F-CDM-RtB ver 01.2

CDM: FORM FOR SUBMISSION OF A "LETTER TO THE BOARD" (Version 01.2)

This form should be used only by project participants and other stakeholders for submitting a "Letter to the Board" in accordance with the latest version of the Modalities *and procedures for direct communication with stakeholders*

Name of the stakeholder[1] submitting this form (individual/organization):	Gary Clyne Trinidad Oilfield Services Limited
Address and contact details of the individual submitting this form:	Address: 1st Floor Bourbon House, Bourbon Street P.O. Box 1695, Castries, St. Lucia Telephone number: 868.322-1326 E-mail address: projects1@tosl.com
Title/Subject (give a short title or specify the subject of your submission)	**Requesting for clarification (For the Carbon Market Pathway Plan)**
Please mention whether the submitter of the form is:	☒ Project participant ☐ Other stakeholder, please specify
Specify whether you want the letter to be treated as confidential[2]:	☐ To be treated as confidential ☒ To be publicly available (UNFCCC CDM web site)

Please choose any of the type(s) below[3] to describe the purpose of this submission.

☐ **Type I:**

☐ **Request for clarification** ☐ **Revision of existing rules**

- ☐ Standards. Please specify reference
- ☐ Procedures. Please specify reference
- ☐ Guidance. Please specify reference
- ☐ Forms. Please specify reference
- ☐ Others. Please specify reference

☒ **Type II: Request for Introduction of new rules**

☐ **Type III: Provision of information and suggestions on policy issues**

Please describe in detail the issue on which you request a response from the Board, including the exact reference source and version (if applicable).

[1] DNAs and DOEs shall use the respective DNA/DOE forms for communication with the Board.
[2] As per the applicable modalities and procedures, the Board may make its response publicly available.
[3] Latest CDM regulatory documents and information are available at: http://cdm.unfccc.int/Reference/index.html .

The Kyoto Protocol is a top-down agreement on climate change, which is rigid in its approach to reducing GHG emissions via carbon markets. Incremental bottom-up carbon market approaches wherein, each country determines what is socially, economically, politically, and technically feasible based on national circumstances is the current trend and most likely scenario to finance climate-friedly development in Trinidad and Tobago. The global carbon market is not developing in the UNFCCC originally envisioned structured, top-down manner; but instead is emerging from the bottom up. Individual national and sub-national governments around the world are implementing carbon market policies that put a price on carbon. To utilize the full potential of CDM's programmatic approach and to keep up with the evolution of the second generation of carbon markets, Trinidad and Tobago will also engage the bottom-up approach for design and implementation of a national carbon market. Trinidad and Tobago has not yet generated a single Kyoto-valid carbon credit through its registered CDM programme and new market mechanisms and policy options are being developed for trading by industrialised countries that will lead to possibly the stranding our investment in CDM. Nations such as the United States, New Zealand, Canada, China, Switzerland, and South Korea are markets that may or may not allow CER offset if it is considered not to be in their national or system best interest. In fact, the development of these systems itself are a reaction to the perceived failure of CDM and the need of reform. I am therefore seeking clarification on the UNFCCC position for new and flexible market mechanisms under multilateral, bilateral, or domestic governance which do not plan to allow offset with CDM CERs through 2050. What role will the UNFCCC play on behalf of developing countries that have invested in the CDM in relation to individual parties implementing new market or flexible mechanisms? What are the proposed relationships between new and flexible market mechanisms and the UNFCCC? How will the UNFCCC guard against protectionism and CER offset exclusion in new bottom up cap-and-trade market mechanisms? Can CDM modalities and policy constraints such as PoA application post registration for utilsation of practical emission reduction combination methodologies (ie fuel switch) be amended by the EB if in line with new low emission development realities and national interests? If so, it will help maintain CDM relevancy in a new and flexible carbon market and low emission economy after the 2nd Commitment Period.

Please provide any specific suggestions or further information which would address the issue raised in the previous section, including the exact reference source and version (if applicable).

It can be suggested that in this era of new and flexible market mechanisms CDM modalities and policy constraints such as a PoA application for post registration utilization of concomitant combination methodologies should be favourably considered by the EB. When climate-related risks are incorporated into financial global market investment portfolios, large amounts of money will migrate to the low emission development (our PoA project scenario) economy. This will result in a redistribution of opportunity across many industrial sectors. New capital will begin flowing to fossil fuel low emission developments and climate-friendly investments will benefit from the trillions of dollars freed up. Links between other cap-and-trade systems and a credit system, such as the one envisioned for Trinidad and Tobago, will provide all of the near-term cost-saving and risk-diversifying advantages that linking offers. By broadening markets for credits, linking increases the liquidity and improves the functioning of the linked markets. As with other international trade, linking leads to capital flows between linked systems. In consideration of the foregoing, we therefore desire to add AM37, AM55 and AM77 to our existing AM9 PoA platform. Will the EB give us an audience on the matter? We want to work with emerging systems and harmonize our system design with that of new systems so reform of CDM is necessary. Bonding our programmatic CDM platform with a Trinidad and Tobago system (Concept Paper attached) and new international carbon markets will be achieved with the support of the EB.

If necessary, list attached files containing relevant information (if any)	• [replace this bracket with text, the field will expand automatically with size of text]

Section below to be filled in by UNFCCC secretariat

Date when the form was received at UNFCCC secretariat	8 June 2014
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7 June 2014

VIA EMAIL TO: cdm-info@unfccc.int

ATTN: Dr. Hugh Sealy
Chairman CDM Executive Board (EB)
St. George's University
P.O. Box 7
Grenada, W.I.

Re: PoA-DD No. 9358 – Request for Carbon Market Pathway Plan

Dear Dr. Sealy:

Through the Kyoto Protocol, the United Nations Framework Convention on Climate Change (UNFCCC) prepared the groundwork for carbon markets. The underlying assumption of carbon markets is to achieve maximum possible emissions reduction at the lowest possible cost by: (1) quantifying emissions caused by industrial activities; (2) setting a cap on all greenhouse gas (GHG) emissions; and (3) incentivizing companies and entire industries to make decisions on how to meet their caps in the most economical possible way. This is accomplished by bringing in 'green technologies' or by buying credits/allowances from other industries or from offsetting with other emission crediting systems (the subject of this letter).

Trinidad and Tobago is the second largest emitter of GHG globally on a per capita basis. Releasing approximately 53 million tonnes of GHG emissions annually, the country's carbon footprint is twice that of the United States and three times that of Russia. The Petrotrin programmatic open platform is the first and only CDM project registered in Trinidad and Tobago. Petrotrin's financial investment was made to address global warming's impact on our nation and assist other developing countries that desire to reduce emissions in oilfields. Trinidad and Tobago encourages measures that:

- support the programmatic project approach to levelling emissions;
- use the carbon market to further reduce emissions; and
- acquire knowledge and experience to participate in new carbon market mechanisms.

During the first Kyoto commitment period, the CDM emerged as the global currency for emissions trading. As you are aware, the CDM has mobilised over 400 Billion US Dollars of investment in developing countries for 7500 projects. It has reduced over 1 Billion tonnes of GHG emissions. The CDM and its programmatic systems should therefore become a major link to second generation international carbon markets.

The Kyoto Protocol is a top-down agreement on climate change, which is rigid in its approach to reducing GHG emissions. In an incremental bottom-up approach, each country determines what is socially, economically, politically, and technically feasible based on national

circumstances. As a result of this lesser rigidity, the global carbon market has not developed in the UNFCCC originally envisioned structured, top-down manner; but instead is emerging from the bottom up. Individual national and sub-national governments around the world are implementing policies that will put a price on carbon and mandate industry to reduce their emissions. To utilize the full potential of CDM's programmatic approach and promote the evolution of these second generation carbon market mechanisms, Trinidad and Tobago will engage the bottom-up approach for design and implementation of a national carbon market and integrate its host country PoA with its national climate policies and market. A copy of our concept is attached to this mail along with the form required to communicate with the EB.

Trinidad and Tobago has not yet generated a single Kyoto-valid carbon credit through its CDM programme due in large part to the market collapse of the CER. So we are attempting to be proactive and engage new and flexible market mechanisms developed for trading by industrialised countries, such as the United States, New Zealand, Canada, China, Switzerland, and South Korea. But these are markets that may *or may not* allow CER offset if it is considered not to be in their national or system best interest. In fact, some second generation carbon market systems contend that CDM is a failure and are not planning to carry forward the promise of finance by the UNFCCC, possibly stranding developing country investment in the CDM, including the investment of Trinidad and Tobago. So reform of some kind to CDM policy may be required to protect developing country investment and keep CDM relevant beyond 2020.

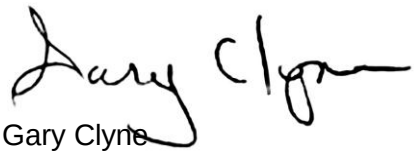
Petrotrin is strategically located to promote its CDM programmatic open platform to governments throughout the Caribbean, Mexico, South and Central America. The initial programmatic CDM methodology to be used to jump start a Trinidad and Tobago credit system is: AM0009 Version 06.0.0: Large-scale Methodology – Recovery and utilization of gas from oil fields that would otherwise be flared or vented. Typical projects include: Associated gas from oil fields (including gas-lift gas) that was previously flared or vented is recovered and utilized. The type of GHG emissions mitigation action is fuel switch. Fuel switch is the displacement of use of other fossil fuel sources, such as natural gas, dry gas, LPG and condensate, by utilizing recovered associated vented or flared gas from oil fields.

In relation to the above, we have since examined the benefits for the use of AM0037, AM0055 and AM0077 in combination with AM0009 in order to achieve a robust and precipitous decline of emissions in Trinidad and Tobago. The aforementioned additional methodologies are in the same fuel switch or GHG less intensive gas recovery and utilization families. During September 2012, AM0055 was amended to include recovery and utilization of waste gas in gas plants, as well as in refineries. At that time, we were well into the final phase of PoA registration and could not consider including AM0055 due to time restrictions subject to the EU-ETS December 31, 2012 deadline for the registration of CDM projects able to produce eligble CERs post 2012.

Petrotrin is enabled by its CDM programmatic open platform to reduce emissions in Trinidad and globally. The need to access new and flexible market mechanisms may require some changes to CDM methodology application and restrictions, making them flexible and adjustable to new economic realities. With an EB-approved PoA-DD revised eligibility criterion, hundreds of thousands of additional metric tonnes of emissions can be reduced annually in the oil and gas upstream, midstream and downstream sectors in Trinidad and Tobago alone. These potential CPAs will be eligible to benefit from carbon revenue offsets generated under a national crediting system. GHG reductions will be continuously scaled up, since an unlimited number of CPAs can be added.

In closing, TOSL, as the PoA CME, seeks clarification on the UNFCCC position for new and flexible market mechanisms under multilateral, bilateral, or domestic governance which do not plan to allow offset with CDM CERs. What role will the UNFCCC play on behalf of developing countries that have invested in the CDM in relation to individual parties implementing new and/or flexible market mechanisms? What are the proposed links between new and flexible market mechanisms and the UNFCCC? How will the UNFCCC guard against protectionism and CER offset exclusion in new and flexible carbon market mechanisms? In an era of new and flexible market mechanisms can policy constraints such as PoA application for post registration of combination methodologies be more favourably considered by the EB?

Respectfully submitted,



Gary Clyne
CME Team Lead

TRINIDAD AND TOBAGO CREDIT SYSTEM CONCEPT PAPER

1.0 INTRODUCTION

As carbon emissions globalize, the climate impact becomes more intense for poorer, less developed countries and small island developing states. In an effort to address past environmental atmospheric complications and to scale-up climate change mitigation, the industrial nations pioneered the largest private sector engagement in the history of the United Nations – the Kyoto Protocol. Under the Protocol, the Clean Development Mechanism (CDM) generates carbon credits for projects in developing countries that reduce or avoid greenhouse gas emissions. These carbon credits can be used to offset pollution in more advanced nations. Carbon markets and putting a price on carbon are a key part of the international response to climate change. Carbon Markets fall into two categories: cap-and trade systems and emission reduction credit systems. Under the cap-and-trade, regulated emissions are capped and the sources purchase allowances equal to their emissions. In a credit system like the CDM, sources voluntarily undertake emission reduction projects and are awarded credits that can be sold to emission sources in cap-and trade systems. This transaction is known as an offset. Trinidad and Tobago is seeking to develop a credit system.

In an emission crediting system, participants that undertake particular emission reduction projects are awarded "credits" that can be sold to any participant in other cap-and-trade systems. A one-way link between a cap-and-trade system and a Trinidad and Tobago credit system will offer a cap-and-trade system's regulated sources greater savings. It also provides other national or sub-national cap-and-trade system's participants access to emission reduction opportunities in Trinidad and Tobago. Projects to reduce emissions that are challenging in the cap-and-trade system (e.g., carbon capture and sequestration) may be easily achievable in a Trinidad and Tobago carbon market. In addition, a linkage will reduce the other cap-and-trade system's allowance price and increase the price that participants in the Trinidad and Tobago credit system receive for their credits. The additionality problem (whether reductions of similar size would have taken place anyway) is an important concern but can be managed through a robust credit system monitoring, reporting and verification regime.

Presently, there is no global agreement for a cap on emissions and, as a result, the concentration of greenhouse gases in the atmosphere continues to increase precipitously. Without a worldwide limit on cumulative emissions, dangerous climate thresholds will be crossed and irreversible damage to our planet will become locked in. When these climate-related risks are incorporated into financial global market investment portfolios, large amounts of money will migrate to the low emission development economy. This will result in a redistribution of opportunity across many industrial sectors. New capital will begin flowing to fossil fuel low emission developments and climate-friendly investments will benefit from the trillions of dollars freed up. Links between other cap-and-trade systems and a credit system, such as the one envisioned for Trinidad and Tobago, will provide all of the near-term cost-saving and risk-diversifying advantages that linking offers. By broadening markets for credits, linking increases the liquidity and improves the functioning of the linked markets. As with other international trade, linking leads to capital flows between linked systems.

The design and implementation of an internationally compliant credit system will be led by the Energy Chamber of Trinidad and Tobago (Chamber) with support from the local private sector. The Chamber, an NGO, is seeking USD 3 million from donor agencies, foundations, funds and private equity to complete this task in a 1 year timeframe. A service charge between 5 to 10 percent of each credit monetized will cover return on investments and the Chamber's operation, monitoring, reporting, emission reduction verification and maintenance requirements of the credit system.

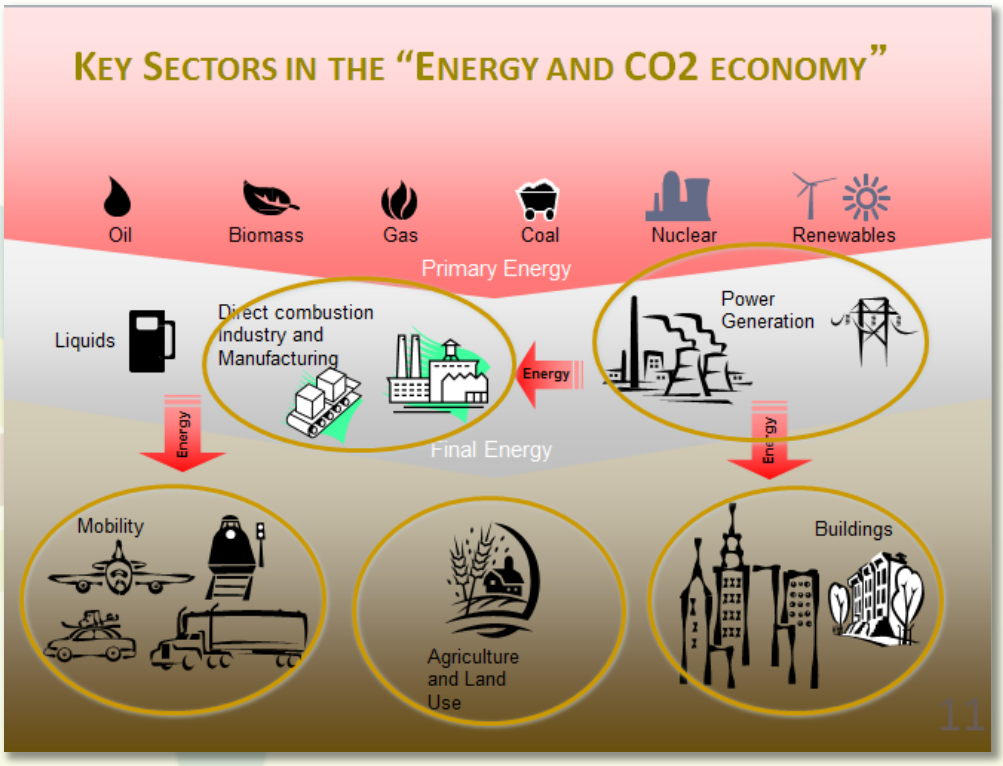
2.0 PURPOSE

The global carbon market is not developing in the UN's originally envisioned structured, top-down manner; but instead is emerging from the bottom up. Individual national and sub-national governments around the world are implementing policies that will put a price on carbon and mandate industries to reduce their emissions.

Trinidad and Tobago will develop a bottom-up credit system and align its host country CDM project and carbon market with national climate policies. An emission credit system will:

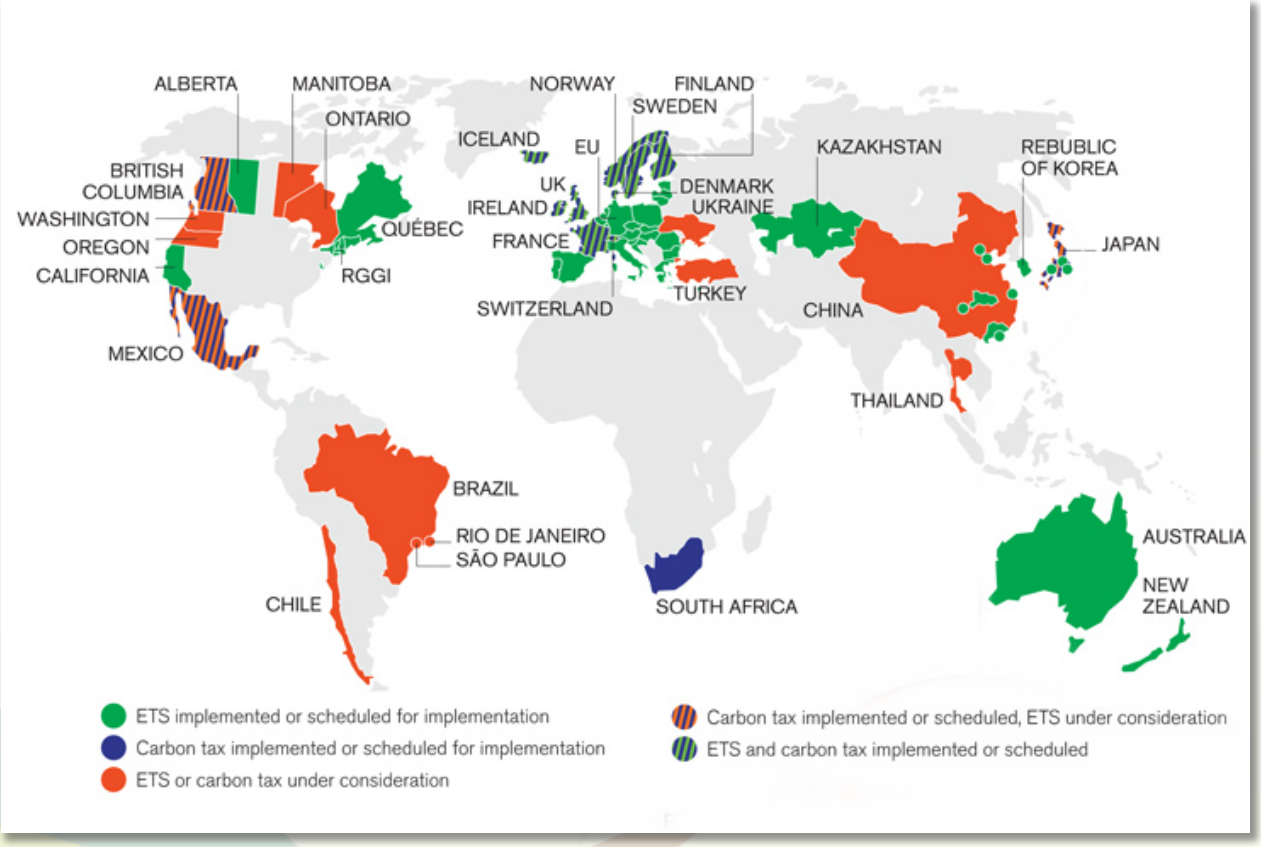
1. Increase the international competitiveness of Trinidad and Tobago's businesses;
2. Effectively respond to climate change through international trade arrangements;
3. Put Trinidad and Tobago in the forefront of a global carbon constrained marketplace;
4. Create local employment and;
5. Be an economic driver.

Figure 1: Illustrating Key Sectors in the Trinidad and Tobago Economy



It will be critical to design a credit system that can create synergies internationally and promote clean technology business competitiveness in Trinidad and Tobago, create jobs locally, provide a boost to the economy, mitigate the effects of global warming and protect our oil and gas assets. An emission credit system with a special focus on upstream and downstream fossil fuel industries and with opt-in by commercial and transportation sectors is the most cost-effective means of reducing CO2 emissions in Trinidad and Tobago, and will be at the centre of governments' efforts to tackle climate change.

Figure 2: Illustrating Global ETS Development



- Globally, 39 national and 23 sub-national jurisdictions have implemented or are scheduled to implement carbon pricing instruments, including emissions trading systems and taxes.
- The world's emissions trading schemes are valued at about $30 billion, with China now housing the world's second largest carbon market, covering the equivalent of 1,115 million tons of carbon dioxide emissions.
- The World Bank Group and others are encouraging countries, sub-national jurisdictions, and companies to join a growing coalition of first movers supporting carbon pricing.

3.0 PROJECT DESCRIPTION

3.1 CDM

Trinidad and Tobago recognizes that the success of its national long-term environmental goals requires commitment to the principles of sustainable low emissions development. To that end, Trinidad and Tobago, through the Petroleum Company of Trinidad and Tobago (Petrotrin), has connected with specialized agencies and programs in the United Nations family resolved to manage the effects of climate change and provide financial support for climate mitigation and adaptation. In August of 2013 Trinidad registered its first CDM project with the UNFCCC. It is a standardized oilfield gas emission reduction open platform with a 28 year life and can be deployed not only in Trinidad and Tobago but other developing countries. This CDM standardized project is the foundation for a national emission reduction credit system.

Petrotrin is a fully integrated oil and gas company with both upstream and refinery operations. It owns 290,000 acres of land and 900,000 acres of marine territory serviced by 2700 oil wells. Located 7 miles off the coast of Venezuela it is strategically located to promote its CDM programmatic open platform throughout the Caribbean, Central and South America. The Programmatic CDM methodology to be used to jump start the Trinidad and Tobago credit system is:

- AM0009 Version 06.0.0: Large-scale Methodology - Recovery and utilization of gas from oil fields that would otherwise be flared or vented.
- Typical projects: Associated gas from oil fields (including gas-lift gas) that was previously flared or vented is recovered and utilized.
- The type of GHG emissions mitigation action is fuel switch. Fuel switch is the displacement of use of other fossil fuel sources, such as natural gas, dry gas, LPG and condensate, by utilizing recovered associated vented or flared gas from oil fields.

During the first Kyoto commitment period the CDM emerged as the global currency for emissions trading. CDM has mobilized over 400 US billion dollars of investment in developing countries in more than 7,500 projects. The CDM has reduced 1 billion tons of emissions. The Trinidad CDM programmatic project will be a critical link to 1st and 2nd generation international carbon markets.

3.2 Ammonia and Methanol Production

Trinidad and Tobago has benefitted greatly from investing in the energy sector. The nation has achieved a competitive position in liquefied natural gas and petrochemical production. It was also one of the first countries in the world to switch from “dirtier” carbon intensive fossil fuels and generate all of its electricity from cleaner burning natural gas. However, the nation is not exempt from the environmental conundrum that many developing nations face when pursuing economic development through natural resource exploitation. The major sources of carbon emissions in the country stem from the very industries that helped secure its position as a world leader in natural gas monetization and underpin a

major portion of its revenues. The petrochemical sector in particular is responsible for an estimated 56% of all national CO2 emissions[1]. Trinidad and Tobago has therefore continued to struggle with further carbon reduction commitments beyond that of the conversion of its power plants to natural gas fired generation. This is despite having a plethora of opportunities that align environmental goals with economic and strategic opportunities in similar fashion. The following will examine these opportunities with specific emphasis on the petrochemical sector and outline a combined model that seeks to reduce carbon emissions, improve resource management, create job opportunities and protect the environment.

There are currently 11 ammonia and 7 methanol plants in existence with plans for another methanol plant to be constructed by 2017. Ammonia production is responsible for 76% of CO2 emissions in the petrochemical sector[1] and can be simplified into a three step process, the first of which is steam reforming. Steam reformation involves combining natural gas with steam at high temperatures in order to form hydrogen and carbon monoxide or synthesis gas. The second step involves combining the carbon monoxide with water to form additional hydrogen. During this step, highly purified carbon dioxide is produced as a waste stream. The final step involves combining the hydrogen acquired from the first two steps with nitrogen to form ammonia.

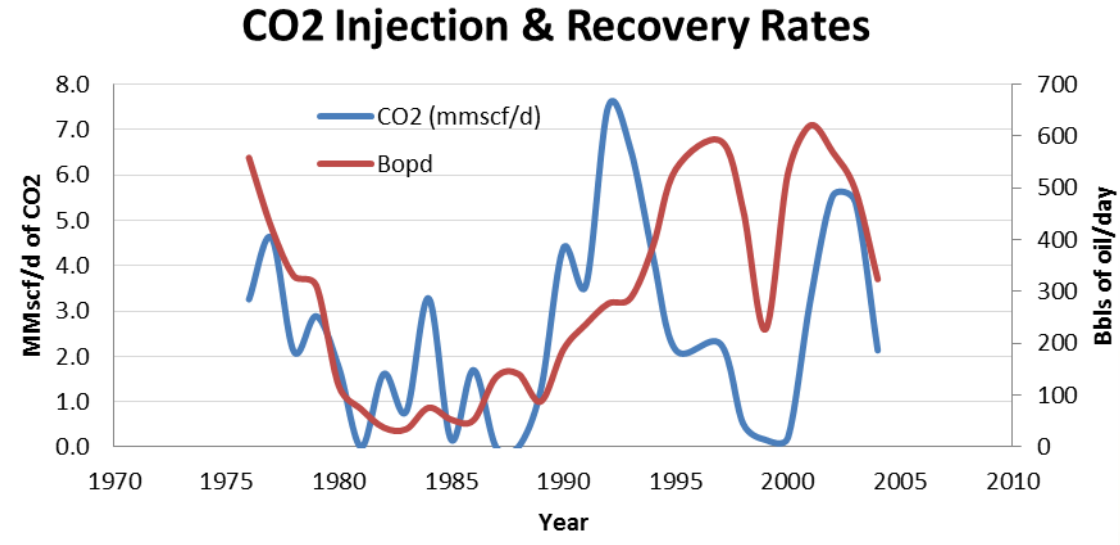
Ammonia production is very energy intensive and requires as much as 40% of the inlet feed gas to be combusted for heat generation. The remaining 60% of the feed gas is used to create synthesis gas. Carbon dioxide is created as a waste product of this process both in the combustion of natural gas as well as the catalytic shift conversion that produces more hydrogen from carbon monoxide component of the synthesis gas. In 2010 the total energy used in ammonia production was 299.6 TJ[1]. Using the Intergovernmental Panel on Climate Change (IPCC) tier 2 approach for computing CO2 emissions, this resulted in 16.9 MT of CO2, 10MT of which was relatively pure[1]. The methanol industry requires carbon dioxide as an input for methanol production. Hence, the identification of the methanol industry as a CO2 sink was easily identifiable. As a result about 1.3 MT of CO2 per annum is captured and utilized in methanol production[2]. This has resulted in the existence of a high level of expertise and familiarity with the capture and transportation of CO2 within Trinidad and Tobago. Other sinks for CO2 exist that can allow Trinidad and Tobago to view CO2 as a valuable commodity that should be utilized rather than vented.

3.3 Enhanced Oil Recovery Using CO2

An example of such a sink is a depleted or mature oil field. In mature fields carbon dioxide can be injected into the formation to reduce viscosity and surface tension in reservoir rock thereby effectively raising the rate of production from these older wells. Any CO2 that returns to the surface can be captured and recycled back into the formation. At the very least, 50% of the CO2 injected will remain in the reservoir. In other words, this method has the ability to significantly reduce the nation's high levels of CO2 production while increasing its rate of oil production.

[1] Boodlal, 2010 adapted from MEEA Bulletin Reports
[2] MEEA, 2009

Of the 10 MT of relatively pure CO2 produced in 2010 by the ammonia sector, 8.7 MT was available for CO2 EOR but none was utilized for this purpose. CO2 EOR projects have had proven levels of success in Trinidad and Tobago. According to the Ministry of Energy and Energy Affairs Administrative Reports CO2 EOR projects took place in Trinidad between 1976 and 2004. In any given year CO2 was injected in 4 fields on average. The carbon dioxide was supplied by the existing ammonia facilities and around 3 million barrels of oil were recovered over the 28 year period (See figure below).



Source: Ministry of Energy Administrative Reports 1976-2004.

In 1987 and 1988 injection was suspended as lines became corroded and unusable[3]. In discussions with former Ministry of Energy employees, it was revealed that line corrosion also plagued the later CO2 projects as well. The issue was caused by the transportation of wet CO2 in unlined pipelines and eventually resulted in suspension of CO2 EOR indefinitely. Furthermore, residential settlements have grown around these abandoned pipelines making their restoration and resumed operation questionable as CO2 is not only colorless and odorless, but poisonous in large concentrations as well. In order for CO2 EOR to become a reality, significant investments onshore in CO2 pipeline and compression infrastructure will have to be made. Despite these challenges, CO2 EOR is a proven method of reducing carbon emissions and increasing production in Trinidad and Tobago. However, CO2 EOR is not the only method of reducing petrochemical sector emissions. Improved energy efficiency at the petrochemical facilities can also result in reduced emissions.

[3] Ministry of Energy Administrative Report 1987 & 1988

3.4 Energy Efficiency in the Petrochemical Sector

Conversion efficiencies of the plants in the petrochemical sector depend on many variables. Within Trinidad and Tobago newer plants with improved process technologies have the benefit of higher efficiencies. In contrast, older plants suffer inefficiencies due to outdated process technologies and aging equipment. This is evident in the conversion efficiencies of the eleven ammonia plants in Trinidad. Efficiencies range from 50mmbtu/MT of ammonia produced for older plants to 32mmbtu/MT of ammonia produced for newer facilities. The methanol plants which are comparatively younger than the ammonia plants are more efficient and range from about 40mmbtu/MT to 32mmbtu/MT of methanol produced. The global industry average for ammonia and methanol plants is around 36mmbtu/MT. Therefore Trinidad has a significant opportunity to reduce its carbon footprint by focusing on the efficiency of the petrochemical sector. Improvements in conversion efficiency at the Point Lisas Industrial Estate will result in lowered natural gas consumption, reduced CO2 emissions, an improved national reserves position as well as net benefits to the bottom line of plant operators. It is estimated that if we can increase our energy efficiencies of these plants in Trinidad to global averages, we can mitigate about 4 million tonnes of CO2 per annum[1].

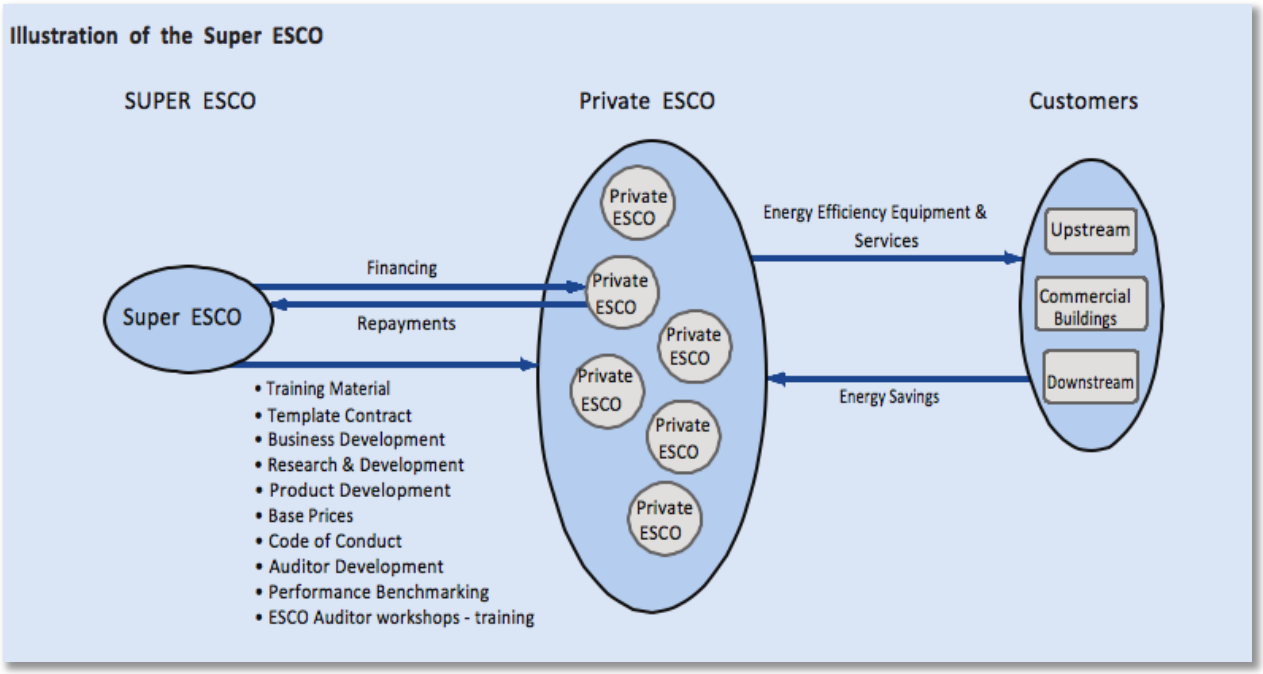
3.5 Energy Service Companies

In Trinidad and Tobago the government has recognized the importance of energy efficiency and has given tax credits and allowances to companies that engage ESCOs to improve the energy efficiency of their businesses and operations. ESCOs or energy service companies traditionally perform services that reduce energy demands by lighting upgrades, building climate management, process equipment change out and turbo machinery retrofits to facilities. The Energy Chamber's ESCO certification model seeks to provide all of the integral components necessary to ensure successful ESCO operation in Trinidad and Tobago including, but not limited to, training of personnel, financing, performance benchmarking and research and business development opportunities. This programme combined with an effective emission trading system and support from all relevant stakeholders including the Ministry of Environment and Ministry of Energy, will allow for a realized reduction in CO2 emissions in as little as 5 years[4] for CO2 EOR projects and 2 years for Energy Efficiency projects[5]

[4] Project timelines include 1-2years for in depth feasibility studies to examine all the methods involved 2 years for CO2 EOR project implementation, 1 year for post project evaluation.

[5] Project timelines include 6months - 1year for investment grade audit evaluations and recommendations and 6 months – 1 year for tendering, equipment purchase, installation and post project evaluation

Figure3: Illustrating the Chamber Super Energy Service Company (ESCO) Plan



4.0 ACTION PLAN

4.1 Mitigation in the Power Generation Sector

To address mitigation in Trinidad's power generation sector, three "low-hanging fruit" options are considered. These are:

1. Increasing efficiency in power generation
2. Improving power consumption efficiency
3. Carbon capture and sequestration (CCS)

4.2 Increasing Efficiency in Power Generation

There are presently five (5) power generation plants within T&T. In addition to these, Atlantic's liquefied natural gas (LNG) plant generates its own power to drive related compressors. These plants (including LNG) are all listed in the table below together with their generation capacities, efficiencies and technologies. The weighted average of the efficiencies of all the simple cycle plants is 27%. If this is improved to 40% to 45%, a reasonable efficiency for a retrofitted combined-cycle plant, then an estimated 5 Mt of CO_2e can be mitigated annually[1].

Plant Name	Capacity	Technology	Efficiency
Powergen, POS	320 MW	Steam Turbines	21.5%
Powergen, Point Lisas	630 MW	Steam Turbines	28%
Trinity Power	225 MW	Gas Turbines	27.5%
LNG	1000 MW	Gas Turbines	28%
TGU	720 MW	Combined Cycle	55%
Powergen, Penal	225 MW	Combined Cycle	39%

4.3 Improving Power Consumption Efficiency

The only method of power consumption efficiency assessed in this study was that of power factor improvement. A lower power factor results in a greater demand charge for industrial consumers. It also ultimately requires more power to be generated and transmitted to meet the extra requirements of inductive loads. It follows, therefore, that an increase in power factor can result in a decrease in electricity demand because of concomitant reduced generation and transmission. This can result in should both an overall decrease in emission levels and generation of savings. Power is consumed in T&T according to table below:

Consumer Type	Amount Demanded (MW)	Percentage (%) of Total Consumed	Related CO_2e Emissions (Mt)
Residential	406	13	1.56
Commercial	156	5	0.6
Industrial	2527	81	9.72
Street Lighting	31	1	0.12

The largest Power Consumption sector within the country is industrial (LNG included). This sector is also more suited to power factor improvement, since it contains more of the inductive loads (such as motors) that contribute to lower power factors. If improvements are implemented within this sector to increase the power factor from the present levels of 0.8 to about 0.95, then a potential to avoid 2 Mt of CO_2e annually exists[1].

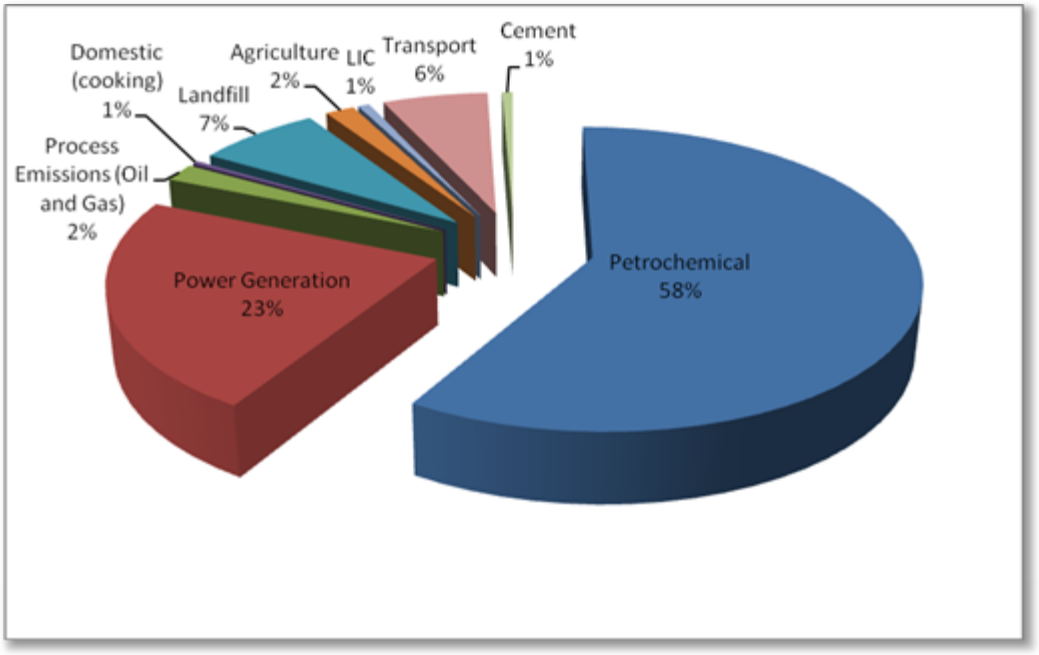
4.4 Carbon Capture and Sequestration

This technology was assumed to apply to the emissions from the power plants **after** their efficiencies have been enhanced via the technologies described above. Unlike emissions from ammonia plants (which are ideal to be used for EOR), these emissions must be captured before liquefaction and transportation to a storage site. It is estimated that 2 MT can be mitigated with this technology in the long term[1].

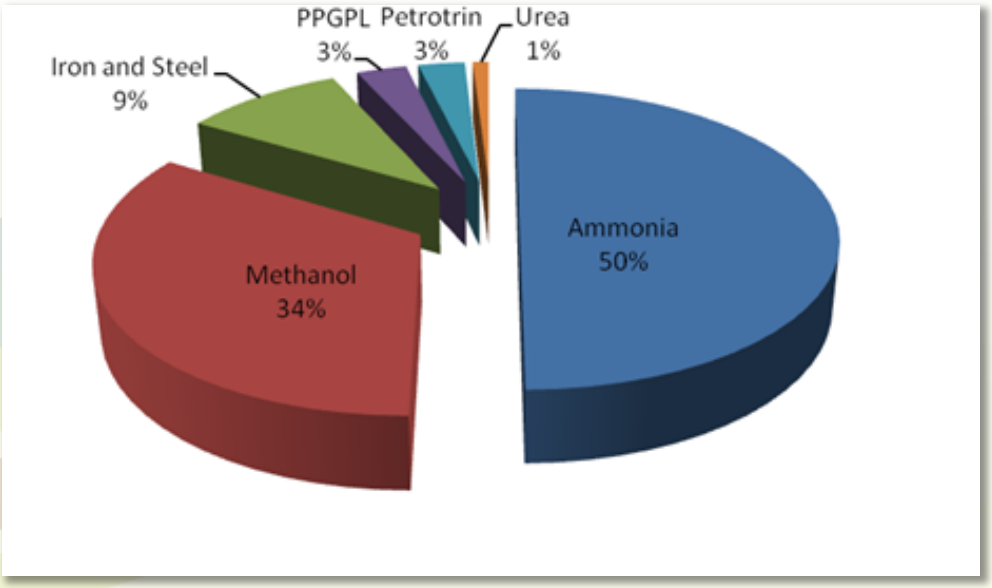
4.5 Fuel Switching to CNG

Fuel switching to CNG in the transportation sector can be an ideal mitigation strategy for Trinidad. Once the substitution of gasoline and diesel to alternate low-carbon fuels is extensively implemented, the very costly fuel subsidy, presently in place in order to reduce the financial burden on the low-income population sector, can be reduced along with the transportation-related GHG emissions. The potential reduction resulting from implementing this strategy in Trinidad is approximately 2 MT of carbon dioxide equivalent (CO2e) [1].

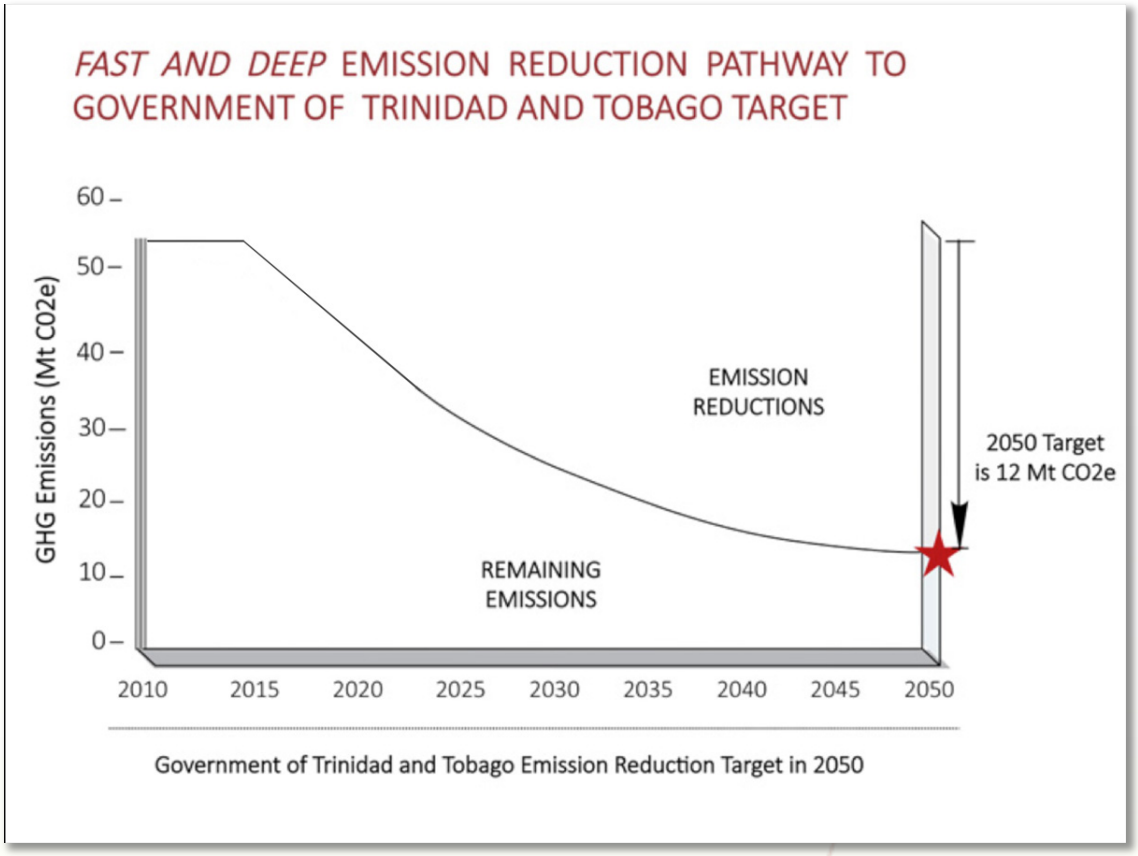
An inventory of anthropogenic greenhouse gas (GHG) emissions was conducted in 2010 in accordance with the Intergovernmental Panel on Climate Change (IPCC) 2006 Tier 2 methodology. From this, the total related emission level for T&T was found to be 53 million tonnes, MT). These emissions stemmed from various sectors throughout the country, and this sectoral breakdown is illustrated in following figure. From this figure, it can be seen that the two major sectors are the Power and Petrochemical Sectors, together accounting for more than 80% of total emissions. This is an important point which exemplifies further the energy-intensive nature of T&T's economy since the global average for these sectors (when combined) is 63% (IEA Statistics 2010). Also of interest is the fact that although the country has large number of vehicles per capita, the transportation sector only accounts for about 6% of the total compared with the global average of about 22%.



A breakdown of the largest contributor, the petrochemical sector (57%), can be seen in other figure illustrated below. This figure shows that the largest contributors are from Ammonia (55%) and Methanol (28%) production. This is not surprising since T&T is the largest exporter of both commodities in the world (Encyclopedia of the Nations 2011) and can even boast of having the two largest methanol plants in the world (by production capacity).



As such, for mitigation efforts to impact significantly in Trinidad, they should be directed towards these sectors. It has also been shown that low cost opportunities also exist in the transportation sector and as such this sector should also not be excluded.



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