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GHG Management using a web-based EMIS platform - A case study from a Midwest power generation utility

Extended Abstract #1012
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Introduction

As the climate change impact aggravates with the passage of time, so does the growing urgency of finding the solution to the problem. There is a general consensus that greenhouse gas (GHG) emission must be controlled before it is too late to avoid the irreversible consequences of climate change. Governments and international bodies such as United Nations are eager to put forth a common approach, acceptable to both the developed and developing nations. Ten years ago the Kyoto protocol was a first international effort in this direction under the United Nations Framework Convention on Climate Change (UNFCCC) through which a GHG binding limit agreement was reached by developed Annex 1 countries that included the USA. Although the Bush Administration and Australia refused to sign the Phase 1 of Kyoto Protocol on February 16, 2005, the rest of the developed world continued to make progress in meeting its target of 4-6% emission reductions below the 1990 GHG levels. The recent UNFCCC next Phase negotiations of the Kyoto Protocol at the Bali Conference in December 2007 also brought the USA at the negotiation table with Australia joining in soon after November 2007 elections. The Bali Action Plan emphasized an urgency to address climate change as indicated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Here in the U.S., GHG activities are not stagnant. At the states level: California signed Bill AB 32, the Global Warming Solution Act, into law in 2006, 7 Western States joined the Western Climate Initiative in early 2007, in mid-2007, a Climate Registry (that has 39 member states) was launched to establish a common protocol for GHG reporting, 10 Northeastern and Mid-Atlantic States have joined the Regional Greenhouse Gas Initiative (RGGI). At the Federal level 7 major GHG bills are in the 110th Congress and it is anticipated that some form of GHG regulation will be in place after November 2008 presidential elections that will prepare the U.S. for meaningful negotiations for the Kyoto next Phase GHG binding limits by 2012.

The above discussion brings in to focus the question: What is the Corporate America doing to prepare itself for the coming GHG reduction challenges. The top management is asking how big is the GHG emission or carbon foot print of their businesses? Such questions may cause sleepless nights to company environmental managers if they have not already prepared themselves for it. Finding an answer to this question may take months of effort keeping in view that there are numerous GHG protocols to pick from and there may be facilities and businesses spread across the nation or even globally.

Performing this massive task on Excel spread sheets may work to meet a one time demand but to maintain a large number of Excel spreads in different locations and using them as on-going tool may be a nightmare.

Using high speed internet and sophisticated web-based environmental software tools may effectively make it easier to cope with GHG inventory challenges. At Alliant Energy, we have developed a GHG management system using a web-based EMIS platform that compiles, maintains and tracks GHG emissions of more than 50 coal, gas and oil fired power generation facilities across Iowa, Wisconsin and Minnesota.

Rather than developing in-house software or installing off-the-shelf vendor GHG software on the company server, we subscribe to the internet-based EMIS software provided by Enviance, Inc. from San Diego, California. Through a unique combination of highly powerful and a flexible internet-based platform, the company provides EMIS services that can be used across the nation and for any facility in the world if there is an internet access. The EMIS platform on which companies can design and build a customized EHS management system, using their EHS specialized staff rather than IT professionals.

In the following, I will describe the implementation of GHG management at a midsized power generation utility from: selection of appropriate GHG protocol, defining GHG inventory boundaries, identifying all GHG sources, developing a conceptual design, configuring EMIS at a pilot implementation level and then expanding it for all facilities to monitor carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) emissions, setting customized reports in the system printing directly on reporting formats of different agencies such as the EPA Climate Leader and finally system expansion plan to include other three GHG (HFCs, PFCs, and SF_6).

About Alliant Energy Corporation

Alliant Energy Corporation is a regulated, investor-owned public utility holding company providing electric and natural gas service to approximately one million electric and 400,000 natural gas customers in the upper Midwest states of Iowa, Wisconsin and Minnesota, through its utility subsidiaries, Interstate Power and Light Company (IP&L) and Wisconsin Power and Light Company (WP&L). IP&L generation fleet includes 7 coal fired generation facilities, one combined cycle gas fired facility and one fuel oil and gas fired unit with a total generation capacity of around 3,000 MW. WP&L generation fleet includes 3 coal fired generation facilities, one simple cycle gas fired facility and one fuel oil and gas fired unit with a total generation capacity of around 2,100 MW. Other business platforms include non-regulated generation and other non-regulated investments. Alliant Energy, headquartered in Madison, Wisconsin, is a Fortune 1000 company.

Selecting GHG Protocol

The first objective of the company was to select the GHG protocol that should not only be applicable at the state and national levels but should also be acceptable to international community if GHG trading between nations becomes a norm in the future. The IPCC which along with the U.S ex-vice president Mr. Al Gore received the Noble prize in 2007 for their climate change impact and GHG inventory and protocol work, has developed an extensive GHG protocol "2006 IPCC's Guidelines for National Greenhouse Gas Inventories" that includes emission calculation methodologies and factors applicable to businesses and industry specific sectors.

The World Resource Institute/World Business Council on Sustainable Development (WRI/WBCSD) adopted IPCC protocol to develop into two main GHG protocol documents "A Corporate Accounting and Reporting Standard" and "The GHG Protocol for Project Accounting". The California's Climate Action Registry - General Reporting Protocol and industry specific protocol, for example "Power/Utility Reporting Protocol also developed using IPCC and WRI/WBCSD protocol documents. The Climate Registry Protocol being developed for 39 member states, "General Reporting Protocol for Voluntary Reporting Program" is mostly based on the California's Climate Action Registry Protocol.

Similarly, the EPA's Climate Leader GHG Inventory Protocol documents such as "Design Principle", "Direct Emission from Stationary Combustion Sources" and so forth are also based on IPCC and WRI/WBCSD GHG Protocol. Additionally, the EPA's methodologies of emission monitoring such as continuous emission monitoring system (CEMS) for carbon dioxide and GHG emission calculation method document "Inventory of Greenhouse Gas Emissions and Sink: 1990-2005" and its latest edition of 2007 have been widely used by IPCC, WRI/WBCSD, the California's Registry and the Climate Registry as guidelines for emission calculations for GHG inventory.

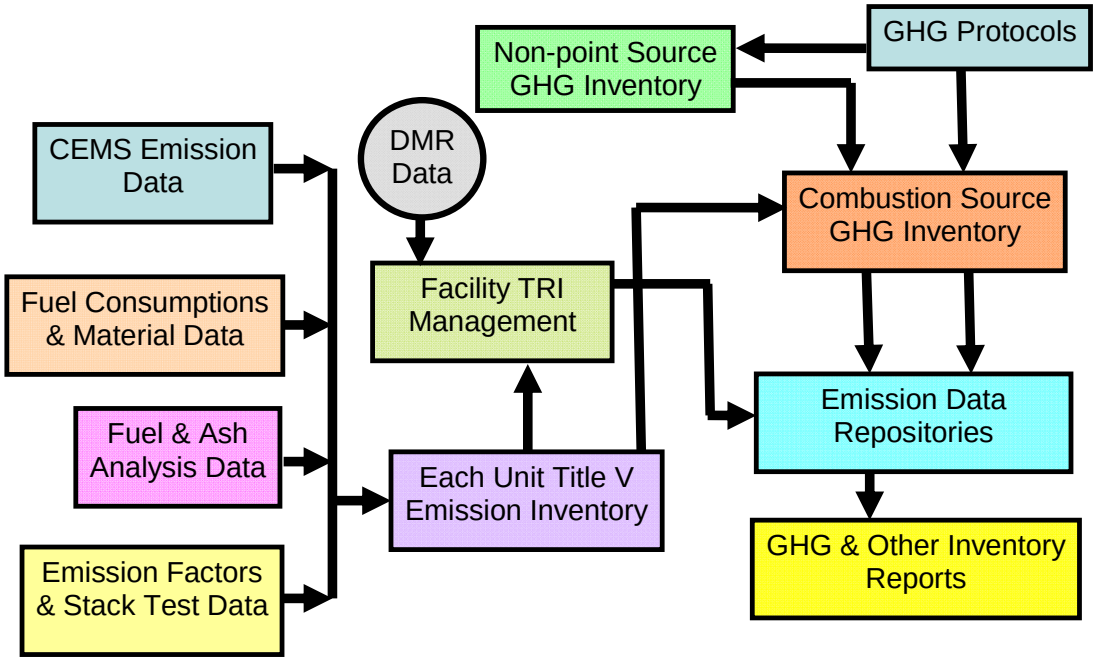
At Alliant Energy we reviewed all above mentioned protocols extensively to come up with consistent GHG protocols and calculation methodologies for our GHG management design. This approach will keep our GHG inventory in compliance with most of the above described protocols. It will also prepare us for any third party validation and verification audit based on above protocols. We strived to keep the calculation hierarchy to the highest tier method wherever the data gathering and analysis were easy to manage cost effectively. Similarly, in the calculations approach, it was also kept into perspective to use the EPA's emission factor hierarchy to maintain emission data quality.

Conceptual Design of the GHG Management System

One significant advantage in design of GHG management in our existing EMIS platform was that during the last three years, our EMIS system was already configured to do most of our Title V compliance management and Toxic Release Inventory (TRI) reporting work. The system was designed to automatically collect all plant CEMS Electronic Data Report (EDR), relevant fuel consumptions and other material data use to generate a Title

V emission inventory and TRI reports. Similarly, data on coal and ash analysis, fuel storage and operation and so forth was already available in the system. The figure below illustrated how GHG process was integrated in overall Title V emission inventory and TRI configuration:

GHG and Inventory Integrated Process



The GHG management starting point was to define GHG inventory boundaries in order to scope the inventory per operating entity and to identify all applicable direct (Scope 1) and indirect emission (Scope 2) sources. The GHG boundaries defined were across all IP&L and WP&L generation (are called as Genco) facilities and all support services facilities providing technical, engineering, maintenance, administrative, supply chain, accounting, and so forth to Genco. A problem faced was the difficult and very resource intensive work to separate support services for Genco from other businesses such as energy Delivery (ED).

To facilitate the implementation, it was decided that instead of breaking support service between Genco and other businesses, to keep it as one and to decide at a later stage how to break it in percent share when GHG management is developed for those areas. It also made sense since from preliminary data review, it was determined that Genco GHG inventory is almost 95-98% of the company overall GHG emissions. The second step was to identify all GHG stationary sources. The facilities Title V permits and Title V emission inventory was a big help in this context.

The Title V permits especially for Iowa include all stationary emission sources from main facility power generation boilers to combustion turbines, diesel engines, black start generators, starting engines, space and gas heaters, emergency generator and diesel

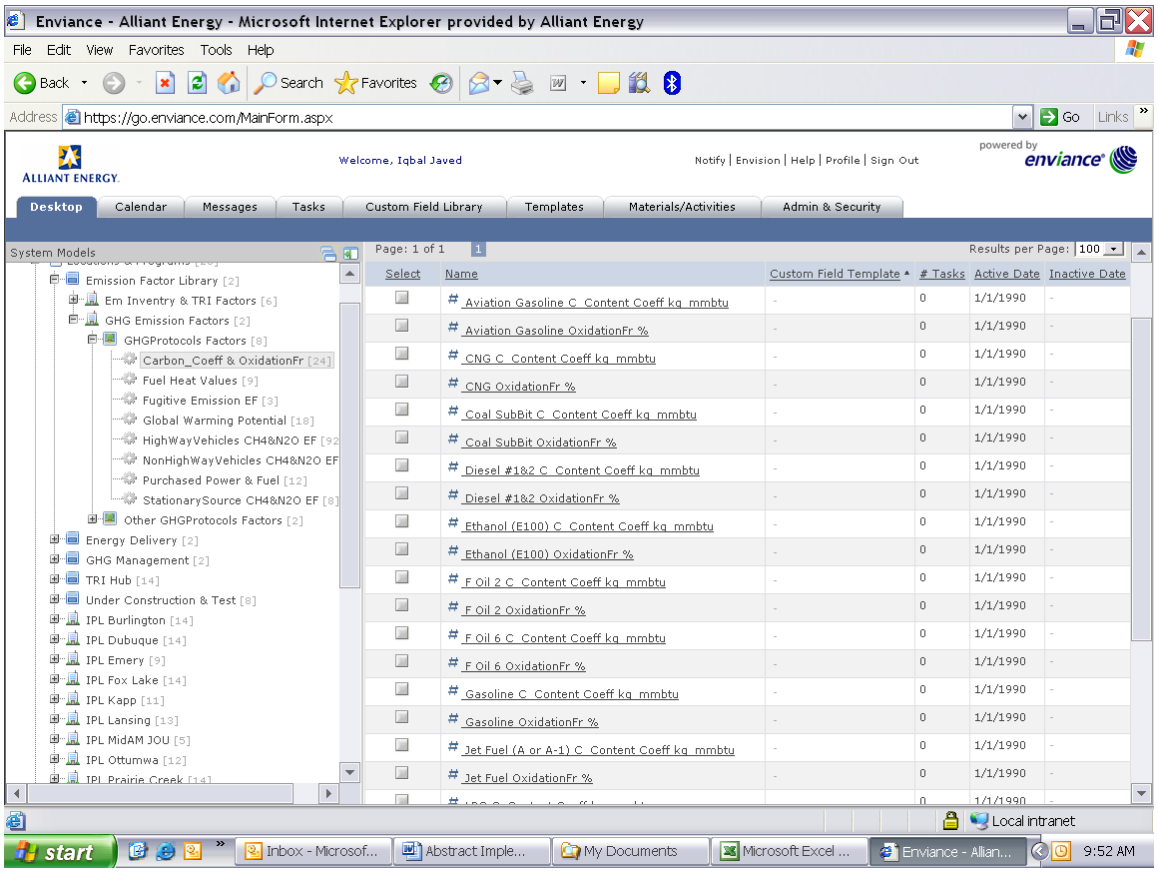
operated fire pumps and so on. Similarly, all mobile sources used at the facilities have fuel consumption available centrally. Other emissions such as fugitive from coal piles, sulfur hexafluoride (SF_6) and facility auxiliary power were also available centrally. Our main focus was to complete direct emission (scope 1) for the identified sources and indirect emissions (scope 2) for all the sources within defined boundaries.

A conceptual design flow diagram was developed for all sources and generation calculation method and emission calculation and factor approach was added for each source per GHG Protocols. The flow diagram was reviewed in the light of prevalent GHG Protocols to ensure it meets the GHG inventory methodology and accounting and reporting principles (relevance, completeness, consistency, transparency, and accuracy).

	GHG Management Conceptual Design							De minimis criteria
Scope 1				CO2	N2O	CH4	CO2e-MT calc	
	Stationary Sources		GWP **(IPCC's TAR, 2001)**	1	296	23		
(direct)	GENCO	Emission Source	Data Source					
	Stationary Combustion Sources	CEMS Installed Units (boilers, Combined & simple cycle CTS	CEMS	CEMS	EF	EF	Calculations	
			CEMS/PEMS	CEMS/PEMS	EF	EF	Calculations	
		Non-CEMS Units CTs	Fuel consumption (Production stats report)	EF	EF	EF	Calculations	
		Non-CEMS Auxiliary Equip Diesel generators, starting engine, gas heater, space heater, emergency generator, fire pump	Fuel consumption (Production stats report)	EF	EF	EF	Calculations	
	Process/fugitives	Material	NG pipelines	CH4	CO2			
			Coal piles	CH4				
			Ash ponds	CH4	CO2			
	Non-combustion sources	Refrigeration/AC Equip use	Material used	HFC-134a	HFC-143a	HFC-123	Calculations	=>5% of (including all other fugitives) participant's total emissions
			GWP **(IPCC's TAR, 2001)**	1300	4300	12000		
				EF	EF	EF		
		Company building HVAC	Commercial chillers			x		
		Commercial AC system 7 tons	R407C (HFC 32 23%, HFC-125 25%, HFC-134a 52%)				Total annual refrigerant charged x assumed annual leakage rate	
		Company auto fleet AC		x				
		Split air conditioners						
		Window air conditioners						
			Material used	SF6				
	Circuit breakers		GWP **(IPCC's TAR, 2001)**	23900				
	Mobile Combustion Sources							
	Heavy equipment	coal bulldozers, cranes, bobcats,water spray lorries	fuel used (log or purchased receipts)	EF	EF	EF	Calculations	
	Company Owned vehicles	cars, Vans, trucks, SUVs, etc. (need to have mileage for each category of cars						
		Company aircrafts	Fuel Consumption	EF	EF	EF	Calculations	
			Mileage by car type	EF	EF	EF	Calculations	
Scope 2				CO2	N2O	CH4	CO2e-MT calc	
	Stationary Sources							
	Facility/office building Electricty, hot water and steam use (stationary)	Madison GO Dubuque GO Cedar Rapids GO		e-GRID EF	e-GRID EF	e-GRID EF	Calculations	

GHG Pilot Configuration on Our EMIS Platform

As part of the GHG management configuration was to develop GHG factors library from where GHG factors can be applied to each individual source calculations within the facilities. The GHG Protocol factor library has sub-categories as: Carbon Coefficient & Oxidation Fractions; Global Warming Potential; Station Source CH_4 & N_2O factors; Fugitive Emission Factors; Highway and Non-highway vehicles CH_4 & N_2O factors; Purchase Power Factors and Fuel Heat Values. The system screen shot below shows carbon coefficient and oxidation fraction:



Next step was to configure new requirements per conceptual design flow diagram in to the company's existing EMIS system. As I mentioned earlier, the system configuration that was done as part of Title V emission inventory requirement already included the CEMS EDR based CO_2 hourly tracking. It was configured to calculate monthly and annual CO_2 emissions for each CEMS based units. CO_2 calculations were configured for all non-CEMS CO_2 emissions such as combustion turbines (CT), diesel generators, starting engines, emergency generators and so forth following GHG protocol and emission factors and methodologies.

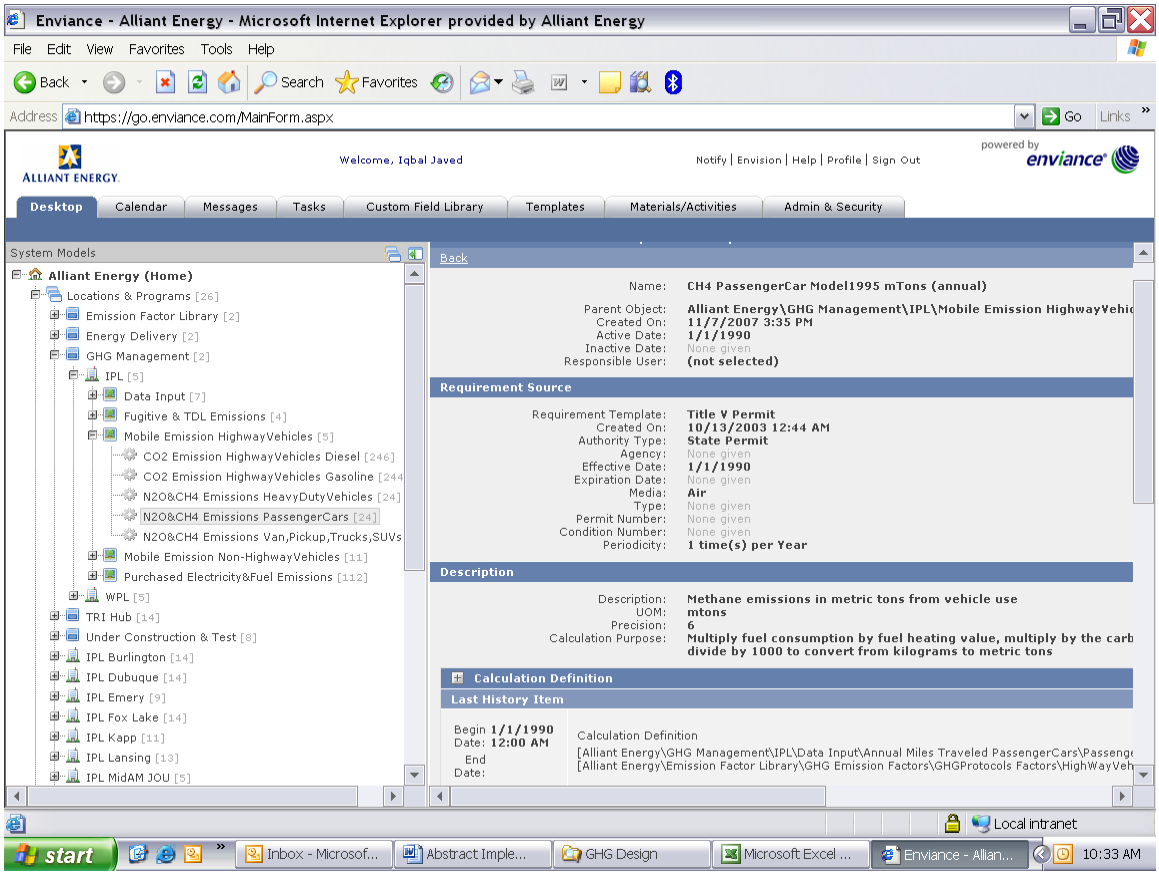
The other two GHG gases, CH_4 and N_2O were configured for all stationary sources. It was also decided to set all calculations for CEMS CO_2, calculated CO_2, CH_4 and N_2O

both in the U.S. and System International (SI) units, used by all GHG protocols, in order to provide management data comparison. Therefore, the next requirement was to set GHG calculations for CO_2, CH_4 and N_2O in metric tons and also to provide CO_2 equivalent emissions for all sources in metric tons. The following is as example of how those calculations were set in the system:

CO2 equivalent Emission calculations in metric tons:

([CO2 Tons (monthly)]+([N2O F Oil 2 Tons (monthly)]+[N2O Coal Tons (monthly)]+[N2O N Gas Tons (monthly)])*[N2O GWP Factor]+([Methane F Oil 2 Tons (monthly)]+[Methane Coal Tons (monthly)]+[Methane N Gas Tons (monthly)])*[CH4 GWP Factor])*0.907184

Another direct emission requirement was to calculate CO_2, CH4, N_2O and CO_2e for all mobile sources owned or financial leased by the company for the facilities within system boundaries. The CO_2 calculations were based on fuel (gasoline, diesel, propane) consumption and CH_4 and N_2O calculations were based on the miles traveled per the mobile equipment type and the year of manufacturing of both highway and non-highway equipment. The CH_4 and N_2O calculations depends on the tail pipe control technology applied has progressively improved each year as technology was enhanced in new vehicle models. The system screen shot below shows the passenger car model 1995 calculations for CH_4 emissions:



The fugitive emission sources include coal pile CH_4 emissions, SF_6 consumed in breaker equipment, and HFC and PFC consumed in onsite fixed and mobile equipment during a year. For example SF_6 emissions are calculated of IP&L facilities is:

SF_6 Annual Emission:

[SF6-IA (IB) Storage Inventory Lb (annual)]-[SF6-IA (IE) Storage Inventory Lb (annual)]+[SF6-IA (P) Purchased Lb (annual)]-[SF6-IA (S) Sales Lb (annual)]-[SF6-IA (C) Change Lb (annual)]

SF_6 emissions converted to CO_2e:

[SF6-IA Lb (annual)]*23900/2000*0.9071784

The GHG accounting principle require that data must meet the relevance, completeness, consistency, transparency, and accuracy criteria and all supporting documents must be documented for source and location to facilitate third party validation and verification audit. The approach adopted is that GHG management system will carry all information about the document type, location and the company system having (hard copy or soft copy) and will also describe how the particular document system and source meet the GHG protocols accounting principle requirements. GHG system will not maintain the actual document within Enviance document management system to avoid duplication efforts. In case third party auditors are required to see relevant document, they can be directed to a relevant department or server system location maintaining the document.

Another requirement was to record all facilities indirect grid electricity, natural pipeline gas, hot water and steam use and calculate CO_2, CH_4, N_2O and CO_2e emissions which are called Scope 2 emissions.

The grid electricity use calculations are based on eGRID sub-region emission rates for MAIN South (MANS) which applies to IP&L facilities and MAIN North (MANN) that applied to WP&L facilities. The following is an example of how those calculations are set:

IP&L Garage Facility Grid electricity use:

[AlbertLeaGarage KWh (monthly)]/1000*[CO2 eGRIDMANS (IA) lb_MWh]/2000*0.907184

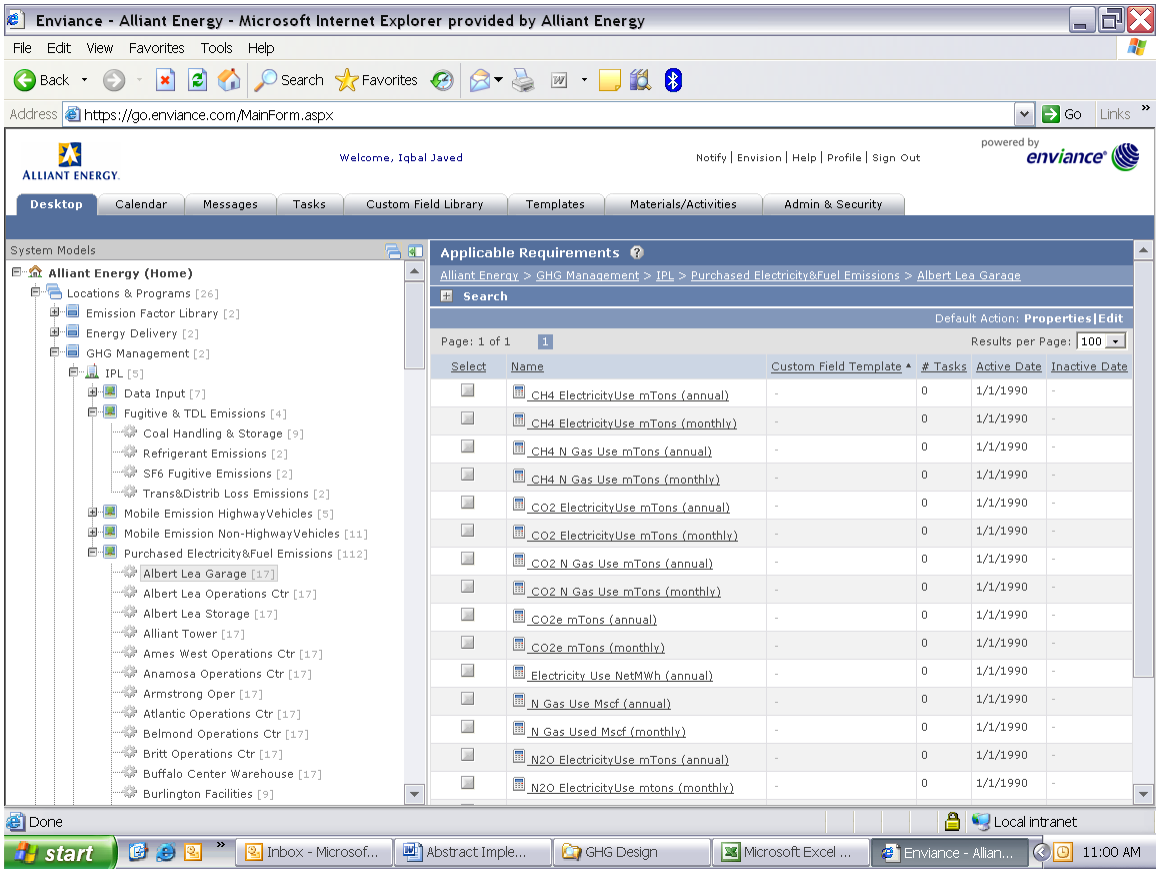
[AlbertLeaGarage KWh (monthly)]/1000*[CH4 eGRIDMANS (IA) lb_MWh]/2000*0.907184

[AlbertLeaGarage KWh (monthly)]/1000*[N2O eGRIDMANS (IA) lb_MWh]/2000*0.907184

CO2e Calculations for Grid Electricity:

[CO2 ElectricityUse mTons (monthly)]+[CO2 N Gas Use mTons (monthly)]+([N2O ElectricityUse mtons (monthly)]+[N2O N Gas Use mTons (monthly)])*[N2O GWP Factor]+([CH4 ElectricityUse mTons (monthly)]+[CH4 N Gas Use mTons (monthly)])*[CH4 GWP Factor]

The screen shot below shows the system configuration for indirect electricity based GHG calculations:



Setting Customized Reports on GHG Protocol Specific Templates

Once the pilot GHG system was set and test for QA/QC, the next step was to set various reports for internal use and for GHG reporting as per different reporting requirements. The Enviance system is very flexible and user friendly for designing customized reports per specific needs. Reports can be set in generic Excel or in HTML format or even GHG specific templates can be loaded in the system to bring data directly on GHG specific forms and format.

The generic Excel reports were set at facility level to bring out source specific data of CO_2, CH_4, N_2O and CO_2e. The reports were also set per different sources of emission

such as highway vehicle, non-highway mobile sources, fugitive emission source and indirect grid electricity use. The following is example of GHG generic report stationary emission sources and IP&L entity-wide grid electricity based GHG emissions:

Burlington GHG Report

GHG Emission Factor Reference:
EPA's Climate Leaders GHG Inventory Protocols, Oct. 2004
Module: "Direct Emissions from Stationary Combustion Sources
Sub-bituminous Coal: CO2 = 213.86 lb/mmbtu (Appendix B, page 22);
Coal Electricity Generation: CH4 = 0.0022 lb/mmbtu; N2O = 0.0031 lb/mmbtu (Appendix A, page 20)
Global Warming Potential (GWP), (Intergovernmental Panel on Climate Change (PCCC),
Third Assessment Report (TAR): CH4 = 23; N2O = 296
U.S.EPA, Inventory of GHG Emission & Sinks: 1990-2005(2007), Annex 2.1, Tables A-31, A-34, A-36, A-39
Heat Values: Fuel Oil (1&2) = 138,690 Btu/gal; Pipeline Natural Gas = 1006 Btu/scf; Propane = 91,048 Btu/gal

Includes each emission source fuel consumption and CO2, CH4 and N2O emissions in tons from boiler and

	Data Value	Requirement Unit of Measure
Location: Alliant Energy\IPL Burlington\Boiler Main Plant\CEMS Emission Data		
Parameter: CO2 TONS (ANNUAL)		
12/31/2007 12:00 AM	1551487.45	tons
Location: Alliant Energy\IPL Burlington\Boiler Main Plant\Fuel Throughput		
Parameter: COAL TOTAL TONS (ANNUAL)		
12/31/2007 12:00 AM	798543.00	tons
Parameter: F OIL 2 GALS (ANNUAL)		
12/31/2007 12:00 AM	27256.00	gal
Parameter: N GAS MMSCF (ANNUAL)		
12/31/2007 12:00 AM	14.24	mmscf
Location: Alliant Energy\IPL Burlington\Boiler Main Plant\Regulated Emission Data		
Parameter: METHANE COAL TONS (ANNUAL)		
12/31/2007 12:00 AM	14.70	tons
Parameter: METHANE F OIL 2 TONS (ANNUAL)		
12/31/2007 12:00 AM	0.01	tons
Parameter: METHANE N GAS TONS (ANNUAL)		
12/31/2007 12:00 AM	0.01	tons
Parameter: N2O COAL TONS (ANNUAL)		
12/31/2007 12:00 AM	20.58	tons
Parameter: N2O F OIL 2 TONS (ANNUAL)		
12/31/2007 12:00 AM	0	tons
Parameter: N2O N GAS TONS (ANNUAL)		
12/31/2007 12:00 AM	0	tons
Location: Alliant Energy\IPL Burlington\CTs Agency Street\Fuel Throughput		
Parameter: CT 1 F OIL 2 GALS (ANNUAL)		
12/31/2007 12:00 AM	6600.00	gal
Parameter: CT 1 N GAS MMSCF (ANNUAL)		
12/31/2007 12:00 AM	7.39	mmscf
Parameter: CT 2 F OIL 2 GALS (ANNUAL)		
12/31/2007 12:00 AM	17200.00	gal
Parameter: CT 2 N GAS MMSCF (ANNUAL)		
12/31/2007 12:00 AM	14.69	mmscf
Parameter: CT 3 F OIL 2 GALS (ANNUAL)		
12/31/2007 12:00 AM	0	gal
Parameter: CT 3 N GAS MMSCF (ANNUAL)		
12/31/2007 12:00 AM	6.34	mmscf
Parameter: CT 4 F OIL 2 GALS (ANNUAL)		
12/31/2007 12:00 AM	0	gal
Parameter: CT 4 N GAS MMSCF (ANNUAL)		
12/31/2007 12:00 AM	8.58	mmscf

Grid Electricity Use for IPL Facilties

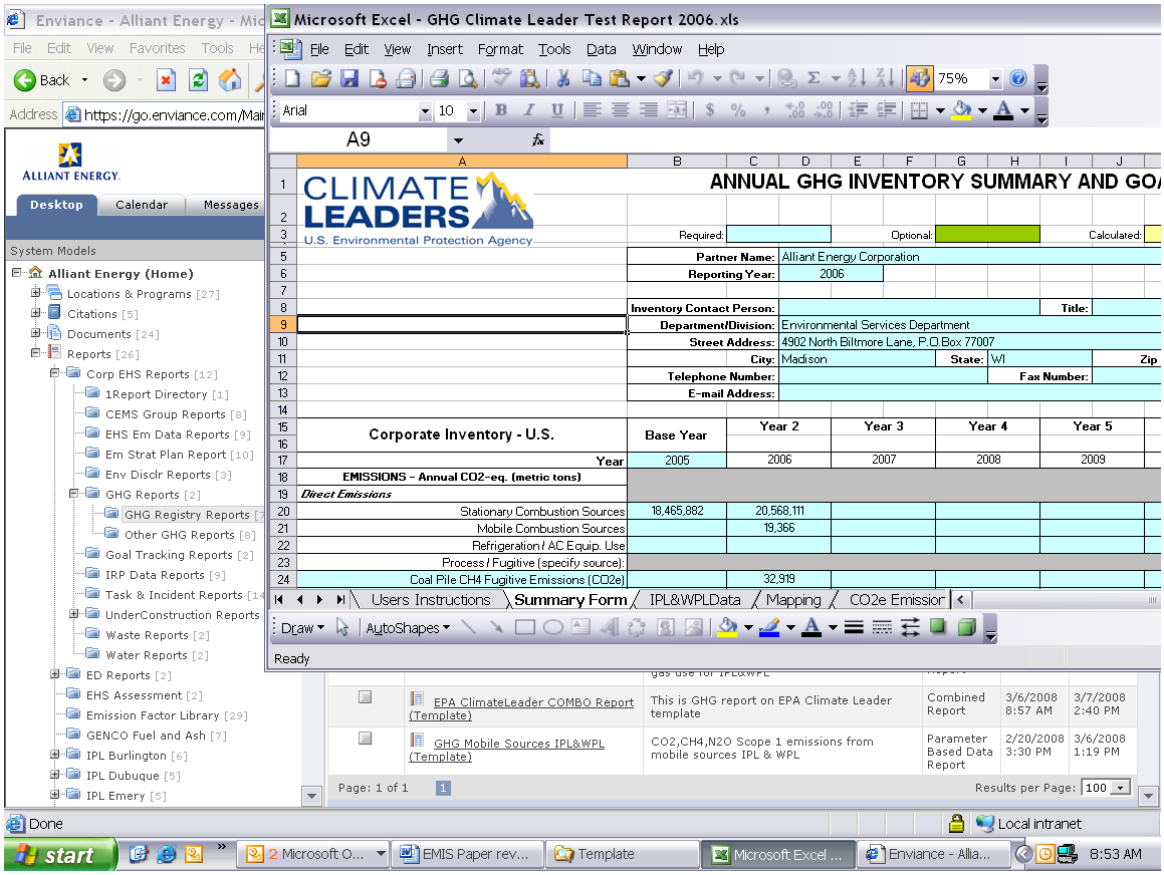
Carbon dioxide equivalent emissions from CO2, CH4 & N2O in metric tons from grid power and pipe line natural gas use at IPL Facilities

	12/31/2006 12:00 AM	
	Data Value	Requirement Unit of Measure
Parameter: CO2E MTONS (ANNUAL)		
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Albert Lea Garage\	60.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Albert Lea Operations Ctr\	87.46	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Albert Lea Storage\	2.90	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Alliant Tower\	7718.76	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Ames West Operations Ctr\	475.39	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Atlantic Operations Ctr\	4.16	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Belmond Operations Ctr\	14.70	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Britt Operations Ctr\	35.43	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Buffalo Center Warehouse\	8.48	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Burlington Operations Ctr\	279.71	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Cedar Rapids Operations Ctr\	7.23	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Centerville Call Ctr\	640.09	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Centerville Fleet Maintenance\	7.60	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Centerville Operations Ctr\	199.09	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Chariton Operations Ctr\	124.50	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Chatfield Operations Ctr\	34.95	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Cherokee Operations Ctr\	17.06	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clarinda Operations Ctr\	15.06	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clinton 2nd St Substation\	18.60	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clinton Garage\	7.25	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clinton Gas Storage 2\	14.33	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clinton Operations Ctr\	231.46	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Clinton Warehouse\	69.31	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Conroy Operations Ctr\	44.16	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\CR System Protection\	146.81	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Creston Operations Ctr\	278.50	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Decorah Operations Ctr\	226.39	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Decorah Warehouse\	42.04	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dewitt Operations Ctr\	64.40	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque 1000 Bldg\	209.11	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque 1030 Bldg\	256.01	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque 10th St Bldg\	76.21	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque Fleet Maintenance\	19.45	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque Iowa St Office Bldg\	1.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dubuque Kerper Bldg\	111.81	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Dyersville Operations Ctr\	7.68	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Elkader Operations Ctr\	4.42	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Fairfield Operations Ctr\	74.39	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Fort Madison Operations Ctr\	0.04	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Fulda Operations Ctr\	32.90	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Galena Operations Ctr\	39.10	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Grinnell Operations Ctr\	105.99	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Guthrie Ctr Operations\	27.08	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Hills Operations Ctr\	25.33	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Iowa Falls Operations Ctr\	126.90	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Jefferson Operations Ctr\	46.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Keokuk Operations Ctr\	105.48	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Knoxville Operations Ctr\	22.50	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Lamberton Operations Ctr\	13.90	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Leon Operations Ctr\	39.20	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\LeRoy Operations Ctr\	4.80	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Lisbon Operations Ctr\	84.15	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Manchester Service Ctr\	34.46	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Marshalltown Operations Ctr\	400.63	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Marshalltown Training Ctr\	33.12	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mason City Fleet Maintenance\	88.83	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mason City Heated Storage\	16.78	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mason City Operations Ctr\	198.93	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mason City Warehouse\	68.38	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Montgomery\	118.45	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mt Ayr\	49.50	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Mt Pleasant\	8.88	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Muscatine Operations Ctr\	46.86	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Nevada Operations Ctr\	0.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Nevada Storage\	56.10	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Nevada Sub Storeroom\	6.05	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Newton Operations Ctr\	284.19	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Northwood Operations Ctr\	5.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Oelwein Operations Ctr\	134.79	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Oelwein SubStation\	55.14	mtons
Alliant Energy\GHG Management\IPL\Purchased Electricity&Fuel Emissions\Osceola Operations Ctr\	53.26	mtons

GHG Management Expansion to all Power Generation Facilities

The GHG Management system was expanded to include all the IP&L and WP&L Genco and support facilities within the GHG defined boundaries. At this point system QA/QC is in progress and we hope the system will be completed to meet the EPA's climate Leader GHG Inventory portion by second quarter of this year. As I mentioned in the beginning,

our focus is to first complete the system for GHG inventory portion. The system configuration of GHG reduction projects such a plant efficiency improvement, fuel switch analysis, bio-sequestration projects on forestation, reforestation (Land Use, Land Use Change and Forestry), and renewable energy project will be in the Phase II of GHG Management implementation. Given below is example of the EPA Climate Leader GHG Inventory form which was loaded into the EMIS system to bring the Genco wide GHG data direct into the EPA form:



Summary

The climate change issue will not go away and with the passage of time the climate change impact will grow public concerns. This will increase the climate change impact mitigation and adaptation efforts at national and international levels to avoid human suffering. There is a strong possibility that GHG regulations in the form of GHG cap and trade or cap & trade and tax hybrid may be enacted at the Federal level by 2010. Corporate America is already assessing the impact of a carbon constraint future and the top management is looking for answers about GHG inventory or carbon footprint of their businesses. If the company environmental managers are not preparing for this change, then they sooner or later will face the reality of how to compile GHG inventory of their facilities that may be spread across the nation or even globally. The Excel spread sheets based GHG compilation, maintaining and tracking is a difficult and tedious option that can backfire as the GHG management needs grow with emerging regulations.

A smart approach is to adopt internet based EMIS platform tools to develop a comprehensive GHG management system. This may save hundreds of work-hours every year and provide consistent data that comply with GHG Accounting and Reporting principles. However, efforts of developing multi-facilities based GHG Management system on sound GHG protocols may stretch from months to years depending upon the size of the company and therefore corporate environmental managers must start now. At Alliant Energy, an internet based GHG Management system was successfully developed from a conceptual design to entity-wide system level across three states and the system is providing all GHG inventory data and reports based on GHG protocols. Our successful implementation effort is encouraging us to expand the system across other business entities and also to grow it as GHG project tracking system meeting a GHG third party validation and verification audit needs.

Acknowledgement

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