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CURRENT PRACTICES FOR REDUCING GREENHOUSE GAS EMISSIONS

A STUDY OF ELECTRIC UTILITIES IN THE UNITED STATES

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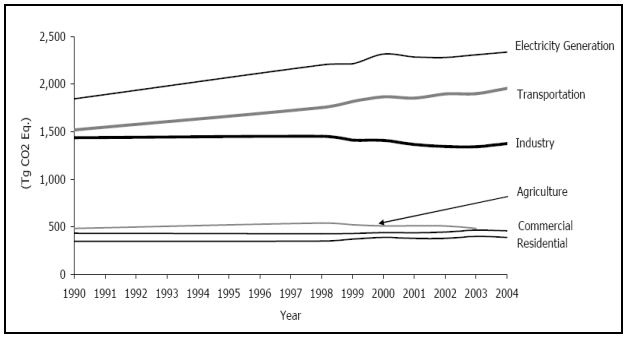
Introduction

Among all of the major economic sectors in the United States, the electric power industry is the largest emitter of greenhouse gas (GHG) emissions (Figure 1). While renewable energy has experienced tremendous growth in recent years, its overall contribution to the industry's total net generation remains quite small. Coal continues to be the predominant source of energy for generating electricity in the U.S. and accounts for a large portion of the industry's GHG emissions. Data from 2005 shows that coal combustion made up 50% of the nation's electricity generation, and was responsible for 82% of the year's CO_2 emissions from electricity generation (EIA, 2006).

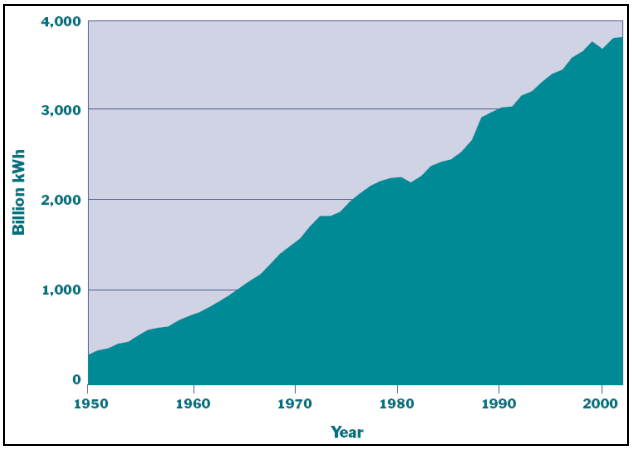
Figure 1: CO_2e emission levels among U.S. economic sectors from 1990 to 2004



Source: (EIA, 2006)

Since 1990, CO_2 emissions from U.S. electric utilities have increased by 31.7%, to 2,375 million metric tons (MMT) in 2005 (EIA 2006). This increase in emissions is associated with the rise in electricity demand over this time period (Figure 2). According to the U.S. Department of State, emissions from electricity production will continue to increase and by 2020 are projected to reach 2,898 MMT annually (U.S.DoS, 2002). This projection incorporates policy measures, technology improvements, demand-side efficiency gains, and cleaner fuels. However, these efforts to reduce emissions are expected to be cancelled out by growth in population and economic activity.

Figure 2: U.S. net electricity generation 1950 – 2003



Source: (PEW, 2005)

Given the magnitude of GHG emissions generated by the electricity generation sector, it is clear that any attempt to regulate GHGs in the U.S. must involve electric utilities. The current lack of federal regulations mandating GHG reductions has led to the development of a patchwork of state and regional regulations, partnerships, and voluntary initiatives aiming to mitigate GHG emissions. Despite the magnitude of the GHG emissions from U.S. electric utilities, limited literature is available on the current state of GHG management strategies used by utilities or their motivations and barriers to taking action.

Project Objectives

This project was developed to achieve three primary objectives:

(1) To assess GHG emission reduction strategies and offsetting practices currently used by electric utilities in the U.S.

(2) To identify the motivations and barriers impacting a utility's decision to take action to mitigate its GHG emissions.

(3) To explore the effects that a utility's ownership-type, size, region, fuel mix, and CO_2 emissions have on its decision to adopt GHG management practices.

This study goes directly to decision makers within U.S. electric utilities to discover exactly what is being done to address GHG emissions and why utilities choose to act or not. Survey methodology was used as the primary data collection tool for this project. The results show which GHG management approaches are most often used and also highlight the principal motivations and barriers to action. Differences in approaches were evaluated based on the following utility characteristics: ownership, size, operating region, CO_2 intensity, and fuel mix.

With the aid of this study, electric utilities in the U.S. can take effective action toward reducing GHG emissions and lowering their impacts on global climate change. By comparing their current GHG emissions management approaches to the aggregated industry data from this project, utilities will be able to use the findings of this study as part of their long-term operational and environmental planning efforts. This project can also provide policymakers with insights on how to properly engage utilities in GHG mitigation efforts.

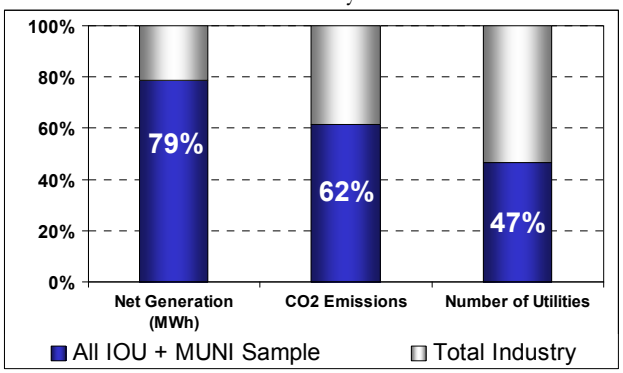
Methodology

The survey gathered data not available from traditional industry information sources regarding mitigation approaches as well as motivations and barriers that influence utilities' GHG management decisions. The survey was titled, "***Current Practices for Reducing Greenhouse Gas Emissions from Electric Utilities,"*** and consisted of twenty questions requesting data about utilities' generation, purchase of electricity, fuel mix, and the management of their GHG emissions. The survey was broken up into the following nine sections:

(1) Respondent Information
(2) Human Resources in the Environmental Dept.
(3) Capacity and Generation
(4) GHG Inventory and Registration
(5) GHG Reductions
(6) GHG Offsetting
(7) Motivations and Barriers
(8) Additional Information
(9) Final Results

The surveyed population for this project consisted of 314 utilities, 88 of which were investor-owned utilities (IOU) and 226 municipal utilities (MUNI). The utilities that make up the surveyed population include 100% of the investor-owned generating utilities and 39% of the municipal generating facilities located in the contiguous United States, Alaska, Puerto Rico and the U.S. territories. Due to the large number of municipal utilities within the U.S., and limited group resources, a sample of the municipal utilities had to be taken. Figure 3 shows how the surveyed population (all IOUs + MUNI Sample) compared to the entire electric utility industry in terms of net generation, CO_2 emissions and number of utilities.

Figure 3: Surveyed population as percentage of total industry



Participation in the survey was on a voluntary basis and respondents were assured that all information would be kept strictly confidential. The time estimated for a respondent to complete the survey was between 10 and 15 minutes. The final version of the survey design was completed at the end of October 2006 and was posted on an internet survey website in the same layout, wording and question order as the paper-based survey.

The administration of the survey involved contacting the survey recipients through multiple avenues of communication. Over a period of about two months the contacts for each utility received 2 mailings of a survey and cover letter, 1 postcard reminder, 2 phone calls, and 3 email reminders requesting their participation in the survey. In addition to the survey, supporting industry data was collected from the EPA's Emissions and Generation Resource Integrated Database (eGRID).

Data & Analysis

Among the total 314 generating utilities surveyed, 61 utilities (19.4%) responded to the survey, 15 utilities (4.8%) explicitly declined to participate, and 238

utilities (75.8%) neither responded nor declined. Among the respondents, 16 utilities were investor owned representing 18.2% of the IOUs and 45 were municipal utilities representing 19.9% of sampled MUNIs. Given the two options for filling out the survey, 34 utilities completed the survey online, 24 utilities chose mail, and 3 utilities chose email.

Five characteristics were used to examine the responding utilities for potential bias in relation to the original surveyed population. The five categories were net generation, CO_2 emissions, CO_2 emission intensity, fuel mix, and NERC regional representation. The results of this analysis show that the respondents were unbiased.

From the results, the municipal utilities seem to favor GHG reduction partnerships operated by the state or federal government, while investor-owned utilities appear to favor industry partnerships. The most frequently selected partnerships were the SF_6 partnership, Climate VISION partnership, the CA Climate Action Registry and the carbon sequestration partnerships.

The analysis of the responses shows that a majority of utilities rely on at least one strategy to reduce GHG emissions. Among survey respondents, the strategies most frequently adopted to reduce GHG emissions were demand-side management and switching to renewable energy sources (Figure 4).

Figure 4: Count of respondents utilizing GHG emissions reduction practices

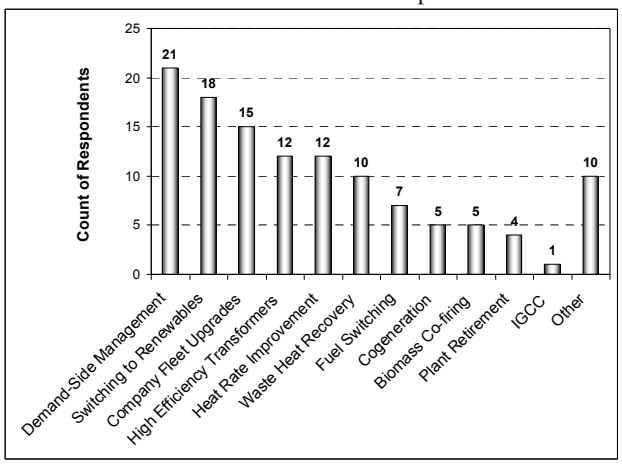
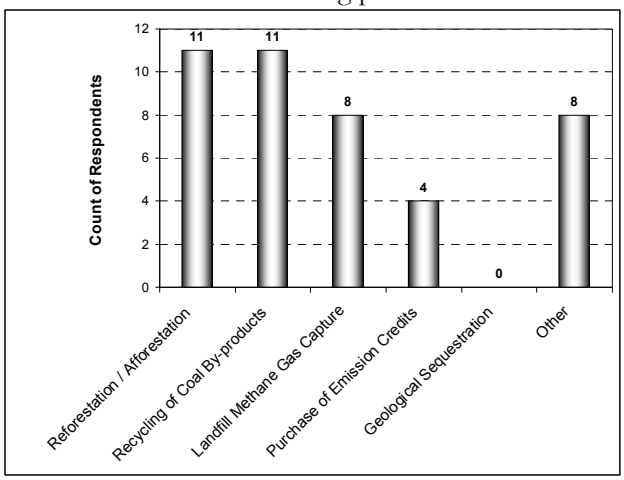


Figure 5 shows that the two most frequently selected GHG offsetting practices were reforestation and recycling of coal by-products, and landfill methane gas capture. Similar to the partnerships and GHG reduction analysis, the offsetting practice analysis showed that the utilities involved in these practices rely heavily on coal for their electricity generation.

Figure 5: Count of respondents utilizing GHG offsetting practices



We also asked respondents if they offer a green power program to customers. Green power programs allow customers to pay a premium for power generated from renewable energy sources. Results show that about half of the respondents offer such a program with a range of customer participation from 0 to 5%. Additionally, 71% of the utilities that have green power programs had less than 1% customer participation.

The primary motivations for mitigating greenhouse gas emissions are anticipated regulatory pressure, executive leadership, and improved efficiency. Aggregated survey results show that respondents ranked cost of mitigation, regulatory uncertainty, and lack of technologies as the strongest barriers that prevent GHG mitigation.

Conclusions

While the majority of respondents are currently engaged in at least one GHG reduction strategy, those utilities engaged in offsetting practices are in the minority. A likely reason for this observation is that reductions are generally more easily quantified and verified than are offsets. In addition, reduction strategies can lead to cost-savings whereas offsetting, in the absence of a GHG emissions market, is generally cost-prohibitive.

The top two GHG reduction strategies adopted by the survey respondents were demand-side management and switching to renewable energy sources. By examining the effect of existing state regulation on the decision to adopt these reduction strategies, it was discovered that utilities are indeed utilizing demand-side management and switching to renewable energy sources for the purposes of mitigating GHG emissions and are not simply adopting these strategies because they are required to do so under current regulations.

Reforestation and recycling of coal by-products tied for the top GHG offsetting practices utilized by respondents. Coal by-products may have economic value as inputs for industrial processes such as cement manufacture. Therefore, recycling of coal by-products may be an opportunity for utilities to generate an additional revenue stream while simultaneously addressing GHG emissions. Similarly, reforestation can be associated with peripheral benefits such as positive public relations.

None of the survey respondents were engaged in geological sequestration. This is an important finding because carbon capture and storage (CCS) is often sited as an essential approach to achieve carbon reduction goals. However, compared to conventional technologies, CCS requires higher capital costs and results in efficiency losses of some 30% (Steve Koonin, in talks at UCSB). This means that in the absence of a price on carbon, there is no economic rationale for pursuing CCS – with the possible exception of enhanced oil recovery (Specker, 2007).

Size, in terms of net generation, has a large effect on a utility's choice of whether or not to adopt GHG emission mitigation measures. As one self-described small rural municipal utility put it, "the impact of GHG emissions from [a] wildfire in our area exceed any impact of our utility by many orders of magnitude." For our survey respondents, size was highly correlated with investor ownership; therefore it often appears as though investor owned utilities are more actively pursuing GHG mitigation than municipal utilities even though the effect may be resulting from differences in size alone.

Regulatory uncertainty is unequivocally the strongest barrier to GHG reduction that utilities face. Without regulatory certainty, it is difficult for utilities to engage in long term planning. This problem was highlighted in the recent release of ***"A Call for Action"*** in which the U.S. Climate Action Partnership states that "we need a mandatory, flexible climate program."

The primary motivation for GHG reduction among municipal utilities is executive leadership. Analyzing all respondents together identified improved efficiency and trade association pressure as the strongest motivations influencing GHG reduction behavior. Table 1 summarizes the main motivations and barriers.

Table 1: Summary of motivations & barriers

	Strong	Weak
Motivations	➢ **Improved Efficiency** ➢ **Trade Association Pressure**	➢ **State Financial Subsidies** ➢ **Existing State Regulations**
Barriers	➢ **Regulatory Uncertainty**	➢ **Lack of Political Pressure**

This study has demonstrated a clear need for federal regulations on greenhouse gases. The current state of regulatory limbo is hamstringing GHG reduction in the electric power sector. However, some proactive utilities are moving forward and reducing their GHG emissions voluntarily, primarily through demand-side management and switching to renewable energy sources. A number of additional GHG reduction strategies are also currently in use, which demonstrates that utilities have many options to choose from. Further implementation of these strategies will be highly dependent on the future of federal regulations.

References

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