which will amount to 40 companies. We will also interview a few international companies, especially those who are party to the Kyoto Protocols such as the UK and Germany. These companies will be provide a useful reference when designing strategies for companies operating in the U.S. Data for domestic electric utilities will be collected from the reports and databases of the EIA, FERC, EPA, NRDC, and carbon registries.

Survey/Interview

There are five key factors that our interview will focus on. The survey will include questions regarding the following:

1. **Fuel Mix:** What type of fuel mix companies are using; extent to which renewable generation is incorporated.
2. **Maintenance and Upgrades:** What types, if any, of maintenance and upgrades has the company completed in order to reduce GHG's. This includes operational infrastructure and technologies.
3. **Control Technology:** Whether scrubbers or other technologies to capture or reduce GHG emissions currently employed.
4. **Carbon Sequestration:** If companies are using carbon sequestration in any form.
5. **Offsetting:** Does the company participate in any form of carbon offsetting including, but not limited to, internal alternative fuel transportation programs,

purchasing carbon credits, participating in a carbon cap and trade program, and offering climate neutral electricity options to consumers.

In addition, we will ask companies the costs and the benefits associated with implementing and maintaining these strategies.

Complementary Research/Information

Regulatory Programs

This section will consider the regulatory initiatives and programs that are already in place to mandate the reduction of GHG emissions, both in regulated American states and in Europe. We will investigate the overall performance of the programs, as well as the cost of implementing and enforcing them. In addition, we will assess any barriers the regulatory programs create to conducting cost-effective GHG reductions as well as how effective they are in spurring innovation of reduction strategies.

Recommendations

Finally, we will provide GHG reduction recommendations designed for electric utility companies in the United States. The results of the project will be provided in a report that will be accessible online. Thus, our recommendations on possible strategies to reduce GHG emissions will be available for both the client and the general public.

VII. Management Plan

Group Structure and Management

Each member is assigned certain roles within the group, and it is each member's responsibility to perform the tasks associated with his/her job. The project manager will have the duty of keeping each member accountable for their portion of the project and contributing to each member's work in the form of advice and counsel when necessary.

Organizational Roles and Responsibilities

- Data/Web Manager – Mark Weeks
 - Maintains shared folder
 - Organizes electronic data
 - Designs, constructs, & maintains project website
- Financial Manager – Anthony Fournier
 - Organizes and distributes funds
 - Tracks and records expenses
- Project Manager – Lijin Sun
 - Keeps team members on tasks and up to date
 - Leads meetings
 - Provides agendas & meeting minutes
 - Provides advice & counsel when needed
- Project Coordinator – Avra Goldman
 - Coordinate meetings
 - Internal communication with Bren staff & group members

- Coordinate & organize outside activities and tasks
- Assist Project Manager

Research Focuses and Summer Responsibilities

- Anthony Fournier – GHG reduction partnerships in the U.S.
 - Conduct interviews/surveys for given subset of electric utilities
 - Monitor and update financial records as needed
 - Distribute funds as needed for group or individual travel
 - Compose a report detailing GHG reduction partnerships and the management of these partnerships at local, state, regional and national levels
 - Collaborate with Avra on report of GHG reduction strategies
- Avra Goldman – Technology and strategies currently used in electric utilities to reduce GHG emissions
 - Conduct interviews/surveys for given subset of electric utilities
 - Organizes conference calls and meetings for group if needed
 - Compose a report on the strategies currently in place in electric utilities to reduce GHG emissions
- Lijin Sun – Political landscape; local, regional, national and international
 - Conduct interviews/surveys for given subset of electric utilities
 - Compose a report on the political landscape of electric utilities regarding GHG emissions. Report will include a list of regulations and government initiatives regarding GHG reduction
- Mark Weeks – Life cycle analysis of electricity production, distribution, and consumption
 - Conduct interviews/surveys for given subset of electric utilities
 - Compose a report on lifecycle of electricity production at the plant level and organization of electric utility companies
 - Create metric for gauging effectiveness of various private emissions reduction initiatives

Meeting Structure

Meetings will be held on Tuesdays at 12:30pm with the faculty sponsor, Magali Delmas, during the Spring 2006 quarter. A second weekly meeting will be held on Thursdays at 12:30 without Magali present. Meetings will be at these set times for the entire quarter. Avra Goldman will reserve rooms for these meetings, and Lijin Sun will lead the meetings. The Tuesday meetings will primarily be designated to going over work, research, and questions from the previous week with Magali Delmas and for conference calls with our client, ENSR. The Thursday meetings will allow the group members to delegate tasks and prepare the work that will be presented to Magali Delmas the following Tuesday. Lijin Sun will take the minutes during the meetings, and she will post those minutes the following day in the group folder. The project spokesperson will schedule and lead the conference calls with Paul Smokler and any other group project committee members from ENSR.

Summer

Each group member has been assigned a specific research topic related to electric utility companies and their strategies to reduce GHG emissions. Each group member will conduct their research on their own and write a paper summarizing their findings. Group members will email updates and questions every other week. Once a month, Avra Goldman will schedule a conference call for the group members to discuss their progress and findings.

Responsibilities of Members

Each group member will perform their given tasks through the end of the project. Members will present and turn in their work by the deadlines the group decides upon. Every group member will attend every scheduled meeting unless extenuating circumstances arise. If any member expresses that their job becomes too difficult, other group members will come forward to help with the responsibilities.

System to Ensure Deadlines are Met

Mark Weeks is creating a detailed timeline of deadlines for the group. Every step of the group project process is listed on the timeline. When the group completes a step, that step will be marked as finished on the timeline. When work is divided among the group members, the deadlines will be scheduled for the Tuesday meeting times. The group's deadlines will be set slightly earlier than the Bren School's deadlines. This will allow time for revisions after Magali has critiqued the work. This will ensure that the members to turn their work into Magali on time. All documents will be filed in the team folder and every team member and Magali will have access to the folder.

Conflict Resolution

To help avoid conflict, work will be divided evenly among the group members. Tasks will be assigned to members based on their personal strengths and desires to perform certain tasks. Communication among the group is encouraged regarding conflicts. Constructive criticism and praise are encouraged as well.

Procedures for Documentation, Cataloging and Archiving Information

Data Manager Mark Weeks is responsible for maintaining and organizing electronic data on the group's shared folder and on the website. Readings, data, minutes, documents, and individual member documents will all have their own electronic folder. Anthony Fournier is responsible for maintaining and organizing the group's financial information in the designated financial folder on the shared drive.

Guidelines for Interacting with Faculty Advisors, External Advisors, Clients, Customers or Consultants

Faculty Advisor Magali Delmas will be called upon for advice and guidance when needed. She will also oversee the weekly Tuesday group meetings and ensure that the group is keeping reasonable project expectations and meeting deadlines. We expect our advisor to return papers submitted for editing within one week.

Our client, Paul Smokler, will attend meetings when necessary and make sure that the project is moving in the desired direction. As progress is made, the spokesperson will email Paul and request feedback within one week.

Overall Expectations of Group Members and Faculty Advisors

The group members expect that the faculty advisor will provide advice, direction when needed, expertise, and constructive criticism. The group also expects documents submitted for editing to be returned in a timely fashion.

The group members expect each other to put forth sufficient effort and help other members when their jobs are too burdensome. The group is expected to treat each other with respect and be open to everyone’s suggestions. Every group member is expected to have their work done by the appointed deadline.

VIII. Deliverables

Deliverables to ENSR include:

A final report and presentation will provide an evaluation of the current industry voluntary strategies and practices regarding greenhouse gases. This assessment will also forecast the market for GHG consulting services and the specific professional resources that will meet those needs.

- Final report and presentation providing an evaluation of current industry voluntary reduction strategies for GHG’s
- Database of electric utility companies in the U.S. that qualify for GHG reduction strategy consultation
- Assessment that will forecast the market for GHG consulting services within the electric utility sector and the required professional resources to meet those needs
- Recommendations to ENSR on companies with whom they should establish a consulting relationship

IX. Milestones

Spring Quarter 2006	
9-May	Submit Project Proposal to Advisor
24-May	Send Revised Project Proposal to Review Committee
30-May	Review Project Proposal with Committee
2-June	Publish Website
5-June	Submit Report on Project Proposal Review
7-June	Submit Evaluations of Peers and Advisor
Summer Quarter 2006	
June – July	Test the Survey on Electric Utility Industry Experts and

	Survey Experts and Finalize the Survey
July-September	Work on research papers & Conduct surveys/interviews. Timing of survey administration will vary by team member and their summer schedule.
Sept (TBA)	Summer Task Report Meeting
TBA	Group Conference Calls
Fall Quarter 2006	
17-Nov	Complete Progress Reviews
1-Dec	Submit Draft Report
1-Dec	Submit Evaluations of Peers and Advisor
Winter Quarter 2007	
2-Feb	Project Defense Presentation
16-Feb	Submit Final Report to Advisor
16-Feb	Submit Presentation Information
16-Feb	Submit Presentation Invitation List to GP Coordinator
9-Mar	Submit Final Report and Project Brief to Advisor
Spring Quarter 2007	
4-Apr	Print Project Poster
4-Apr	Finalize PowerPoint Slides and Submit to Advisor
11-Apr	Final Public Oral Presentation
18-Apr	Archive Final Report
18-Apr	Submit Final Evaluations of Peers and Advisor

X. Advisory Committee

Faculty Advisor

Malali Delmas – UCSB Bren School

Other Academic Advisors

Mathew Kotchen – UCSB Bren School

Roland Geyer – UCSB Bren School

External Advisors

Paul Smoklwer – ENSR

Robert Weber – ENSR

XI. Budget

REPI Budget

Description	\$
Phone (\$1/mo)	12
Monthly Phone Bill (\$10/mo)	110

Presentation Expenses	100
Library Supplies	50
Research Materials *	100
Final Poster Production	250
Final Paper Printing *	300
Conferences	2,500
Total	3422

Copies	100
Printing	150
Total	250

Bren Contribution	1,100.00
Bren Printing Contribution	200
ENSR Contribution	5,000
Total Budget	6,300.00

Total Balance *	2,628.00
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XII. Budget Justification

The Donald Bren School of Environmental Science & Management provides an overall contribution of \$1,100 and a printing stipend of \$200.

Description of anticipated expenses:

- Phone: Calls will be made to our client and other contacts to conduct informational interviews, organize meetings, and conference calls. This line is not intended to be used for private calls. A \$10 initial start-up fee is charged but is covered by the Bren School.
- Monthly Phone Bill: Every month we will incur a phone bill. The minimum cost will be \$1/month. Additional charges are incurred by making phone calls. A per call charge is levied; the amount of this charge is dependent upon where the call is made to. Since our client is located relatively close to the Bren School and he will represent the majority of our telephone calls, we do not anticipate incurring monthly bills higher than \$10/month.
- Presentation Expenses: This expense covers material necessary to create a professional presentation.
- Library Supplies: This money will cover the materials needed to set up an efficient work station. Money will be spent on dividers, organizers, and binders to organize the hard copy documents, schedules, and contact information for each group member.
- Research Materials: Books, periodicals and databases will be needed to conduct research. The group may need to subscribe to online journals or databases to obtain sufficient information. We also may use an online survey system for the convenience of our sample population. This type of online data analysis system may be free to students, but that has not yet been determined.

This expense may increase if our project necessitates subscribing to multiple online information sources.

- Final Poster Printing: Printing the final poster will be a costly expense. We will research printing companies to find the most economical choice. However, we will choose the printing company with the highest quality printing rather than the lowest prices.
- Final Paper Printing: We would like our final paper to be as professional as possible. Therefore, we will seek the best printing service to produce our final paper.
- Printing: The Donald Bren School of Environmental Science & Management provides a \$200 stipend for printing expenses. We expect to spend the entire stipend and most likely more on copying and printing articles, research papers, and databases that are relevant to our project.
- Conferences: It may be necessary for one, a few, or all of our group members to attend conferences related to our group project. Such conferences may include those representing the electricity sector, and those on GHG emissions reductions. Interviews and surveys may be conducted at these conferences as well. The amount printed on our budget is not final. It may be smaller or larger depending on the number of group members that attend a conference, how many conferences are attended, and how far we must travel to attend such conferences.

Expenses paid out of REPI's project funds will only be used for items related to this project. No other use of project funds will be tolerated.

XIII: References

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