

**Technology Assessment of Greenhouse
Gas and Carbon Emissions Management
Strategic Planning Tools**

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION.....	1
2.0 GHG EMISSIONS MANAGEMENT OVERVIEW.....	3
2.1 Background.....	3
2.2 International	4
2.3 National	4
2.4 Analysis.....	5
3.0 GHG EMISSIONS STRATEGIC PLANNING TOOLS.....	6
3.1 Introduction	6
3.2 Applicable Technologies – Private Industry	6
3.2.1 CARBONSIM SM	7
3.2.2 CO ₂ e	7
3.2.3 Emission Strategies.....	9
3.2.4 Environmental Software Providers (ESP).....	10
3.2.5 GHG Spaces, Ltd.	10
3.2.6 Trexler and Associates, Inc.....	11
3.2.7 Summary of Commercial Technologies Analysis	12
3.3 Applicable Technologies – State Initiatives	13
3.3.1 State of California – Climate Action Registry Reporting Online Tool	13
3.3.2 Summary of State Technologies Analysis	14
4.0 CURRENT VOLUNTARY REPORTING PROGRAMS	15
4.1 Introduction to Voluntary Reporting Programs.....	15
4.2 Federal Voluntary Reporting – U.S. Department of Energy 1605(b)	15
4.2.1 Overview of the 1605(b) Program.....	16
4.2.2 1605(b) Participation and Voluntary Reporting of GHGs	16
4.2.3 1605(b) Program Projects and Participating Companies	19
4.2.4 1605(b) Program Enhancement: Opinions and Recommendations	21
4.3 State Voluntary Reporting Programs.....	24
4.3.1 Reporting Requirements of the California Climate Action Registry	24

5.0 CONCLUSION 26

REFERENCES AND RESOURCES..... 28

LIST OF TABLES

Table 1: Industry GHG Emissions Management Strategic Planning Tools Comparison 13
Table 2: Reportable Greenhouse Gases and Associated Sources..... 17
Table 3: Emissions Reduction Results Reported for Data Year 2000..... 20
Table 4: Select Regional Reporting Entities: Year 2000 Data 21

EXECUTIVE SUMMARY

International, national, and local measures are being assessed and implemented that could aid in the reduction and concentration of greenhouse gas (GHG) emissions and, most significantly, carbon emissions. To meet these regulations and objectives, public policy makers and corporate decision makers must examine cost-effective strategies to approach the legion of options for GHG emissions management, including project-based applications involving carbon sequestration facilities, landfill gas-to-energy sites, and others. Another option that exists to aid enterprises in meeting these regulatory demands and voluntary objectives is the emerging global market in GHG emissions trading. To achieve cost-effective transactions in this market and through internal or cooperative projects, a business enterprise must use a logical, systematic, and informed process. Otherwise, the business will risk implementing GHG emissions reduction strategies which may not be cost-effective. Likewise, public bodies, which will create the policies to drive the use of the emerging trading market and initiation of emissions reduction projects, must approach policy development with a holistic and organized method.

Thus, public bodies and industry leaders must be able to design policy and business strategies to achieve optimal outcomes when fashioning approaches to GHG emissions management, including those focused on market-based solutions. Currently, these public and private planners appear to have limited tools with which to perform their quest for seeking best options for GHG emissions management policy and business strategies. So, there is a need to assess the present state of technology regarding GHG emissions management strategic planning tools for both public policy planning and industrial strategic planning and to formulate a plan to advance research and development of these tools. This report focuses on meeting this need.

Based upon the research effort, the technology arena of GHG and carbon emissions management strategic planning tools presently has significant limitations, in terms of data, functionality, and performance, both for public and private sector parties interested in GHG emissions management. As noted, government entities can play a role in prompting voluntary carbon emissions reduction measures by industry. Therefore, a logical first step to aid in enhanced carbon emissions reduction strategic planning for governments and industry would focus on developing new tools for governmental planning. In this realm, there is a clear need to develop a technology to aid government entities, especially state governments, as they attempt to assist with implementing voluntary GHG emissions mechanisms and encouraging investments in carbon emissions reduction and offset projects in their jurisdictions.

In addition and in parallel with the public sector technology development, technology advances should be explored that will provide enhanced strategic planning tools to private sectors enterprises attempting to comply with corporate GHG emissions reduction targets or regulatory regimes. Based upon the survey and analysis of the private tools, it appears that the most pressing need for this type of tools is related to characterization of project-level investment opportunities.

1.0 INTRODUCTION

Presently, measures are being examined and implemented on international, national, and local bases that could aid in the reduction and concentration of greenhouse gas (GHG) emissions and, most significantly, carbon emissions. However, a universally acceptable approach for framing policy and market measures has not developed. As a result, public policy makers and corporate decision makers are left without a clear method with which to approach the legion of options for GHG emissions management, including project-based applications involving carbon sequestration facilities, landfill gas-to-energy sites, and others.

Another related option that exists to aid enterprises in meeting these end-user demands is the emerging global market in GHG emissions trading. To achieve cost-effective transactions in this market and through internal or cooperative projects, a business enterprise must use a logical, systematic, and informed process. Otherwise, the business will risk implementing GHG emissions reduction strategies which may not be cost-effective.

Likewise, public bodies, which will create the policies to drive the use of the emerging trading market and initiation of emissions reduction projects, must approach policy development with a holistic and organized method. For instance, public bodies will likely need to craft policies which do not result in the markets triggering the creation of areas with heightened localized warming. Therefore, public bodies must be able to effectively design and implement GHG emissions reduction strategies in such a manner that they do not exacerbate opportunities for increased localized warming as a result of emissions concentrations and development patterns.

Thus, both public bodies and industry leaders must be able to design policy and business strategies to achieve optimal outcomes when fashioning approaches to GHG emissions management, including those focused on market-based solutions. Currently, these public and private planners appear to have limited tools with which to perform their quest for seeking best options for GHG emissions management policy and business strategies.

Thus, there is a need to assess the present state of technology regarding GHG emissions management strategic planning tools for both public policy planning and industrial strategic planning and to formulate a plan to advance research and development of these tools. This report focuses on this initial study.

In this activity, Augusta Systems was to conduct a thorough search for, and evaluation of, the technologies and tools presently available for use by public bodies to establish policies and by private businesses to develop strategies related to GHG emissions management. This activity included the summarization and comparison of the leading technologies and tools available for each area of planning, and a detailed assessment of the strengths and weaknesses of the present approaches. In addition, a summary evaluation of this technology field was produced to chronicle the opportunities for technology development and enhancement to provide tools for optimized decisions.

This report represents a chronicle of the work of Augusta Systems to meet the objectives of the activity, and is divided into four main sections.

The first section, GHG Emissions Management Overview, provides a synopsis of the emerging market in GHG emissions trading and provides a high-level discussion of the potential impacts this emerging market will have on industry and public bodies.

The next two sections chronicle information on the technologies and tools used by private and public bodies to approach GHG emissions management strategies. In the second section, a technology assessment of the computing tools presently available for use by industry in conducting GHG emissions management strategic planning activities is provided. Next, the registry and planning tools being used by public entities for shaping policies regarding GHG emissions management strategies are discussed.

From the assessment efforts detailed in these sections of this document, the report concludes with findings regarding technology enhancements and innovations that could be made to advance the state of technology regarding GHG emissions management strategic planning.

2.0 GHG EMISSIONS MANAGEMENT OVERVIEW

2.1 Background

From multinational bodies like the United Nations to local authorities like the Nassau County Legislature in New York, governmental bodies have made and continue to initiate efforts to reduce GHG emissions. At present, there are six direct GHGs recognized by international agreements – carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. When compared, these countless efforts regarding GHG emissions management, from multinational to local levels, can be complementary in one manner and contradictory in another. These disparate structures can lead both public bodies and private enterprises to become confused as to the appropriate choices regarding high-level strategies and investments to attempt to mitigate GHG emissions.

As regulatory regimes are put into place by certain government bodies, these public entities must contemplate a myriad of questions, including, but not limited to, how to require enterprises to report emissions and emissions reductions or offsets, which sectors are to be covered by the regimes, what types of emissions reduction and offset activities may qualify for credits against emissions, and whether or not reduction or offset projects should be able to be traded between subject entities. In addition, government bodies must contemplate whether there are opportunities to catalyze market-based options to assist those private entities upon whom they have levied regulatory constraints to meet the stated goals.

In cases where a government opts to utilize voluntary mechanisms to reduce GHG emissions, the opportunity to impact actions through policies is no less significant. In fact, the options selected by governments with regard to these policy questions, whether under regulatory or voluntary measures, can directly impact the opportunities for cost-effective facilitation and implementation of GHG emissions reduction and offset projects within a subject jurisdiction. For instance, a state which attempts to identify and register potential sinks for capturing carbon dioxide emissions may find that opportunities to link sources to sinks are enhanced within its jurisdiction. This linkage could help to make certain types of GHG emissions reduction or offset projects more economically viable by eliminating the need for redundant industry research efforts.

As noted, regulatory and voluntary regimes are often accompanied by GHG emissions trading programs, which add further complexities to emissions management. These market trading mechanisms are intended to allow for GHG emissions reduction and offset investments to be made when and where economically most appropriate, and, thus, not unduly burden private entities and national economies. Adding to the complexities inherent in managing a portfolio of internal project investments and trades is the fact that enterprises with facilities or interests in multiple locations may be subject to different structures in different locales, as a result of the absence of coordinated approaches from the various governing bodies.

2.2 International

Clearly, the Kyoto Protocol represents the most widely covered of these measures being adopted, considered, or advocated by government bodies. In addition to the Kyoto Protocol presently being adopted or considered for adoption globally, which will be applied in different manners in various subject nations, individual nations including the United Kingdom (U.K.) and Denmark have adopted trading mechanisms to provide for financially viable solutions to meet new emissions standards. To demonstrate the fragmentation of the regulatory approaches that makes planning difficult, these U.K. and Danish systems allow trading of different emissions, cover different economic sectors, and use markedly different allowance and credit-driven mechanisms. As if this was not complicated enough for companies with locations in both countries, these two systems diverge in some manners from the structure being developed for the European Union as a whole.

2.3 National

Turning attention closer to home, in the United States (U.S.), there have been overtures from national policymakers and business leaders that voluntary, market-based solutions offer the only realistic answer to reduce GHG emissions. For instance, President George W. Bush has, through his Global Climate Change Initiative, called for America to commit to an aggressive strategy to cut GHG intensity by 18 percent over the period of 2002 – 2012, utilizing market-based, voluntary approaches.

The broad-based support for this market-driven vision can be evidenced by an examination of the energy and industrial players associated with the Chicago Climate Exchange, a voluntary emissions trading platform presently under design for use initially in the Great Lakes region, and, prospectively examining the viability of extending throughout the Americas. Notable energy companies among the entities participating in the design phase of the Chicago Climate Exchange are: Alliant Energy Corporation, American Electric Power (AEP), BP America, Cinergy Corporation, CMS Generation Company, DTE, Exelon Corporation, FirstEnergy Corporation, NiSource, PG&E National Energy Group, TXU Energy Trading Company, and Wisconsin Energy Corporation. Industrial enterprises aiding in the design phase include: Cemex, Ford Motor Company, International Paper, MeadWestvaco Corporation, and Waste Management. Additional credibility for this voluntary platform resides in the fact that environmental advocacy enterprises like the Nature Conservancy are also engaged in the design phase activities.

Further, over half of the individual states within the United States have developed or are developing strategies to reduce GHG emissions. Some are enacting their own carbon emissions regulatory measures to compel action. In most instances, these regimes fail to share commonalities with one another with regard to covered sectors, compliance measures, and offset opportunities. For instance, Massachusetts, New Hampshire, and Oregon, have all mandated certain GHG emissions reduction requirements for energy companies that differ in important respects. This lack of a common approach adds to the complexities of fashioning strategies for enterprises with facilities in multiple locales or jurisdictions.

2.4 Analysis

However, while the fragmentation of this marketplace, both internationally and within the United States, poses certain obstacles to enterprise planning for emissions management, it does not foreclose on opportunities to trade across systems. In fact, this system-to-system trading potential reinforces the need for sophisticated, dynamic tools to assist public entities in developing and catalyzing opportunities to reduce GHG emissions and private enterprises with navigating the myriad of possible investment scenarios.

As enterprises confront decisions regarding GHG emissions management strategies, a market is set to develop in GHG emissions reduction trading. The estimates for market size range from a Deutsche Bank projection of up to \$150 billion globally to the United Nations Environment Programme's Finance Initiative reported figure of as much as \$2 trillion globally by 2012. In addition, a market for internal GHG emissions reduction projects will develop that could match this trading market dollar for dollar, or exceed it.

As this market expands, the development of GHG emissions management strategies will be vital to the developing emissions reduction trading market. For instance, a recent study from the Pew Center for Global Climate Change (Pew Center) entitled "The Emerging International Greenhouse Gas Market" indicated that, for enterprises, "... key tasks involved in developing optimal compliance strategies include understanding current emissions, projecting future emissions growth, assessing internal costs of abatement, comparing these prices to external market prices, and evaluating and implementing less GHG-intensive technologies, practices and processes."

Thus, the emerging arena of GHG emissions management, and most significantly, carbon management, poses strategic challenges to public and private enterprises alike. In order to plan effectively, whether to initiate planning of regulatory or voluntary mechanisms, or to structure approaches to comply with government mechanisms or corporate goals, advanced analytical technologies will be a key driver for cost-effective activities. More specifically, in order to effectively and efficiently manage in this environment, public and private entities will need advanced computing technologies to manage information, make knowledgeable decisions, and undertake appropriate investments regarding GHG emissions management.

The next section of this report focuses on examining the present analytical technologies available for use by private enterprises and government bodies to assist in strategic planning related to GHG emissions reduction management.

3.0 GHG EMISSIONS STRATEGIC PLANNING TOOLS

3.1 Introduction

As noted previously, an integrated assessment of GHG emissions management strategic planning tools must focus on technologies available for utilization by both public and private bodies to perform their various roles within the arena of GHG emissions management. Under this subtask, those currently available tools to assist industry and public bodies with GHG and carbon emissions management strategic planning initiatives were identified and evaluated. While a significant number of enterprises indicate an ability to assist with strategic planning of GHG emissions reduction activities, there are far fewer enterprises or organizations with technologies that actually assist in facilitating these activities.

From an exhaustive research effort, seven software tools were identified which could be said to lead the market at this time. Six are commercial applications focused on meeting the needs of private enterprises, while one is an application developed by an affiliated nonprofit of the State of California, and available for use by other public entities. This section chronicles the current leading technologies and offers observations with regard to performance limitations of the present GHG analytical technologies utilized by public and private parties.

Prior to examining the results of this research, it is important to note that the technology assessment focused both on data-driven elements and information technology capabilities to provide a more robust snapshot of the present technologies, along with their assets and limitations.

Information on the six commercial applications and one state application is provided below.

3.2 Applicable Technologies – Private Industry

Based upon the research conducted under this effort, six tools developed by private industry were selected for in-depth research in order to ascertain present capabilities and consider opportunities for enhancements to the present GHG emissions strategic planning activities of industry. The companies which developed the technologies featured in this report are as follows: CARBONSIMSM, CO2e, Emission Strategies, Environmental Software Providers, GHG Spaces Ltd., and Trexler and Associates. This section of the report is organized around these companies and their technologies.

At the conclusion of this section of the report, a summary of the technologies and capabilities is provided for ease of reference and comparison.

3.2.1 CARBONSIMSM

Background

CARBONSIMSM, an Australian based enterprise, has developed GHG emissions trading platforms, simulations, and software to assist companies with GHG emissions reduction needs. While offering software for planning, CARBONSIMSM donates more significant focus to trading activities and training.

CARBONSIMSM conducts Internet-based emissions trading simulations in order to give participants an idea of what a realistic trading scenario would look like. The trading simulations allow up to 100 participants to attempt to maximize company profits while also meeting emissions reduction targets. The purpose of these simulations is to educate organizations on the factors involved in trading emissions reduction credits and to assist in GHG strategic planning. The platform used during these trading simulations was also developed by CARBONSIMSM.

More significant to this research effort, CARBONSIMSM has also developed a software application, CO2EMSSM, to assist organizations in tracking their emissions inventories.

CO2EMSSM Summary and Analysis

CO2EMSSM, a web-based GHG emissions management tool, enables organizations to quantify and analyze their GHG emissions inventories. CO2EMSSM allows companies to store emissions, production, and financial information for individual facilities. This data can then be viewed based on a number of user preferences including specific business groups, regions, or company-wide. By tracking emissions data over time through the CO2EMSSM tool, users can ascertain how emission levels vary in response to the business environment and use this information to generate marginal abatement cost curves. The inventory method used in the technology is based upon the Intergovernmental Panel on Climate Change (IPCC) methodology and consistent with the World Business Council for Sustainable Development / World Resources Institute (WBCSD/WRI) GHG accounting and reporting standard. Additionally, CO2EMSSM purports to be scalable for small, medium, and large enterprises.

Based upon the available information, the core strength of CO2EMSSM is to serve as an emissions inventory mechanism. True, in-depth analytical capabilities of this CO2EMSSM tool appear to be somewhat limited, as it does not enable companies to track emissions reduction initiative performance or value.

3.2.2 CO2e

Background

CO2e, a subsidiary of investment brokerage Cantor Fitzgerald, provides a variety of products and services to help companies address climate change issues. These products include: Portfolio BuilderSM, a planning and execution tool for managing emissions reduction and offset projects needed to meet future GHG mitigation obligations; Carbon Asset and Liability Manager - CALMSM, a tool to assist in optimizing emissions reduction options based upon risk factors; Internal Markets, an internal trading platform; and, Trading Simulations, which is designed to demonstrate how decisions may produce impacts in the GHG market. Additionally, CO2e offers Corporate Trading Sessions which serve to educate employees on how the GHG trading market will operate as it becomes more commodity-based.

Similarly to CARBONSIMSM, CO2e devotes more attention to the market applications for GHG planning activities, than to the higher-level strategic planning activities, which must be performed in a carefully managed process in order to make market applications cost-effective.

Portfolio BuilderSM Summary and Analysis

For purposes of this technology assessment, the most applicable tool of CO2e is Portfolio BuilderSM. Portfolio BuilderSM is an Internet-based tool that allows users to define, build, and analyze their emissions reduction portfolios. This technology allows for the storage of up to five portfolios. Although there is no restriction on the number of emissions reduction or offset projects that can be housed in the system, CO2e recommends entering only a small number of reduction or offset projects, and in no case more than 40 projects, due to the long wait times that would result from use of the application for high project-count analysis.

With Portfolio BuilderSM, the process for construction of the user portfolio is divided into three phases – portfolio definition, portfolio assembly, and portfolio analysis.

Thus, the first step for a user is to define the type of portfolio that one wishes to construct. This process enables users to define the portfolio parameters, determine their emissions reduction target against generalized Kyoto requirements, determine the Aggregate Emissions Gap, and set the default discount rate to be applied to individual projects. In Portfolio BuilderSM, the Aggregate Emissions Gap is the difference between emissions forecasts under current conditions and the emissions targets during the five year Kyoto commitment period. Portfolio BuilderSM provides an Emissions Gap Calculator to assist with this process. The Emissions Gap Calculator uses a simplified method to calculate the Aggregate Emissions Gap. In the event that a more sophisticated, more accurate method is required, alternative options can be designed and input into the system. The discount rate selected will be automatically applied to all projects in this portfolio but the discount rate can be changed on a project-by-project basis.

In the “build phase,” a user can add project details to the portfolio. Users can include three types of projects – existing, internal, and new – in the portfolios. Existing projects are emissions reduction rights owned by a firm that have been acquired from a third party. Internal projects are emissions reduction activities that result from initiatives undertaken by the organization. New projects are projects that an organization does not own but may choose to acquire and are included in the portfolio for analysis purposes. Some project data will be automatically populated into the system if a project is acquired via CO2e. Projects can be added, edited, and deleted from a portfolio. With regard to each project, detailed information must be recorded with each project entry including information on: reduction or offset project type, project risk factors, project cost information, and discounted project values.

Following the entry of project information, Portfolio BuilderSM provides two methods for analysis and examination of the portfolio and its contents. The first is referred to as “Top Down”. This method allows users to establish an emissions reduction level first and then analyze which projects enable them to achieve that reduction amount. The second method is referred to as “Bottom Up”. This method allows users to select projects of interest and then analyze to determine the total reduction amount based upon the selected projects. Under this analysis phase, users can view data in both a summary

chart and a summary table. The summary chart allows the user to view the Analysis Portfolio using a pie chart sorted by project type, location, and other parameters. The summary table displays the critical details for all of the projects. Other key features of the summary table include the ability to launch a transaction, edit projects, and delete projects. Using the launch transaction function, users can sell an existing or internal project as well as buy a new project via CO2e and other affiliated Cantor Fitzgerald enterprises.

In assessing the functionality and performance of CO2e's Portfolio BuilderSM, it is apparent that the tool provides a strong method for organizations to calculate and examine their emissions reduction gap between present practices and desired goals. In addition, the technology is structured to allow for the recordation and storage of detailed information on specific emissions reduction initiatives.

However, Portfolio BuilderSM is limited in certain respects as well. For instance, its limited ability to store numerous portfolios and projects could potentially be a critical obstacle for enterprises. Principally, the technology is geared to analyze compliance to one emissions reduction goal, i.e. generalized Kyoto compliance or a corporate goal, and not to analyze the opportunities to comply with multiple goals.

3.2.3 Emission Strategies

Background

Emission Strategies provides web-based tools and services to help companies manage GHG, nitrogen oxide, and sulfur oxide emissions. Emission Strategies was developed by ICF Consulting and is based in Virginia.

GHGSolutions™ Summary and Analysis

GHGSolutions™ is a suite of web-based tools and services to assist companies in developing GHG emissions strategies. The following tools comprise GHGSolutions™: GHGBase™, GHGData™, GHGProject™, GHGCosts™, and GHGTracker™. In addition to these tools, Emission Strategies offers consulting services to assist companies in defining direct and indirect emissions, verifying emissions inventories, and comparing company performance indicators with similar companies.

The Emission Strategies suite of tools, when utilized in tandem, allow for the performance of a range of tasks to help with GHG emissions management strategy development, including: estimation of baseline and project GHG emissions for different sectors, such as power generation and livestock based upon substantiated emission factors; estimation of emissions reduction factors from energy efficiency and fuel switching projects; tracking of GHG inventories and reductions; and, calculation of the break-even carbon price for reduction projects.

The capabilities of the GHGSolutions™ technologies to aid in estimating emissions and emissions reductions for certain types of activities are key advantages of this technology package. However, the benefits derived from these estimations must be weighed with the potential weaknesses borne of performing planning with generalized estimations, which may not accurately account for actual corporate positions.

3.2.4 Environmental Software Providers (ESP)

Background

Environmental Software Providers (ESP), based in Monterey, California, offers a variety of environmental emissions management products. ESP has three primary product offerings to help companies manage emissions related activities, including: opsEnvironmental™, which focuses specifically on environmental management and regulatory compliance; ecoAssetManager™, which provides a tool for emissions portfolio management; and, Greenhouse Gas Suite™, which provides the ability to track GHG emissions and emissions reduction projects. The Greenhouse Gas Suite™ is the only system that concentrates uniquely on GHGs. The opsEnvironmental™ and ecoAssetManager™ can be used for different types of emissions, including nitrogen oxide and sulfur oxide emissions.

Greenhouse Gas Suite™ Summary and Analysis

The Greenhouse Gas Suite™ combines some of the elements of the opsEnvironmental™ application and the ecoAssetManager™ application to deliver a system to assist companies in tracking GHG emissions and reduction projects. The Greenhouse Gas Suite™ tracks internal and external reduction projects performance from an environmental and a financial perspective. Additional capabilities of the technology include the opportunity to track purchases and sales of reductions and allowances, the ability to identify the risk associated with and the value of a portfolio, the option to utilize both standard and ad-hoc reporting features, and the opportunity to use emissions calculations and protocol libraries to measure compliance gaps.

To advance its capabilities and accuracy, ESP is developing country specific solutions. Currently, they are working with Environmental Resources Management to develop GHG Suite – UK, which is a module to support clients who are involved with U.K. emissions trading. They are also working to develop a Greenhouse Gas Suite™ exclusively applicable to North America. It is envisioned that users would have the ability to utilize entered information across country modules.

ESP and its Greenhouse Gas Suite™ have certain strengths to lend to enterprises attempting to ascertain their plans for reducing GHG emissions. Principally, Greenhouse Gas Suite™ features comparatively better protocol and compliance libraries than the other technology applications analyzed herein. In addition, the use of emissions calculators can help project enterprise emissions positions for planning purposes.

The Greenhouse Gas Suite™, however, does not appear to be without limitations. Principally, Greenhouse Gas Suite™ does not appear to support detailed project-level comparative functional or cost analyses. This limitation with regard to project level data and analysis, in turn, can undermine the high-level subsidiary or enterprise-wide data and analysis activities.

3.2.5 GHG Spaces, Ltd.

Background

Based in Burlington, Vermont, GHG Spaces is a provider of software and consulting services for private sector GHG control and compliance activities. GHG Spaces offers

ghgsmart™, a technology focused on meeting the GHG emissions management needs of large, multi-jurisdictional corporations.

ghgsmart™ Summary and Analysis

The application offered by GHG Spaces, ghgsmart™, is an integrated GHG emissions management software application. The application is a modular database solution comprised of an inventory accounting module, an administrative module (business information), a credits and allowances position tracking module, a project management module (project data), and an analytic engine module (report generator). From the research effort, ghgsmart™ could be defined as an inventory system, project management tool, and multi-jurisdictional compliance report generator. Through manual data entry, ghgsmart™ can use the same data to examine portfolio composition, assess compliance, and quantify gaps in the portfolio.

The principal strengths of ghgsmart™ are inherent in its integrated architecture and its ability to measure compliance against multiple jurisdictional requirements. The integrated architecture allows for enhanced enterprise-wide data sharing and collaboration, while the multi-jurisdictional capabilities provide a key element that differentiates ghgsmart™ from other surveyed technologies.

This application, ghgsmart™, is not without its own potential issues, as it is focused on multinational compliance, and does not provide significant opportunities for detailed market analyses to allow enterprises to produce the most cost-effective strategies. In addition, proposed methodologies to design compliance- or objective-focused portfolios appear to be underemphasized in this application.

3.2.6 Trexler and Associates, Inc.

Background

Trexler and Associates, based in Portland, Oregon, provides a variety of tools and services to help organizations address emissions management issues. Trexler and Associates currently provides three software applications to assist their clients, as follows: Multi-Pollutant Financial Planning Software, Greenhouse Gas Offset Cost Assessment and Decisionmaking (GGOCAD©), and GHG Offset Business Planning Model. As the Trexler family of technologies are not integrated, each technology will be summarized and then the technologies will be collectively analyzed.

Multi-Pollutant Financial Planning Software Summary

The Multi-Pollutant Financial Planning Software serves to assist energy companies in assessing the emissions and economic impacts of potential growth and business scenarios. These scenarios can involve alternative generation mixes and divesture strategies, among others. This tool enables companies to identify which economic and environmental variables are the most significant regarding resource decision making.

GGOCAD© Summary

GGOCAD© can be used to fulfill a variety of corporate needs. Its primary purpose is to assist companies in selecting the most optimum GHG emissions mitigation projects. GGOCAD© provides a large database of standardized project information as well as the analytical capabilities to look at characteristics, cost, and quality of the projects. One module, the portfolio building module, allows users to match corporate needs with projects in the most cost-effective manner. The system displays a carbon benefit

timeline for portfolios as well as calculates cost, risk, and quality. The technical potential module examines the local and global potential for the projects. Other analytical capabilities include the ability to see the impact that discount rates and crediting timelines will have on project and portfolio returns. Additionally, GGOCAD© can also serve as a platform to evaluate internal emissions reduction options through the use of customized cost curve generation.

GHG Offset Business Planning Model Summary

Relying on data from the GGOCAD© cost-curve model, the GHG Offset Business Planning Model can provide a detailed assessment of the economic and risk factors associated with specific GHG emissions mitigation strategies. Users can run “what-if” scenarios and compare the results to other scenarios. This tool is able to accommodate a broad range of risk factors for analysis such as project failure for commercial or logistical reasons and the inability to transfer credits from the project investor due to host country restrictions, among others.

Trexler Technologies Analysis

Based upon the results of this analysis, the Trexler technologies have substantial data tracking capabilities for inventories of emissions, emissions reduction activities, emissions offset projects, and emissions trades. Trexler’s applications appear to be more focused on the scientific aspects of GHG emissions management projects, but, in turn, limit their focus on comprehensive planning and market opportunities. These limitations may make comprehensive strategic planning efforts difficult for technology users.

3.2.7 Summary of Commercial Technologies Analysis

Based upon the assessment of the six above-referenced technologies, it can be concluded that significant technological advances and innovations are necessary from a data perspective in order to produce technologies which will allow for optimal GHG emissions reduction strategic planning exercises to be undertaken by industry. All of the surveyed technologies allow, in one form or another, for users to: record emissions inventory accounts; detail reduction, offset, and trading projects; chronicle emissions reduction, offset, or trading investment costs; and, generate reports for portfolio position. While the technologies can, thus, assist with some level of planning, all of the technologies appear to have certain limitations with regard to planning from the enterprise level to the project level. Some of the weaknesses result from the lack of applicable details required for complete level-by-level data sets, while others are inherent in design elements. For simplification and ease of reference, Table 1 below measures the six technology providers and their technologies against ten comparative metrics:

Table 1: Industry GHG Emissions Management Strategic Planning Tools Comparison

	CARBONSIM SM	CO2e	Emission Strategies	ESP	GHG Spaces	Trexler
Inventory Accounting	+	+	+	+	+	+
Reduction, Offset, and Trading Accounting	+	+	+	+	+	+
Compliance Libraries			~	~	~	
Investment Cost Data	+	+	+	+	+	+
Comparative Project Cost Data						~
Comparative Investment Data	~	~	~	~	~	
Present and Future Market Data	~	~		~	~	
Project-by-Project Analysis			~			~
Strategic Portfolio Analysis	~	~	~	~	~	~
Report Analysis & Production	+	+	+	+	+	+

Key: + = full capability ~ = partial capability blank = no capability

3.3 Applicable Technologies – State Initiatives

While there were six technologies significantly advanced to merit comparison among tools for use in strategic planning activities by private enterprises, there was less competition among tools designed for use by government bodies and affiliated non-profit enterprises to perform planning activities. In fact, while thirty-eight states and Puerto Rico have developed inventories to estimate state GHG emissions and six states have initiated voluntary emissions inventories, only one state has progressed to the point of developing and utilizing a tool for enterprises to record their emissions inventories with a state-affiliated entity in a registry – California. California created a nonprofit organization, the California Climate Action Registry (the Registry), to provide a voluntary registry for the six GHGs covered by Kyoto. In the following section, the Climate Action Registry Reporting Online Tool (CARROT), the technology which powers the Registry, is detailed.

3.3.1 State of California – Climate Action Registry Reporting Online Tool

Background

The core mission of the Registry is to assist organizations within the State of California with establishing GHG baselines against which any future GHG emissions reduction requirements may be applied. The State of California is committed to ensuring that participants are treated appropriately with regard to early action if additional state, U.S. national, or international regulatory regimes are initiated.

In October 2002, the Registry opened for business with 23 charter members who have committed to participation. Charter members include large corporations such as BP and PG&E Corp. as well as municipalities such as the City of Los Angeles and other organizations.

Registry and CARROT Analysis

A General Reporting Protocol outlining the principles, approach, methodology, and procedures required for participation in the Registry has been issued. The Registry has also developed the above-referenced CARROT to support its functions. All participants must report their emissions using the CARROT. The CARROT serves as both an emissions calculation tool and as the Registry's reporting forms.

The primary purpose of the Registry is to provide a tool to record emissions including data about the source of emissions, how the emissions are created, and the quantity of emissions. It is believed that through voluntary sharing of the emissions generation data, organizations will be able to reduce emissions. This is a strong first step; however, there are several limitations with this process.

The CARROT serves as a user-friendly tool to calculate and report emissions, but one with some substantial limitations. At the present time, it is only a data repository for GHG emissions information. Thus, the tool does not allow for reporting of emissions reduction or offset projects, nor does it necessarily serve a direct, active role to assist with reducing GHG emissions in the State of California.

3.3.2 Summary of State Technologies Analysis

At present, the State of California is the unquestioned leader in technologies for state strategic planning activities for GHG emissions. The nonprofit Registry and the CARROT represent the most advanced technologies available for public use by states to assist in reducing GHG emissions. The limitations of this tool are clear given that it only serves as a catalogue for storing data regarding GHG emissions. Thus, there is a need for technology advancements and innovations focused on producing more sophisticated tools for states and other governmental subdivisions to utilize in GHG emissions management planning.

In order to provide a foundation for developing the conclusions, the research effort examined an additional subject – voluntary reporting programs – which might have impact upon the structure of the conclusions. The voluntary reporting programs, and especially the U.S. Federal program, provide a touchstone to which all analytical technologies must connect and relate. Thus, the next section of the report will focus on detailing background information on this subject as it pertains to the conclusions of this research endeavor.

4.0 CURRENT VOLUNTARY REPORTING PROGRAMS

4.1 Introduction to Voluntary Reporting Programs

Following the analysis of the existing state of commercially available GHG emissions management strategic planning technologies, an effort to develop conclusions regarding the development of advanced technologies and tools to support public policy and industry efforts for GHG emissions strategic planning must examine all material elements, i.e. those factors that must be addressed in GHG emissions management strategic planning. Central among these factors are the structure of voluntary GHG emissions reporting programs.

Voluntary reporting is valuable as it provides a way to present information about an enterprise's GHG emissions and/or emissions reduction activities to its customers or constituents, who are interested in GHG emissions. The communication of voluntary reports and achievements can be valuable in that it provides public information that may influence future GHG policy formulation, and more importantly, prompt enterprises to pursue GHG mitigation projects in the years to come.

Only a small number of states presently have active voluntary GHG emissions registries. States, such as West Virginia, which lack voluntary GHG registries could benefit from a plan designed to meet the needs of public bodies and businesses located in their state, and which could be replicated to meet the needs of enterprises in other states. The starting point for the development of such a plan is to analyze the U.S. national voluntary GHG reporting program, the 1605(b) program of the U.S. Department of Energy (USDOE). Following a detailed analysis of this evolving Federal program, additional limited information will be provided on emerging state voluntary reporting programs as background.

4.2 Federal Voluntary Reporting – U.S. Department of Energy 1605(b)

In 1992, the U.S. Congress established the Voluntary Reporting of Greenhouse Gases Program (VRGGP) in order to meet U.S. commitments under the United Nations Framework Convention on Climate Change (UNFCCC). The VRGGP was established under Section 1605(b) of the 1992 Energy Policy Act, which has become known as the 1605(b) program. The 1605(b) program is deemed as a channel for entities which have reduced their emissions levels to record their emissions reduction achievements, and communicate their ideas for action with others in the hopes of stimulating the voluntary GHG emissions reduction effort.

The following sections provide an overview of the 1605(b) program and its participating companies, an introduction to the variety of emissions reduction projects and the annual reduction potential based upon year 2000 data, and a briefing of current opinions and recommendations received from stakeholders for 1605(b) reforms to enhance its functionality and the usefulness of its results.

4.2.1 Overview of the 1605(b) Program

Under the enacting legislation for the 1605(b) program, the USDOE through its Energy Information Administration (EIA), and in conference with the U.S. Environmental Protection Agency (USEPA), was required to establish a voluntary reporting system and database on GHG emissions and emissions reduction activities, including efforts regarding carbon sequestration. The USDOE was required to publish procedures for the accurate voluntary reporting of information on: (1) GHG emissions on an annual basis for the baseline period 1987 through 1990, and for subsequent calendar years; (2) annual reductions of GHG emissions achieved through any measure; and, (3) reductions in GHG emissions achieved voluntarily, or as a result of plant or facility closings, or as a result of Federal or individual state requirements.

Final guidelines and supporting materials were developed, with stakeholder input, for the six sectors identified by the 1605(b) program, which are: Electricity Supply; Residential and Commercial Buildings; Industrial; Transportation; Forestry; and, Agricultural. The final product was structured to maximize voluntary reporting participation without compromising the value of the data submitted by participants. The guidelines provide reporting flexibility by allowing the participant to utilize existing GHG emissions and emissions reduction information, and to select appropriate quantification methods based upon the nature of their reduction or offset projects. To prompt action by participants, the support documents included examples of project analyses for the various sectors, appendices of conversion tables, and default emissions factors for various fuels and for electricity on a state-by-state basis.

4.2.2 1605(b) Participation and Voluntary Reporting of GHGs

To participate in the 1605(b) program, an enterprise may submit voluntary reporting information if it initiates, controls, or in some other way supports activities that (1) contribute to GHG emissions, (2) result in reducing GHG emissions, or (3) sequester carbon dioxide emissions. The activities may be part of a participant's regular operations, pilot studies, prototype projects, or demonstration projects that may take place in the community, workplace, at a location controlled by a third party, or at a foreign location. Participants must be legal U.S. entities¹, and categories of reporting entities include head of households, organizations, small businesses, or large corporations. Some of the past reporters of the 1605(b) program include utilities (including electric, gas, and sanitary service companies), manufacturers (including agricultural product, chemical, coal, electronic equipment, paper and allied product, petroleum, and transportation equipment companies), engineering and management service companies, educational service companies, real estate companies, health service companies, and private households.

Participants are encouraged to submit comprehensive reports, which can include information on GHG emissions levels and emissions reduction projects. However, three options exist for GHG emissions reporting structures. An entity can choose to report GHG emissions on an entity-wide basis, GHG emissions corresponding only to GHG

¹ An entity is defined for purposes of the 1605(b) program as any U.S. citizen or resident alien; any company, organization, or group incorporated under or recognized by U.S. law; or, any U.S. Federal, state, or local government entity. (Voluntary Reporting of Greenhouse Gases Under 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

emissions reduction projects, or it can simply provide GHG emissions reduction project information. It is important to note that entity-wide GHG emissions reporting information can include data on the entire organization and all its GHG activities, which is inclusive of historic baseline emissions data for 1987 through 1990 and annual GHG emissions for the subsequent years.

Under the program, voluntary emissions reporting can include both direct² and indirect³ GHG emissions information. For ease of reference, Table 2 below illustrates the reportable types of GHGs and relates these GHG types to the typical anthropogenic related activities that generate these GHG emissions.

Table 2: Reportable Greenhouse Gases and Associated Sources

Greenhouse Gas	Related Anthropogenic Activity
Carbon dioxide	Fossil energy combustion Electricity generation and use Industrial processes Forestry and agriculture
Methane	Landfill operation Coal mining Oil and gas systems Stationary combustion Animal production
Nitrous oxide	Stationary combustion Adipic acid production Forestry and agriculture
Halogenated Substances (including, among others, hydrofluorocarbons and perfluorocarbons)	Chemical manufacturing Use in industrial processes

Source: United States Department of Energy, General Guidelines, 1994.

To assist prospective 1605(b) program participants with reporting activities, two reporting forms have been developed to guide participants, the EIA-1605 (long form) and the EIA-1605EZ (short form). The EIA-1605 allows an entity to provide a detailed account of GHG emissions, GHG emissions reduction achievements, and carbon sequestration for an entire entity or for specific projects; whereas, the EIA-1650EZ allows an entity to provide a brief summary of GHG reductions achieved from GHG emissions reduction or carbon sequestration project efforts. It is not required that an entity-wide report must accompany reports pertaining to specific GHG emissions reduction and carbon sequestration activities. However, enterprises wishing to disclose all GHG related details of their operations would likely report GHG emissions for the entire organization

² Direct emissions result directly from fuel combustion or other processes that release GHG emissions from equipment on-site. (Voluntary Reporting of Greenhouse Gases Under 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

³ Indirect emissions are produced when the activities of an entity cause GHG emissions to be generated elsewhere. (Voluntary Reporting of Greenhouse Gases Under 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

to illustrate the most comprehensive documentation. In addition, the filing of entity-level reports can also help to increase the credibility of reported GHG emissions reduction achievements at a specific project level.

As noted, the reported information for a specific GHG emissions reduction project can include both GHG emissions reductions and carbon sequestration projects, GHG emissions factors used to determine reductions, assumptions about the project, and relevant data sources. To date, ten different project groups have been utilized to categorize the nature of the projects that have been submitted to the 1605(b) program. These project groups include:

- Electricity generation, transmission, and distribution;
- Cogeneration;
- Energy end use;
- Transportation;
- Waste treatment and disposal (methane);
- Agriculture (methane and nitrous oxide);
- Oil and natural gas systems and coal mining (methane);
- Carbon sequestration;
- Halogenated substances; and,
- Other emissions reduction activities.

Based upon year 2000 data, the project types with the most impact on reducing GHG emissions are those from the categories of electricity generation, transmission, and distribution (69.68 percent of total direct emissions reduction) and waste treatment and disposal (60.51 percent of total indirect emissions reduction).

Every GHG emissions reduction project report must include specific information to assist in analyzing the benefits of the projects. For instance, it is required that every report provide an established reference case that serves as a basis for comparison with a specific project. Further, the report must provide identification of the effects of the project, and an estimation of the GHG emissions for both the reference case and the specific GHG emissions reduction or carbon sequestration project.

To aid in the development of these data sets, the 1605(b) program guidelines and supporting documents provide detailed information regarding the appropriate processes under which an entity should obtain data and define the methods for estimating a specific project's effect on GHG emissions reduction and carbon sequestration results. The guidelines outline the acceptance of three types of data -- physical⁴,

⁴ Physical data describes activities of a GHG emissions reduction or sequestration project. (Voluntary Reporting of Greenhouse Gases Under 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

default⁵, and reporter-generated⁶. Based on these three categories of data, the guidelines recognize two categories of projects: standard projects⁷, which rely on physical and default data, and reporter-designed projects⁸, which use relative default data and measured, or engineering data, developed by the entity. The GHG emissions reduction outcomes or sequestered carbon emissions of an entity's project must be determined and recorded. By requiring these elements, the report contains detailed information relative to the impact of the project, which can be reviewed by a third party to determine the validity of the emissions reduction effort.

In summary, the 1605(b) program provides enterprises with an opportunity to record their GHG emissions reduction and carbon sequestration achievements, and communicate these achievements to colleagues, customers, and the general public. By nature of its voluntary and uncomplicated structure, the 1605(b) program provides an unrestrictive opportunity to encourage enterprises to engage in GHG emissions reduction activities.

4.2.3 1605(b) Program Projects and Participating Companies

Following this overview of the 1605(b) program, it is useful to examine the types of projects and reporting entities that utilize the voluntary program. The objective of this examination was to identify, in general terms, the types of projects reported, the GHG emissions reduction results created through these projects, and the enterprises with a presence proximate to the targeted West Virginia region, including those in the state of West Virginia and surrounding states of Delaware, Kentucky, Maryland, Ohio, Pennsylvania, and Virginia.

In 2000, 1,882 projects were reported under the 1605(b) program by a total of 222 participants. A final report from EIA on the activities in 2000 revealed that a total of

⁵ Default data is provided by the supporting documents to assist in evaluating the emissions or sequestration effects of a project, and includes *emissions factors* (conversion of information concerning a change in energy use to an estimated change in GHG emissions) and *stipulated factors* (conversion of physical data related to the project into estimates of changes in energy use, GHG emissions, or carbon sequestration). (Voluntary Reporting of Greenhouse Gases Under Section 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

⁶ Reporter-generated data is provided by the entity to aid in the measurement of the effects of the project, and can be of two types -- *measured data* (collected directly from the project or a control group, and used to estimate project accomplishments) and *engineering data* (derived from various sources, such as engineering manuals, manufacturer's equipment specifications, surveys, academic literature, professional judgment, and computer models). (Voluntary Reporting of Greenhouse Gases Under Section 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

⁷ Standard projects are projects for which the guidelines and supporting documents provide the procedures and information to estimate the GHG emissions reduction or sequestered carbon. (Voluntary Reporting of Greenhouse Gases Under Section 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

⁸ Reporter-designed projects use physical and reporter-generated data, possibly in combination with default data, to estimate project accomplishments. Estimation of the GHG emissions effects of many reporter-designed projects will require gathering of measured or estimated data, and manipulation of this data to derive the GHG emissions levels of the project and reference case. The data manipulation could involve relatively simple calculations, or extremely complex modeling. (Voluntary Reporting of Greenhouse Gases Under Section 1605(b) of the Energy Policy Act of 1992 – General Guidelines)

187,337,729 metric tons of carbon dioxide equivalent (MTCDE) of direct emissions, and 60,998,603 MTCDE of indirect emissions were reduced. Additionally, 9,010,021 MTCDE were sequestered. Table 3 below highlights the number of projects reported and the associated reduced direct and indirect emissions achieved by each project type.

Table 3: Emissions Reduction Results Reported for Data Year 2000

Project Group	Number of Projects	Emissions Reduction Type*		
		Direct	Indirect	Sequestered
Electricity Generation, Transmission, and Distribution	462	130,547,715	7,393,082	-
Cogeneration	18	2,116,344	1,211,308	-
Energy End Use	424	19,633,680	8,137,090	-
Transportation	72	21,911	115,857	-
Waste Treatment and Disposal (Methane)	234	18,707,133	36,910,867	-
Agriculture (Methane and Nitrous Oxide)	5	269	23,993	-
Oil and Natural Gas Systems and Coal Mining (Methane)	26	10,771,552	137,046	-
Carbon Sequestration	494	1,041	0	9,010,021
Halogenated Substances	44	4,637,909	81	-
Other Emissions Reduction Activities	103	900,175	7,069,279	-
TOTAL (All Project Types)	1,882	187,337,729	60,998,603	9,010,021

Source: United States Department of Energy, Energy Information Administration, Forms EIA-1605 and EIA-1605EZ for data year 2000.

*Note: Indicated emissions reduction types are expressed in units of metric tons of carbon dioxide equivalent, or MTCDE.

In Table 3, points of special interest are projects under the electricity generation, transmission, and distribution (130,547,715 direct MTCDE) and waste treatment and disposal (36,910,867 indirect MTCDE) project groups, which appear to have produced the greatest impact on the reduction of direct and indirect emissions, respectively, in 2000. In terms of number of projects for each project group, two groups – (1) carbon sequestration and (2) electricity generation, transmission, and distribution – lead all other groups with 494 and 462 projects, respectively.

As previously noted, past reporters in the 1605(b) program include utilities, manufacturers, engineering and management service companies, educational service companies, real estate companies, health service companies, private households, and others. Many of these reporting entities are active in our target study region noted above. With the strong presence of energy generation facilities and companies in the target region, it is especially important to examine the reporting activities of these and other related enterprises in the target region. For select entities in the target region, Table 4 below identifies the number of projects for all project groups and entity-wide report information for the year 2000.

Table 4: Select Regional Reporting Entities: Year 2000 Data

Name of Reporting Entity	Number of Projects	Entity-wide Report Provided (Yes or No)
AES Warrior Run, Inc.	1	Yes
Allegheny Energy, Inc.	43	Yes
American Electric Power, Inc.	62	No
Baltimore Gas & Electric Company	23	Yes
Cinergy Corporation	37	Yes
Conectiv Delmarva Generation	16	No
Consol Coal Group	0	Yes
Delaware Electric Cooperative	1	No
Delaware Solid Waste Authority	4	No
Dominion Generation	2	No
First Energy Corporation	31	Yes
Old Dominion Electric Cooperative	2	No
TOTAL	222	-

Source: United States Department of Energy, Energy Information Administration Forms EIA-1605 and EIA-1605EZ.

While all of the reporting entities in Table 4 have a presence within the localized region, it is important to note that just as all of their GHG emissions are not generated in the target region, all of their GHG emissions reduction projects have not taken place within the target region. However, to provide an example of the GHG emissions reduction activities taking place in the target region, GHG emissions reduction project details from the 1605(b) database for West Virginia projects undertaken by Allegheny Energy can be examined. These GHG emissions reduction projects feature equipment enhancements or process improvements, including boiler replacement, auxiliary fuel switching, and transmission wire replacement. These investments demonstrate a commitment representative of industry efforts to reduce GHG emissions, especially in the principal areas of operation.

The present 1605(b) program, thus, provides ample evidence of the opportunity for voluntary GHG emissions reduction activities to be highlighted and further stimulated by voluntary GHG reporting mechanisms. The detailed data analysis also demonstrated the industry commitment to making GHG emissions reduction projects occur in concert with GHG emissions sources.

For all of the successes of the 1605(b) program, there are still improvements that could be made to the program to ensure that those enterprises participating in the voluntary program receive the greatest opportunity to benefit should a GHG trading market emerge or if GHG regulations be put in place in the future. The following section describes the on-going efforts of the USDOE, the U.S. Department of Agriculture (USDA), and the USEPA to improve the 1605(b) program.

4.2.4 1605(b) Program Enhancement: Opinions and Recommendations

During 2002, USDOE, USDA, and USEPA initiated a series of actions to facilitate comments and suggestions for enhancements and improvements to the 1605(b) program from stakeholders. In July 2002, the three federal agencies initiated a call for public comments to improve the guidelines. Some of the recommendations for revision

appear to be achieving some consensus. In addition, the three Federal agencies conducted a series of workshops to enable interested persons to help improve the 1605(b) program guidelines. No public detailed proceedings of these workshops are yet available; however, the suggestions and recommendations from the public call for comments provide a glimpse of these offered insights. Thus, this section will discuss those recommendations.

From an examination of the commenting parties, the group consisted of individuals and associations representing: forest industry interest groups; investor-owned and publicly-owned utilities; independent power producers; manufacturers and consumers of oil, coal, motor vehicles, and chemicals; public interest environmental and land use groups; and, academic and commercial interest groups. Based on the comments, four main recommendation topics emerged, which are:

- Mandatory entity-wide reporting;
- Baseline protection and credit for past actions;
- Verifiable and transferable GHG emissions reduction credits; and,
- Rule establishment and calculation protocols.

Beginning in sequence with reporting obligations, there appears to be, at least among the commenting parties, a general consensus building that the new guidelines should adopt a reporting scheme which would mandate entity-wide reporting of direct GHG emissions, and support voluntary reporting of indirect GHG emissions and project-based GHG emissions reduction activities. As an example of the support for this position, the Clean Energy Group⁹ has stated a belief that mandatory tracking of indirect emissions is overly burdensome and would not be a value-added activity, and could possibly lead to double counting of emissions.

To demonstrate that stakeholders and lawmakers may be in lock-step on this issue, this position regarding a combination of mandatory/voluntary reporting is similar to the position found in Senate Bill 517 (S. 517), a National Greenhouse Gas Database. During 2002, S. 517 passed the Senate and later became incorporated into House of Representatives Bill 4 (H.R. 4), which eventually died in conference in November 2002. These bills contained language recommending that a GHG registry be voluntary for an initial period of five years, and if at the conclusion of the initial period the participation in the registry had not reached a level representing 60 percent of U.S. GHG emissions, then companies that emit large quantities of GHG emissions would then be required to report their GHG emissions to the registry. Even though efforts to codify this position died in the conference committee, it seems likely that this provision could resurface in 2003 legislation.

The remaining three general recommendation topics – baseline protection and credit for past actions, verifiable and transferable GHG emissions reduction credits, and rule establishment and calculation protocol – will now be detailed.

Groups such as the Pew Center and the International Climate Change Partnership believe that in the event of future mandatory GHG emission controls in the U.S., a

⁹ The Clean Energy Group membership consists of Connectiv, Consolidated Edison, Exelon Corporation, KeySpan, Northeast Utilities, PG&E National Energy Group, Public Service Enterprise Group, and Sempra Energy. (Berwick)

baseline protection year should be established in the near future in order for entities to receive GHG emissions reduction credits for reductions achieved voluntarily in an unregulated period. A baseline year that surfaced in many comments was the year 1990, which is the same baseline year used by the Kyoto Protocol baseline year.

In addition to the emerging consensus regarding baseline measures, there appears to be a commonly held belief that efforts should be focused on another type of measurement – the establishment of more rigorous verification procedures in order to authorize the granting of transferable GHG emissions reduction credits. While many of the commenting parties expressed support for transferable GHG emissions reduction credits, the most vocal advocate may have been Cinergy Corporation. In the public comment period, a representative of Cinergy Corporation proposed that a transferable GHG emissions reduction credit scheme be created under the revised 1605(b) program. This proposal defined a GHG emissions reduction credit as a legal claim to a GHG emissions reduction or offset that can be reassigned through a legal transaction from the originating entity to another entity.¹⁰ In the Cinergy Corporation proposal and in most other related comments, it was expressed that the qualification of a transferable credit should be determined through the establishment of specific minimum criteria, and the sale and the determination of the transferability of these credits should be resolved by the marketplace, not controlled by any government entity.

For baselines and credits to have any tangible meaning, it is vital that the calculation of GHG emissions reduction or offset projects derived from the projects be improved. Among the commenting parties, it was commonly agreed that as technology or engineering becomes more accurate, source-specific or industry-specific emissions factors or calculation methodologies should be updated in the calculation protocol.

While there is agreement about this direction, the sources which should be relied upon to provide the enhanced calculation tools are in greater debate. For instance, the American Petroleum Institute (API) has issued a Compendium¹¹ which contains updated industry-specific emissions estimation techniques applicable for the petroleum industry, which it suggests for adoption in a revised 1605(b) program structure. Other parties recommended that USDOE establish more detailed emissions calculation procedures, and rules to define GHG emissions reduction and offset projects under a Federal standard. With an eye to globally acceptable measures, both the Clean Energy Group and the Public Service Enterprise Group recommend the product of the WBCSD/WRI Greenhouse Gas Protocol Initiative¹² as one potential model for the standardization of GHG emissions and emissions reduction quantification techniques.

With regard to new data sets which could be included for calculation, Covanta Energy Corporation and the Clean Energy Group, among others, supported the inclusion of avoided GHG emissions reporting. This reporting includes electricity generation from

¹⁰ Reduction or offset is defined by the Cinergy Corporation to be the result of an action to reduce, avoid, or sequester GHG emissions or otherwise reduce GHG emissions intensity from its facilities in the U.S. or international projects. (Kuhn)

¹¹ The API Compendium was developed based on an extensive review of current domestic and international emissions estimation techniques applicable to oil and natural gas industry operations. It maintains flexibility by providing multiple emissions estimation approaches, where possible, thus enabling reporting entities to make use of readily available information. (Greco)

¹² The WBCSD/WRI Greenhouse Gas Protocol Initiative provides guidance on developing a GHG inventory and performance reporting standard.

renewable energy sources or nuclear power, the use of natural gas-fueled motor vehicles, energy efficiency improvements in industrial applications, and carbon sequestration projects. Lastly, and of special importance to this report, ChevronTexaco and the American Petroleum Institute (API) have both recommended the insertion of a separate carbon sequestration section in the guidelines dedicated to oceanic and geologic sequestration, which would further expand the options of carbon sequestration.

Thus, the suggested reforms to the 1605(b) program imply that if initiated, they will establish new rules and procedures, which include implementing baseline protection, GHG emissions reduction calculation protocols, verification and inclusion of avoided GHG emissions, and the development of a transferable GHG emissions reduction credit system. In the interim, the existing 1605(b) program provides a voluntary GHG emissions and emissions reduction standard to which state and local government activities should align and private actions should target for data reporting purposes.

4.3 State Voluntary Reporting Programs

While the 1605(b) program has been in operation for a sufficient period to allow for the thoughtful consideration of enhancements and revisions, state voluntary reporting programs are only beginning to appear. While a number of states are moving forward to initiate and adopt voluntary GHG registries, a smaller number (California, New Hampshire, and New Jersey) have active state voluntary GHG registries. Of these states, only California, to date, has initiated a registry with tools to assist GHG emitters with filing data on their GHG emissions. Thus, this section will summarize the reporting requirements of the state-affiliated California Climate Action Registry (the Registry).

4.3.1 Reporting Requirements of the California Climate Action Registry

As noted, the primary purpose of the Registry is to assist organizations within the State of California with establishing GHG baselines against which any future GHG emissions reduction requirements may be applied. To achieve its reporting objectives, the Registry has developed a General Reporting Protocol outlining the principles, approach, methodology, and procedures required for participation and the CARROT technology to support its functions. To summarize, this protocol covers emissions reporting timeframes, reportable emissions types, participant rules, reporting levels, certification requirements, and participation fees. In greater detail, the structure focuses on:

- **Timeframe** -- Participants are required to report GHG emissions on an annual basis;
- **Emissions** -- Participants are required to report only carbon dioxide emissions for the first three years. However, in subsequent years participants are required to report on all six GHGs covered in the Kyoto Protocol including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Participants are required to report both direct and indirect emissions. Direct emissions include emissions from mobile source combustion, stationary combustion, process emissions, and fugitive emissions. The only indirect emissions required are those from electricity, heat, or steam usage;

- **Participants** -- Organizations who conduct business activities within the State of California can report emissions. Additionally, organizations without California business activities can use the Registry to report total U.S. emissions;
- **Reporting Levels** -- At a minimum, participants must report their entity-wide emissions for the State of California but participants can also report at the facility level as part of the entity-wide report. Currently, project level reporting is not allowed. Additionally, participants can also report on their emissions for the entire U.S. using the Registry;
- **Certification** -- The Registry requires that all emissions reported be verified by an approved third-party. The Registry is in the process of publishing a list of approved certifiers. Further, the Registry has developed a Certification Protocol outlining the process and procedures to be used throughout the certification process; and,
- **Fees** -- The Registry requires an annual fee from all participants, which range from \$500 to \$6000 depending upon the type and revenues of an organization.

Positioned as a GHG emissions registry alone, the California voluntary program presently may have a limited future effect upon the creation of a GHG emissions reduction trading market.

5.0 CONCLUSION

Based upon this research effort, Augusta Systems has concluded that the technology arena of GHG and carbon emissions management strategic planning tools presently has significant limitations, in terms of data, functionality, and performance, both for public and private sector parties interested in GHG emissions management.

There is little question that this underdeveloped technology sector results, in some part, from the lack of a universally acceptable approach for framing policy and market measures. As a result, public policy makers and corporate decision makers are left without a clear method with which to approach the legion of options for GHG emissions management, including project-based applications and market trades involving carbon sequestration, landfill gas-to-energy sites, and others. To achieve optimal outcomes when fashioning approaches to GHG emissions management, public bodies and industry leaders must be able to design policy and business strategies, including those focused on market-based solutions.

As the mandatory regimes, such as those shepherded forward by the United Nations and the European Union, begin to introduce formal regulations and government-monitored trading mechanisms, and voluntary regimes, like that of the Chicago Climate Exchange, begin to gain footholds and assign dates for active operations, private sector parties will demand technologies to assist their time and data intensive planning efforts. Simultaneously, more sophisticated technology to aid governments in their planning to ensure appropriately structured environments to allow for cost-effective GHG management under both mandatory and regulatory structures.

The results of the initial research activity indicates that these public and private planners have access to a small number of tools with limited functionality for developing effective GHG emissions management policy and business strategies. As noted, government entities are attempting to play a leading role in facilitating voluntary carbon emissions reduction measures by industry, thus both types of entities benefit from improved analytical technologies.

Therefore, a logical first step toward enhanced GHG and carbon emissions reduction strategic planning for governments and industry would focus on developing new tools for government planning. There is a clear need to develop a technology to aid government entities, especially state governments, as they attempt to implement voluntary GHG emissions mechanisms and encourage investments in GHG and carbon emissions reduction and offset projects in their jurisdictions. For voluntary GHG emissions reduction activities to be afforded the positive public reinforcement necessary to sustain actions, this situation must change.

Additionally, an opportunity exists to pursue technology advances that will result in enhanced strategic planning tools for private sector enterprises attempting to comply with corporate GHG emissions reduction targets or regulatory regimes. This research effort has determined that one of the most significant needs within this area is tools focused on project-level investments.

In summary, significant advancements have been made with regard to the development of GHG and carbon emissions management strategic planning tools. There remain, however, significant needs for additional research and development to optimize the potential for these technologies to produce beneficial results for users.

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