



Climatechange debates

Dr. Raghavan
Ramanan,
T3Inc. (a Trinity
Consultants
Company),
USA, provides
a response to
the US climate
change debates
from a refinery
perspective.

On September 28th, 2007, US President George Bush said that the US would take on greenhouse gas (GHG) emissions and reach a global consensus at the UN in 2009. While the news is not as sensational as 'US signs Kyoto', it nevertheless gives renewed impetus to the climate change response movement. Although Federal legislation on climate change is nascent in the US, several US states are beginning to lay the framework for future climate change regulation. Meanwhile, stakeholders continue to exert pressure on corporations through shareholder resolutions and demand for carbon risk disclosure; emerging hedge funds are purchasing and financing international⁵ carbon offset projects; and insurers and bankers are protecting their interest by demanding responsible behaviour through higher risk premiums or adoption of Equator Principles¹.

This article briefly outlines a process that a US petroleum refinery may take to prepare for a comprehensive response to the climate change challenge. The key steps include:

- Track development of regulatory and voluntary initiatives.
- Comprehend and select relevant reporting protocol.
- Develop and implement a GHG management system.
- Set and accomplish GHG emission reduction objectives.

Table 1. Summary of climate change bills, 110th congress, August 2007

Bill title	Targeted sector/ industry	Emission targets	Allowance allocation	Offsets
S. 1766 Low Carbon Economy Act of 2007 (Bingman-Specter)	'Eligible' coal mine, electric generation, natural gas processing nonfuel regulated, and refinery facilities	Implement an annual limit on GHG for calendar year 2012. Decrease the limit each subsequent year to achieve 2006 levels by 2020	53% of all allowances will be auctioned to industry	Landfill methane, animal waste or municipal wastewater methane, SF6 reductions, and coal mine methane projects
		Reduce emissions to 1990 levels by 2030: 60% reduction from current levels by 2050	Allocation within industry sectors: Coal: 12%, refining: 7%, natural gas: 4%, electric power: 54%, nonfuel utilities: 4%, and carbon intensive manufacturing: 19%	
		Set the TAP at US\$ 12/t CO ₂ e		
S. 280 Climate Stewardship and Innovation Act of 2007 (McCain-Lieberman)	Economy-wide (for companies with at least one facility that emits GHG > 10 000 t of carbon equivalent /yr	1990 levels by 2020	Starting in 2011 with 6130 million t of allowable emissions. Any converted entity may purchase credits	By 2012, entities may satisfy up to 30% of total allowance submission requirements through domestic and international
		22% below 1990 levels by 2030		
		60% below 1990 levels by 2050		

Source: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:s280is.txt.pdf; [http://www.eia.doe.gov/oiaf/servicerpt/pdf/srpoaf\(2007\)01.pdf](http://www.eia.doe.gov/oiaf/servicerpt/pdf/srpoaf(2007)01.pdf)

promote new energy and emission reduction technologies, and ease impacts of climate change on the most affected communities. Table 1 highlights two other bills that may have the greatest traction at present.

In addition, the following bills have also been or are being introduced into the 110th US Congress:

- Global Warming Pollution Reduction Act (S. 309) (Sanders).
- Climate Stewardship Act of 2007 (H. R. 620) (Olver-Gilchrest).
- Global Warming Reduction Act of 2007 (S. 485) (Kerry).
- Safe Climate Act of 2007 (H. R. 1590) (Sanders-Boxer-Waxman).
- Clean Air/Climate Change Act of 2007 (S. 1168) (Alexander).
- Clean Air Planning Act of 2007 (S. 1177) (Carper).

However, compromising on and merging of components of these bills has to occur to ensure bipartisan support. A key uncertainty is the structure of the climate change bills: whether the legislation will have an upstream emphasis (regulating fuel handlers upstream of usage) or a downstream emphasis (regulating point sources). The bottom line is that federal GHG legislation will be passed in the next two to four year period.³ Hybrid upstream (carbon content cap) is a near certainty and downstream (cap and trade) regulation is a strong possibility.

US regional initiatives and state(s) legislation

Similar to the Federal arena, there are a number of regional and state initiatives and legislation under various stages of development, all the way from conception to implementation. Figure 1a, b and c give an overview of the status of these in the US.

California and AB-32⁴

Regardless of whether an organisation has refineries in the state of California, it is prudent to monitor the implementation of the California Global Warming Solutions Act of 2006 (also known as California Assembly Bill AB-32), a landmark climate change legislation. AB-32 is likely to set the trend for several developments in the climate change arena. First, it is expected to stimulate a US\$ 5 - 10 billion carbon market⁵ in California, with potential links to other markets such as the Regional Greenhouse Gas Initiative (RGGI)⁶ and the European Union Emission Trading Scheme (EU ETS)⁷. Its multi-sector approach will likely serve as a predecessor of future federal climate legislation.

Last month, the California Air Resources Board (CARB) released its preliminary draft on regulation for the mandatory reporting of GHG emissions AB-32. Reporting of GHG from

Track development of regulatory and voluntary initiatives

The first step is to gain a keen understanding of the climate change policy initiatives that potentially impact the organisation and track these developments closely. This section briefly highlights select US Federal and State(s) regulatory and voluntary initiatives that organisations should track.

US Federal legislation

There is a plethora of legislative proposals under development on climate change. Senators Lieberman and Warner released an outline of their potential climate bill expected to be introduced later in the autumn of 2007. This bill brings climate change into the security and hence national context and because of the bipartisan nature and ranking positions of the sponsors on key committees has significant traction. The bill targets greenhouse gas emissions reductions to 10% below 2005 levels by 2020 and 70% below 2005 levels by 2050. The bill will require cuts from the electric power, transportation and industry sectors. A Climate Change Credit Corporation will auction a portion of the emission allowances to contain cost,

Table 2. Data elements	
List of all source streams	Activity data used
Documentation of data collection process used	Emission factors used
Documentation of calculation method used	Facility data used
Power transaction (purchase or sale) data used	Corroborating calculations
CEMs specifications and changes	Raw and aggregated data
Downtimes, calibrations, information blanks	Quality assurance/quality control



Figure 1a. States with mandatory emission reduction targets.²⁸

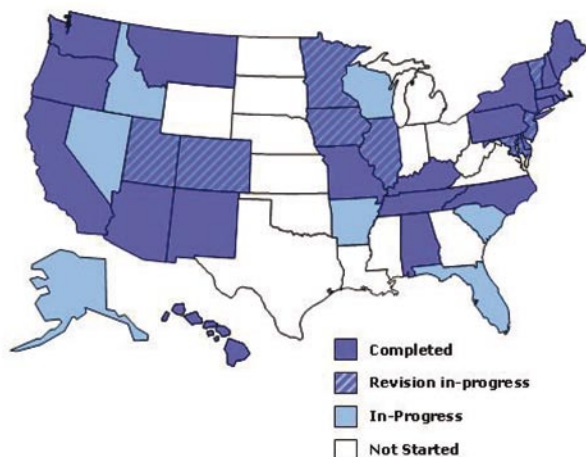


Figure 1b. States with completed climate action plans.²⁹

petroleum refineries and other relevant facilities is addressed under draft sections 95111-14. Reporting requirements are defined for electric generating facilities, cogeneration facilities, petroleum refineries, and hydrogen plants. In addition, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) are setting emissions performance standards for utilities under Senate Bill (SB) 1368 (Electricity Emissions of Greenhouse Gases). This rulemaking will impact power purchase agreements and related refinery GHG emission management.

Regional Greenhouse Gas Initiative (RGGI)

RGGI is a mandatory GHG 'cap and trade' programme for electric generating units located in Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, Vermont,

and Maryland. It could impact purchased electric power GHG emissions reporting for refineries. Also, it will create the first mandatory regional carbon market in the US with potential links to a California cap and trade programme as well as the EU ETS.

The Climate Registry⁸

The Climate Registry is a voluntary GHG multi-state registry backed by state agencies. Over forty states including the Lake Michigan Air Directors Consortium (LADCO), the Western Regional Air Partner (WRAP) states, and the RGGI states have joined the Climate Registry. In addition, two Canadian provinces and one Mexican state have joined (Figure 2). This may be a place to register emissions, with authentication coming from verification requirements and regulatory agency oversight.

Other programmes and initiatives

Many states, regions and other organisations are offering similar programs. These include The Chicago Climate Exchange⁹, the US Department of Energy's Voluntary GHG Reporting Program 605b¹⁰ and the state and local government GHG Reporting programmes.¹¹ However, care should be exercised in electing to participate in any programme.

Comprehend and select appropriate reporting protocol

The second step is to conduct a base year GHG inventory. This requires a sound comprehension of the available mandatory and voluntary reporting requirements and protocols. The GHG protocol should typically address principles of reporting, organisational boundaries, operational boundaries, emissions calculation methodologies, base year selection and recalculation, performance metrics, project based reductions and data management procedures.

Prior to participation in voluntary programmes, the organisation must evaluate cost benefits in the context of required reduction schedule, baseline protection and project emission reduction credits. The Chicago Climate Exchange and EPA Climate Leaders program require reduction goals. The California Climate Action Registry may offer early reductions under future state mandates. Chicago Climate Exchange and RGGI trading programme may support trading project emission reduction credits. The DOE 1605(b) programme allows registrations of offset projects and protection of baselines.

While the programme may dictate use of a specific protocol, an organisation could draw from the World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) GHG Protocol,¹² California Climate Action Registry General Reporting Protocol,¹³ EPA Climate Leaders' GHG Inventory Guidance, and ISO 14064-1 guidelines.¹⁴ This section briefly highlights from a US refinery perspective, one mandatory US GHG programme (California AB-32) and one voluntary protocol (American Petroleum Institute's 'API' guidelines for GHG reporting used broadly by the industry).

AB-32 draft mandatory GHG reporting for the petroleum refining sector¹⁵

Section 95103 mandates petroleum refineries to report all direct CO₂, CH₄ and N₂O emissions starting August 2009 and annually thereafter, verified annually by an accredited verifier. Sections 95104 and 95105 (draft currently) define data

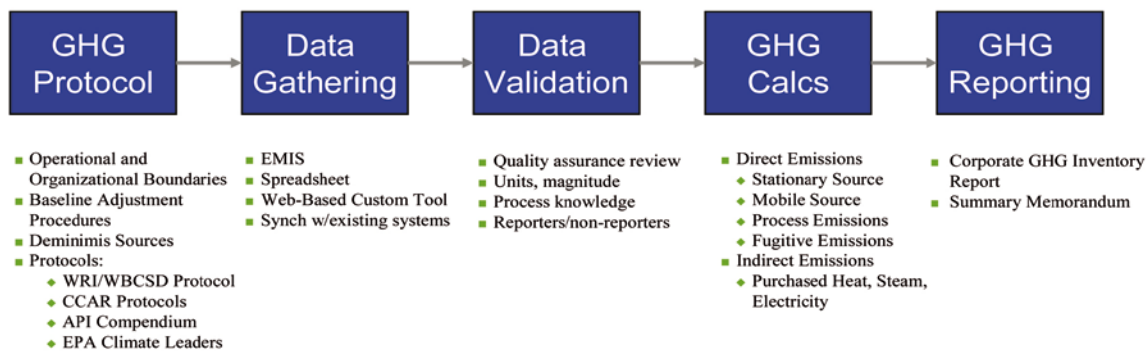


Figure 3. GHG inventory approach. An EMIS can assist with each stage of this process.



Figure 4. GHG management programme.

Operational boundaries drive the distinction between direct and indirect emission sources. GHG emissions from sources that are owned or controlled by the refinery are direct emissions. Most leased equipment in refineries transfer risks and rewards to the operator and are typically capital in nature. For equity share approach, a capital lease is treated the same as in financial accounting, that is no different from owned. In an operational control approach, accounting of GHG emissions from leased equipment is direct or indirect depending on whether the reporting entity has operational control or not.

Indirect emissions could virtually encompass the entire product life cycle emissions. However, while these are conducted to compare products, they are challenging for a single refinery or organisation. A more limited definition refers to GHG emissions that are a consequence of the activities, e.g. purchased electricity, product transport or contract manufacturing. Most programmes require reporting of indirect GHG emissions from purchased electricity.

Develop and implement a GHG management system

GHG emission credits are financial instruments and require a credible, consistent, and reliable accounting and reporting practice. As noted earlier, similar to financial accounting they have to be true, faithful, fair, credible, and unbiased, and based on the principles of relevance, completeness, consistency, transparency and accuracy because of GHG emission management demands a rigorous approach and hence the management system similar to financial accounting.

California's AB-32 mandates extensive GHG data collection, retention, and verification. Section 95104's 'Emission data report' specifies reporting of data on the facility, GHG emissions, sector specific GHG emission

performance metrics, and other relevant activity data. It also spells out the need to establish, document, implement, and maintain a transparent and independently verifiable GHG emission estimation programme, and an effective system for replication by verifier or a third party. Section 95105 'Document retention and record keeping' requires the reporting entity to establish and maintain procedures, provide all data used for GHG emissions report, and retain all data for verification for at least seven years (Table 2).

Even for voluntary programmes data management procedures are essential. Many companies now opt to have their GHG emission inventory third party verified. The entire cycle from data acquisition to data application in emissions calculations and reports are verified. Future annual GHG inventories will benefit from archived input and output data of prior years. While AB-32 mandates data retention for at least seven years, California Climate Action Registry's General Certification Protocol recommends data retention for seven years.¹⁸ Archiving this data permanently is a common practice.

The GHG management systems drives need for an Environmental Management Information System (EMIS) that can streamline data collection and annual inventory preparations. Need for aggregation, slicing and dicing across sectors and businesses, and tracking performance metrics makes simple spreadsheets ineffective. Furthermore, an EMIS can enable long term documentation of the GHG input data, which is critical and may be mandated (e.g. AB-32 requires all data retention for at least seven years). Western Refining¹⁹ recently presented a path forward that focused on reducing uncertainty in future inventories, third party verification, voluntary reporting, inventories of newly acquired refineries, and improved efficiencies. These clearly corroborate a need for an EMIS. Links to existing energy management systems, legacy operational data storage systems (e.g. process historian), and output from continuous emission monitors will streamline consistent energy and emission data collection for the GHG inventory. California Climate Action Registry's Reporting Online Tool (CARROT) allows emission calculations for many sources through an online system. Also, EMIS system sellers²⁰ are enhancing GHG modules, to eventually enable trading²⁰ and tracking. Figure 3 shows how an EMIS can assist in the GHG inventory.²¹

Figure 4 shows an example GHG management system.²² An EMIS system described earlier provides the opportunity to automate the process with emission data management. Linkages to other systems such as SAP or Oracle for financial accounting, energy management systems, and legacy

operational data storage such as process historian helps fully integrate and mainstream the GHG emissions management programme.

Set and accomplish GHG emission reduction objectives

Setting refinery specific GHG emission reduction goals is an arduous task and often an iterative and interactive process. Drivers include stakeholder pressure, insurance risk premiums, regulatory mandates, competitive environment, industry and company visibility and corporate stewardship. Public reporting of the GHG emission inventory may bring an implicit need for ongoing reductions. A classic example was the US EPA's Toxic Release Inventory reporting programme that brought about significant emission reductions.

GHG emission reduction objectives may either be absolute or intensity (GHG emissions per unit revenue or per manufacturing unit) based. The intensity metric tracks emission efficiency on a unit basis, rather than an absolute basis. One could reduce GHG emission intensity while still increasing absolute GHG emissions. As mandatory programmes mature in the US, the focus will shift to absolute reductions, either through internal GHG reductions or through purchasing external GHG offsets.

Refineries could prioritise internal GHG emission reduction opportunities on a cost-benefits basis. Nearly 90% of the refinery GHG emissions²³ come from external combustion sources, catalytic cracking regeneration and hydrogen plant vents. Improving plant energy efficiency, and cogeneration facility for combined heat and power generation are clearly very effective and successful ways to reduce GHG emissions. For instance at ExxonMobil's Fawley refinery, over six years CO₂ emissions have fallen by 'the equivalent of taking about 250 000 cars off British roads every year'.²⁴ This has been accomplished through cogeneration for combined heat and power generation, selecting the most energy efficient drives, improving plant reliability and maintenance (e.g. eliminating steam leaks and repairing insulation), shutting steam vents to atmosphere, and reducing steam flow through desuperheaters. Similar efforts at CEPSA refineries in Spain reduced CO₂ emissions by 182 000 t or approximately 3% from the previous year.²⁵ Key actions included more efficient use of cogeneration steam and replacement of fuel oil with lower carbon intensity fuels. Marathon Petroleum Company²⁶ is focused on energy efficiency improvements through shutdown or replacement of energy inefficient equipment and through increased operational efficiencies.

Options for GHG offsets include Certified Emissions Reductions (CERs) from Clean Development Mechanism (CDM) projects under Kyoto Protocol and Renewable Energy Credits (RECs) to offset purchased power with renewable or 'green' power at manufacturing and office building locations. The US voluntary carbon offset market however presently has no formal standards²⁷ that govern the reductions. In addition, there is no central registry in the US that records transactions, and provides transparent price information.

Conclusion

Fossil fuel combustion, and as a consequence utilities and refineries will continue to be targets. It behooves the industry to join the solution finders to meet the climate change response challenge and position themselves well through the key steps stated earlier: track developments,

understand and select reporting protocols, implement a GHG management system and accomplish GHG emission reduction objectives. **13**

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