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PIONEER

BUSINESS | PEOPLE | ENVIRONMENT, HEALTH, SAFETY & SECURITY

Drilling Deeper into Energy:

Is There More to Explore?

A subsidiary of THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO LIMITED

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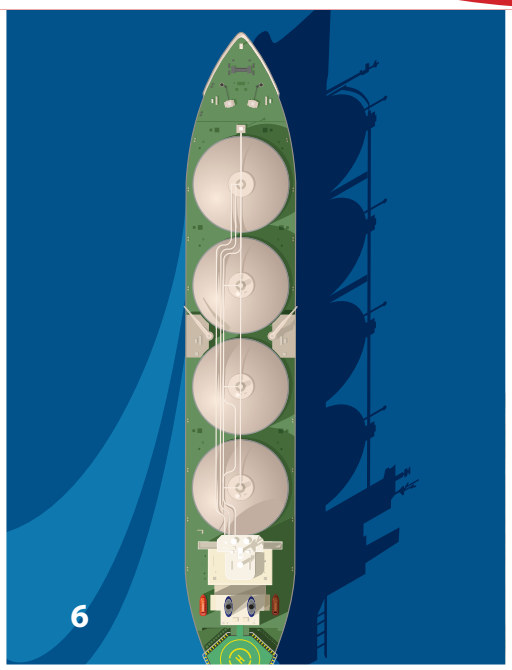


DRILLING DEEPER INTO ENERGY: IS THERE MORE TO EXPLORE?

Say the word 'energy' in Trinidad and Tobago and immediately thoughts surrounding petroleum and natural gas are conjured; in the traditional context, this would be fitting. However, other Caribbean islands such as Aruba and Dominica and countries around the world have been taking bold steps towards redefining their energy landscapes in terms of renewable energy sources. In Trinidad and Tobago, we use hydrocarbon-based energy for electricity generation, as feedstock for petrochemicals and transportation fuel. Some of our natural gas is exported as Liquefied Natural Gas (LNG) while Natural Gas Liquids (NGL) are also exported. But are we optimising the use of all the forms of energy available to us and are we capitalising on opportunities along the full energy value chain? If not, how can other energy sources be incorporated into the country's energy mix and how can we extract additional value from our existing energy operations?

In this issue of the *Pioneer*, we take a closer look at energy to uncover latent opportunities for diversification within and around the current energy offering. We will examine the global trends in renewables and the prospects for Trinidad and Tobago to adopt renewable energy technologies. Alternative fuel options will also be looked at against the backdrop of reduced fuel subsidies.

The NGC Group signalled its intention to enter the commodity trading business with its first, third-party commodity trade and shipping contract (charter party) in 2016. Thus, the *Pioneer* will examine the global commodity trading business to learn more about the ways in which it can help strengthen The NGC Group's services portfolio.

In keeping with National Energy's mandate to develop infrastructure to support the development of downstream energy-based industries, updates will be provided on two (2) of the major infrastructural projects currently being undertaken – the Reconstruction of the La Brea Industrial Development Company Limited (LABIDCO) Corridor and the Pipeline Right of Way (ROW) Project as well as operations at the Port of Galeota.

You are invited to take a journey with us as we drill deeper into energy to explore further aspects for development.

DELVING INTO THE DEEP:

CAPTURING VALUE IN THE TRADE

By: Stephon Jimenez

The National Gas Company of Trinidad and Tobago (NGC) is currently pursuing a growth strategy in which the expansion of its Liquid Natural Gas (LNG) trading business is a major component. Expansion of NGC's trading business creates opportunities for a deepening of the State's participation and thus, increases the value captured from the exploitation of our natural gas resources. Commodity trading promises to allow not only for increased rent capturing but also increased ownership by nationals of Trinidad and Tobago. This business would spread commercial risk along the value chain and develop a new set of energy-related skills in Trinidad and Tobago. Given this important pivot by The NGC Group and the many benefits that can accrue to the country, it may be important now to shed some light on the business of commodity trading by highlighting exactly what commodity trading is, who are some of the major players, and exactly how value is created in this business.

The trading of the basic commodities that are transformed into the foods we eat, the energy that fuels our transportation, heats and lights our homes, and the metals that are present in the myriad objects we employ in our daily lives is one of the oldest forms of economic activity. Yet, even though this activity traces its origins into prehistory, commodity trading is often widely misunderstood, and, as a consequence, is often the subject of controversy.

This article is intended to help demystify the commodity trading business. It presents a combination of description and analysis that explain the salient features of the commodity trading business and commodity trading firms.

What is a commodity trading firm?

Commodity trading firms are all essentially in the business of transforming commodities in space (logistics), in time (storage), and in form (processing).

Virtually all agricultural, energy, and industrial commodities must undergo a variety of processes to transform them into things that we can actually consume. These transformations can be roughly grouped into three categories:

1. **Transformations in space**: Spatial transformations involve the transportation of commodities from regions where they are produced (supply regions) to the places they are consumed. The resources where commodities can be efficiently produced, such as fertile land or mineral deposits, are almost always located away from, and often far away from, the locations where those who desire to consume them reside. Transportation—transformation in space—is necessary to bring commodities from where they are produced to where they are consumed.

2. **Transformations in time**: Just as the locations of commodity production and consumption typically do not align, the timing of commodity production and consumption is often disjointed as well. This is most readily seen for agricultural commodities, which are often produced periodically (with a crop being harvested once a year for some commodities) but which are consumed continuously throughout the year.

3. **Transformations in form**: Commodities often must undergo transformations in form to be suitable for final consumption, or for use as an input in a process further down the value chain. For example, crude oil must be refined into gasoline, diesel, and other products that can be used as fuels.

How is value created in commodity trading?

Firms that engage in commodity trading attempt to identify the most valuable transformations, undertake the transactions necessary to make these transformations, and engage in the physical and operational activities necessary to carry them out. The creation of value in commodity trading therefore involves optimising these transformations. This is an inherently dynamic process because the values of the myriad possible transformations vary over time due to shocks to supply and demand. For instance, a good harvest of a commodity in one region will typically make it optimal to store additional quantities of that commodity and to transport the additional output to consumption locations. The primary role of commodity trading firms is to identify and optimise those transformations.

An important determinant of the optimisation process is the cost of making the transformations. These costs include transportation costs (for making spatial transformations), storage costs (including the cost of financing inventory), and processing/refining costs. These costs depend, in part, on constraints/bottlenecks in the transformation processes. All else being equal, the tighter the constraints affecting a particular transformation process, the more expensive that transformation is. Commodity traders characterise their role as finding and exploiting "arbitrages." An arbitrage is said to exist when the value of a transformation, as indicated by the difference between the prices of the transformed and untransformed commodity, exceeds the cost of making the transformation.

Who are the companies involved in commodity trading?

A large and diverse set of firms engage in commodity trading. Indeed, the diversity is so extensive and occurs along so many dimensions, that it is difficult to generalise. Some commodity trading firms are stand-alone entities that specialise in that activity. For example, well-known trading firms such as Trafigura and Vitol are independent and engage almost exclusively in commodity transformation activities. Other commodity traders are subsidiaries or affiliates of other kinds of firms. Many banks have or had commodity trading operations. Some of the most prominent examples include J. Aron (part of Goldman Sachs since 1981), Phibro (once part of Citigroup and before that Salomon Brothers, though it is no longer affiliated with a bank), and the commodity trading divisions of Morgan Stanley, J. P. Morgan Chase, and Barclay.

Other commodity trading entities are affiliated with larger industrial enterprises. Most notably, many "supermajor" oil companies such as Shell, BP, and Total have large energy trading operations though some, notably Exxon, do not . Pipeline and storage operators "midstream" firms such as Kinder Morgan and ETP in the United States in energy often engage in trading as well. Commodity trading firms also differ by the breadth of the commodities they trade. Some are relatively specialised, trading one or a few commodities. Others trade a broader set of commodities but within a particular sector. For instance, the traditional "ABCD" firms – ADM, Bunge, Cargill, and Louis Dreyfus – concentrate in agricultural commodities, with lesser or no involvement in the other major commodity segments, although Cargill does have a sizable energy trading operation. As another example, some of the largest trading firms such as Vitol, and Mercuria, and the energy trading-affiliates of the oil supermajors, focus on energy commodities, with smaller or no presence in other commodity segments. One major trading firm, Glencore, participates in all major commodity segments, but has a stronger presence in non-ferrous metals, coal, and oil. Another, Trafigura, is a major energy and non-ferrous metals trader. Firms with a presence in a particular sector e.g. agriculture, also vary in the diversity of commodities they trade. Olam participates in 18 distinct agricultural segments, whereas Bunge focuses on two (2) and other major firms are active in between three (3) and seven (7) different segments.

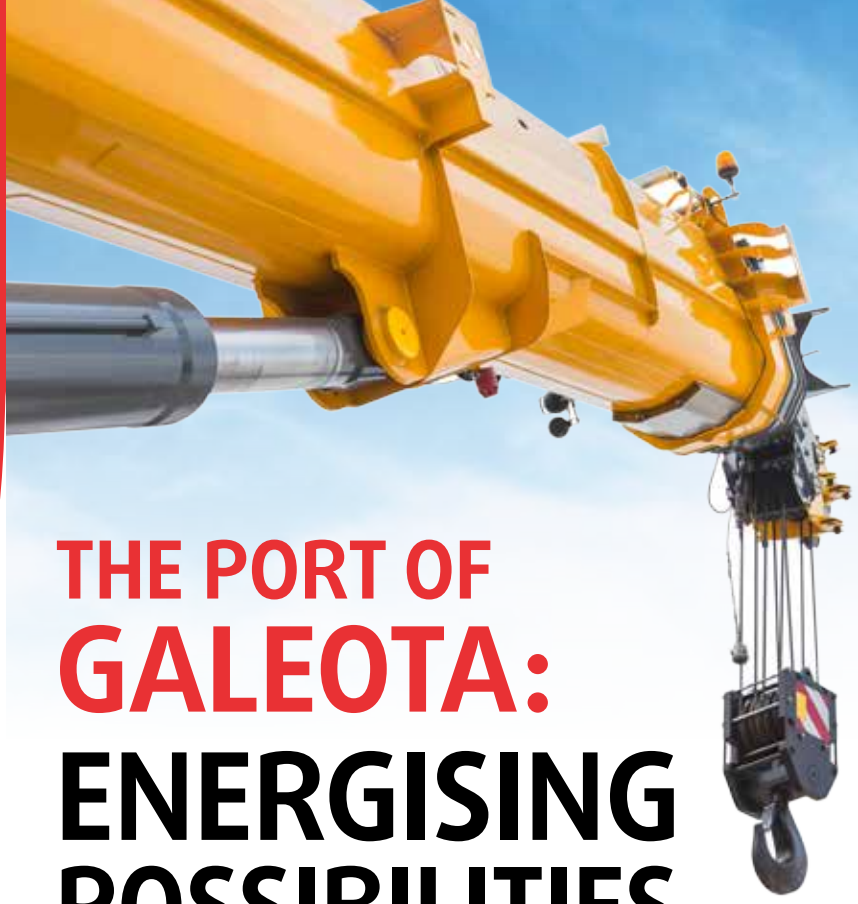
Types of skills required for commodity trading

The commodities industry is one of the few professions that do not require a specific qualification but rather a wide range of demonstrated skills and accomplishments. These could include a grasp of economic history, global practices and trends in transport and shipping, and a general knowledge of world events. Traders should also uphold transparency and be prepared to explain financial transactions and data to others. One of the key attributes a commodity trader should possess is an understanding of the world around them and how supply and demand actually work. Commodity trading is a 24/7 business, which means traders need to be prepared to adjust to flexible schedules.

Conclusion

There have been several rapid and fundamental changes in the global natural gas market which have introduced new dynamics to The NGC Group and others. These changes include the increases in unconventional proven gas reserves in the US and Argentina, exportation of LNG from the US Gulf Coast, shifting of demand centres for petrochemical products, and greater competition from emerging hydrocarbon provinces. These new dynamics have indeed provided an opportunity for The NGC Group to take a bold step into the largely unexplored area of commodity trading. The move is consistent with The Group's vision of strategically positioning itself as a global leader in the energy business.

Source: *Gasco News*, Volume 26, No. 1, April 2016



THE PORT OF GALEOTA: ENERGISING POSSIBILITIES

The Port of Galeota was opened on 5 September 2014. Referred to as the country's first 'Energy Port,' the Port of Galeota offers endless possibilities for companies operating on the east coast, southern and southeastern peninsulas of Trinidad. Based on its strategic location, the Port of Galeota is also positioned to become a gateway to South America, in particular, to Guyana and Suriname which have had recent hydrocarbon discoveries.

The Port is being executed in two (2) phases. Phase 1 has been operationalised in order to capitalise on the opportunities presented in the new burgeoning territories, as well as upcoming deepwater exploration projects such as bpTT's Juniper. The Port of Galeota Phase 1 comprises five (5) berths, one of which is dedicated to the Trinidad and Tobago Coast Guard. The facility provides a draft depth of 7.6m with a 200m turning basin and 80m channel. Users also have access to 529m of quay wall, 1.2km of paved roads and 15 acres of backlands.

At present, the major activities carried out at the Port include energy services to support offshore exploration and production (E&P) off Trinidad's east coast. The major users comprise E&P companies – bpTT, BHP, Repsol and Trinity Exploration and Production plc. Through the implementation of the operationalisation plan, National Energy expects the number of users and scale of operations at the facility to grow steadily, as onsite services are increased and improved.

In order to facilitate bonded warehousing, equipment storage and offshore services to companies such as Peterson, bpTT and Repsol, construction of a 27,000 ft^2 warehouse is in progress. The warehouse is being constructed by General Earth Movers Limited. Administrative space will also be provided for Customs and the Trinidad and Tobago Coast Guard, the Designated Authority for ports in the country.

As a responsible corporate citizen, National Energy supports the maximisation of local participation on all our projects and accordingly, residents of the fenceline communities of Mayaro/Guayaguayare were employed during the Port's construction phase and the company is continuing the practice on this project.

The operationalisation plan is being guided by the Port Operating Procedures and the Port Security Plan in line with the standards of all marine facilities managed by National Energy. In preparation for the transition from a sufferance port to a fully commercialised facility, an operating model is currently being developed for partnering with international port operators who will be involved in delivering key value-added investment and services while generating increased commercial activity for the Port. Simultaneously, negotiations and discussions are continuing with prospective long-term tenants to lease land at the Port while spot activities continue to be accommodated.

At a preliminary estimated cost of US$130 million, Phase 2 will see the construction of 466m of additional quay wall to provide five (5) additional berths. The extended Port will feature a dredged depth of 12.8m to allow for berthing of 60,000 DWT vessels. This phase of the Port of Galeota will facilitate increased deepwater exploration and production activity off Trinidad's east/southeast coast as well as in the Guyana/Suriname Basin.

While the new Port of Galeota is in its early stages of development, operations are being handled by a team of employees from the Operations Group and as the activities advance, the appropriate skills and competencies will be added to the team.

For all local and international investors seeking a gateway to South America and the wider Caribbean, the Port of Galeota may be the catalyst you have been looking for to launch the next phase of your business. We invite you to consider the Port of Galeota which is open and ready for business.

RECONSTRUCTION OF THE LABIDCO CORRIDOR AND PIPELINE ROW PROJECT

The La Brea Industrial Development Company Limited (LABIDCO) was established to manage the La Brea Industrial Estate in 1995 and since then, the estate has grown steadily to become a significant industrial centre in the southwestern region of the country. The estate's main corridor has been in use for over 20 years and now requires reconstruction to meet the expanding needs of the estate and Port of Brighton operations. To this end, a contract was awarded to Junior Sammy Contractors Limited (JSCL) for the Reconstruction of the La Brea Industrial Development Company Limited (LABIDCO) Corridor and Pipeline Right of Way (ROW) Project.

The project, which was designed by Trintoplan Consultants Limited, saw the collaboration of Caribbean Gas Chemical Limited (CGCL) and National Energy. The Business and Technical Support (BTS) Department reviewed the scope for the design and the construction phase of the works is being managed by National Energy's Infrastructure Planning and Development (IPD) Department.

The project entails widening and realignment of the existing roadway which is being conducted in phases, to minimise disruption to traffic flow at the estate. The new roadway will be 8m wide with a 3m wide shoulder on either side. This is being done primarily to accommodate movement of modules for the construction of the CGCL plant in 2017. For the pipeline ROW, an embankment is being constructed to accommodate the CGCL pipeline, which will be used to transport products from their Natural Gas to Petrochemicals Complex located at the Union Industrial Estate.

The corridor's drainage is also being enhanced based on an upgrade to the design. Sub-surface drains are being installed to handle ground water and new surface drainage will also be installed throughout the length of the roadway.

Another major element of the reconstruction project involves relocation of utility lines including electricity,

Road paving and ongoing utility relocation works at La Brea Industrial Estate.

water and communication. Discussions are being held with stakeholders including tenants, Trinidad and Tobago Electricity Commission (T&TEC), Water and Sewerage Authority (WASA) and Telecommunications Services of Trinidad and Tobago (TSTT) in order to manage the repositioning of these lines in a safe and efficient manner while minimising disruptions to services. A plan is also being put in place for the protection of NGC pipelines during the works.

Tenants on the La Brea Industrial Estate have welcomed the project which would redound to the benefit of all who utilise the estate. The realigned and resurfaced roadway will contribute towards improving safety and efficiency of traversing, while improved drainage will ensure the longevity of the road infrastructure. With the widening of the corridor, larger vehicles can now be accommodated while the addition of shoulders would allow vehicles to pull aside in the event of an emergency without interrupting the flow of traffic.

As at the end of December 2016, the works were 60% completed overall and on average, 40% of persons employed on the project come from the community of La Brea and environs. Two (2) layers of asphaltic base course was laid over the majority of the carriageway. The embankment to accommodate the CGCL pipelines on LABIDCO Estate was substantially completed at the end of December 2016. Work on the embankment at the Union Industrial Estate site is being undertaken as a separate contract.

To date, there have been no accidents or loss time incidents on the project. The project has augured well for continued collaboration and cooperation among stakeholders who are all looking forward to using the reconstructed corridor.

Be in the Know Tour visits Union Industrial Estate

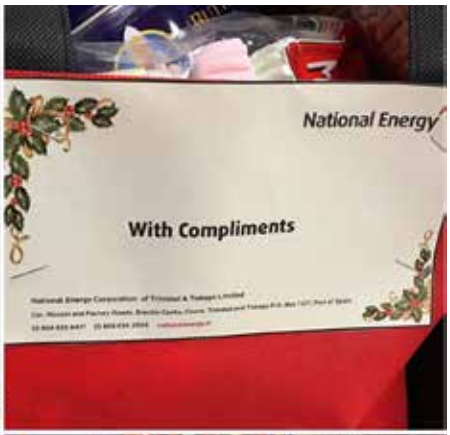
'BE IN THE KNOW' TOURS

Be in the Know Tour at Berth 2, Port of Brighton

In 2016, students from the Vacation Employment Programme across The NGC Group along with employees, got an opportunity to visit National Energy's projects at La Brea and Guayaguayare. This was part of the 'Be in the Know' tours hosted by the Corporate Communication and Administration Department.

On the first tour, held on 27 July 2016, the group visited the La Brea Industrial Estate, Union Industrial Estate and Berth 2 at the Port of Brighton. This was facilitated by Bobby Thomas, Senior Project Engineer from the Infrastructure Planning and Development Department as well as representatives of Soletenche Bachy Cimas, contractor for the repairs to Berth 2.

The second tour, took place on 17 August 2016, when the students and employees visited the Port of Galeota and Fish Landing Facility at Guayaguayare. The group also got the chance to board the *National Energy Explorer*, the company's Fast Crew Supply Vessel, which is used for transport of crews and cargoes. Following the tour they were treated to lunch prepared by the vessel's cook.



ANNUAL CHRISTMAS CHARITY DRIVE 2016

Employees brought in food items and donated cash towards the Annual Christmas Charity Drive 2016. Hampers were distributed to families in the Company's fenceline communities of La Brea and Mayaro/ Guayaguayare and environs. Thanks to all employees who gave generously and assisted in packing hampers.

TAKE YOUR KIDS TO WORK DAY 2016

On August 11th 2016, National Energy hosted its annual "Take Your Kids to Work Day." Several children of National Energy employees aged 4-12 participated in the event which kicked off with a company-wide tour in which they met National Energy President, Dr Vernon Paltoo. He urged the children to work hard to achieve their goals and congratulated those in the group who were successful in the 2016 Secondary Entrance Assessment (SEA) Examination.

The Zoological Society of Trinidad and Tobago treated the group to a surprise when they brought animals including an ocelot, a porcupine and a boa constrictor, among others. The children and their parents were invited to interact with the animals while learning about their natural habitats.

The day capped off with the younger kids thoroughly enjoying themselves on the bouncy castle while the older ones tested their skills on the velcro wall and the sumo wrestling ring.

Learning about wildlife preservation

The kids got to meet some very special guests

Let the games begin!

GLOBAL TRENDS IN RENEWABLE ENERGY

Renewable Energy is generally defined as energy that is collected from resources which are naturally replenished on a human timescale.

TYPES OF RENEWABLE ENERGY

- SOLAR ENERGY
- WIND ENERGY
- GEOTHERMAL ENERGY
- BIOENERGY

Renewable energy has been attracting increased attention for several years now. Why?

Globally, there is a heavy dependence on fossil fuels such as coal, oil, and natural gas for the world's continuously growing energy needs. Fossil fuels are non-renewable, meaning that their finite resources will eventually diminish. Additionally, the burning of fossil fuels results in carbon dioxide being released into the environment, which, over the years, has led to global warming and accelerated climate change. Renewable energy is a possible solution to combat the effects of global warming while simultaneously meeting the world's energy requirements.

Renewable energy technologies seek to harness clean sources of energy that have a much lower environmental impact than conventional energy technologies. Using renewable energy technologies can reduce the dependence on fossil fuels for electricity, motor fuels, rural energy and heating. According to data collected by the International Panel on Climate Change, the global warming emissions related to renewable energy are minimal. This includes manufacturing, installation, operation and maintenance, and dismantling and decommissioning of required equipment. For example, it was noted that when compared to natural gas-based electricity generation, which emits 0.6 to 2 pounds of carbon dioxide equivalent per kilowatt hour (CO2E/kWh), solar power emits 0.07 to 0.2 CO2E/kWh.

What is the world doing in terms of renewable energy technologies?

According to the United Nations Environment Programme (UNEP) and Bloomberg New Energy Finance, all investments into renewable energy technologies totalled US$286 billion in 2015. It should be noted that coal and gas-fired electricity generation attracted less than half the record contributions made in solar, wind, and other renewables. From this same report, the developing world seems to be taking the lead in producing renewable energy technologies. The developing world's investments in renewables, up 19% in 2015, topped those of developed nations for the first time in 2015. While much of this record-breaking developing world spending took place in China, other developing countries that recorded an increase included India, South Africa, Mexico and Chile. Within the group of developing countries, China, India, and Brazil, considered to be the "big three" saw a rise of 16% to US$120.2 billion, while other developing economies enjoyed a 30% escalation to US$36.1 billion.

Both wind and solar technologies hit record levels of utility-scale asset finance in 2015. Financing into wind technologies increased by 9% to a total of US$107 billion globally, due to appreciations in both the onshore and offshore sub-sectors. Of these wind technology projects, six of the top 20 global wind deals were for offshore projects in China; whereas solar energy technologies grew by 13% amounting to US$80.9 billion.

On 22 April 2016 (Earth Day), 175 countries signed the Paris Agreement in New York, a global agreement on the reduction of climate change, beginning the process for adopting it within their own legal systems (through ratification, acceptance, approval, or accession. The Agreement was the outcome of successful negotiations among the 196 parties attending the 2015 United Nations Climate Change Conference, COP 21 or CMP 11 held in Paris, France, from 30 November to 12 December 2015. The key result was an agreement to set a goal of limiting global warming to less than 2 degrees Celsius (°C) compared to pre-industrial levels. The agreement calls for zero net anthropogenic greenhouse gas emissions to be reached during the second half of the 21st century.

More recently, in November 2016, the International Renewable Energy Agency (IRENA) and the Abu Dhabi Fund for Development (ADFD) began a fifth round of funding for Renewable Energy projects in developing countries in the amount of US$50 million.

What is Trinidad & Tobago doing in terms of Renewable Energy initiatives?

Trinidad and Tobago has certainly not just stood by and the country has demonstrated an understanding of the need to adjust policies and think long term in addressing sustainability challenges. The objective of introducing renewable energy locally is not to replace fossil fuels, but rather to provide alternative energy sources to service domestic, commercial and possibly light industrial consumer markets.

Several State and private bodies have been working to bring about the changes such as:

Government of Trinidad & Tobago (www.energy.gov.tt)

- Establishment of the Regional Renewable Energy Centre, following the 2013 signing of a Memorandum of Understanding (MoU) between Trinidad and Tobago and the United States of America to establish this centre in Trinidad and Tobago. The MoU falls within the framework of the Energy and Climate Partnership of the Americas (ECPA) and seeks to foster green initiatives within Trinidad and Tobago and the CARICOM region;
- National Energy Communication Campaign to sensitise the population on traditional sources of energy, energy efficiency and conservation and renewable energy technologies;
- Introduction of fiscal support mechanisms: tax credits, import duty exemptions, 0-rating for VAT purposes, wear and tear allowances etc;
- Providing legislative support: amendment to the T&TEC Act and the RIC Act;
- Installations of Renewable Energy in government buildings including hospitals, medical clinics and schools
- Inclusion of renewable energy and energy efficiency in education curricula of schools, workshops to engage personnel who would be directly engaged in the renewable energy industry eg. technicians/electricians including T&TEC inspectorate, teachers, 'do-it-yourself' individuals;
- Awareness creation re communication fairs, workshops, various media, micromarketing of incentives for renewable energy and energy efficiency;
- Strategic pursuits including renewable energy installations in community centres which would also serve as demonstration centres and thereby promote education and awareness.

Trinidad & Tobago Electricity Commission (www.ttec.co.tt)

- Testing and research ongoing since 2012 for the installation of PV units at the three (3) project sites in Mt. Hope, Arima and a T&TEC/Powergen hybrid solar/wind system in Gasparillo.

University of Trinidad and Tobago (www.u.tt)

- Consideration being given to offering diploma and certificate programmes in the area of renewable energy, both wind and solar power systems.

The Arthur Lok Jack Graduate School of Business (www.aljgsb.com)

- Creation of an incubator programme for entrepreneurs implementing new renewable energy projects.

Private Companies

- Sale of Solar Photovoltaic (PV), solar water heaters, biogas/bio-mass, solar AC systems
- Conduct of energy efficiency and energy audits

National Energy has played a pivotal role in a number of key measures taken to date, which include:

- Member of the Renewable Energy Committee under the Ministry of Energy and Energy Industries (MEEI);
- Installation of Solar PV external lighting in selected community centres under the renewable energy and energy efficiency in Community Centres Project;
- Installation of solar water stills and PV systems for supporting school libraries across 20 secondary schools;
- Conduct of study under the Wind Resource Assessment Programme (WRAP) to assess potential locations for installations of wind power generation systems;
- Construction of solar house at the University of Trinidad and Tobago (UTT), Point Lisas Campus as part of MEEI's National Energy Communication Campaign to generate awareness of the design of

solar and energy efficient systems for households, and the benefits of such systems;
- Use of compressed natural gas, a cleaner burning fuel compared to gasoline or diesel, in the company's fleet of vehicles.

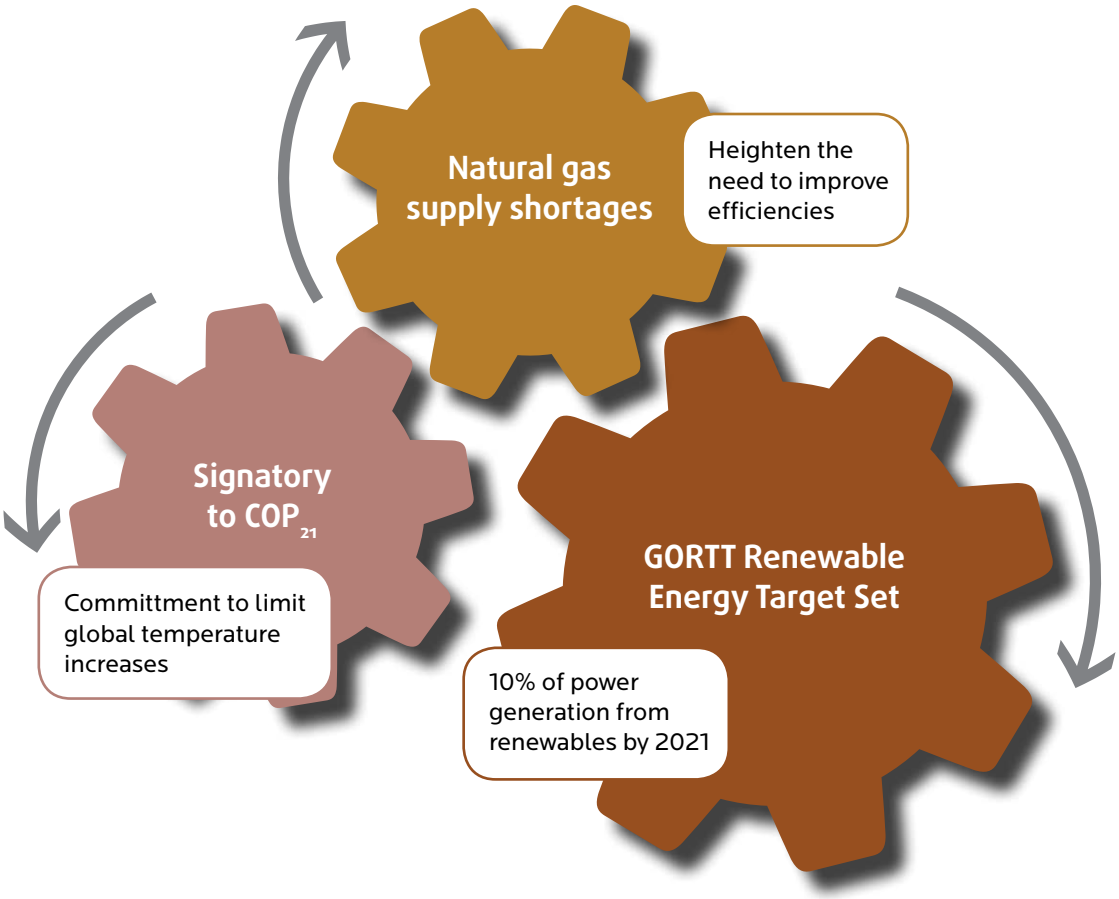
What more can be done?

The conditions for a perfect renewable energy storm may now exist in Trinidad and Tobago given the interplay among the following factors:

These factors may serve as the much-needed impetus to take initiatives already developed to the next step of implementation and encourage innovative approaches to introducing renewable energy to our energy mix.

National, regional and individual actions can all add up to global solutions. As signatories to the COP 21 Paris Agreement, Trinidad and Tobago will have emission reduction targets to meet which have been set by Government of the Republic of Trinidad and Tobago (GORTT). Investing in Renewable Energy technologies today for the provision of energy in the future can reduce the world's dependence on fuels if the initiatives outlined below are more widely implemented:

- The world's use of renewable energy technologies needs to be expanded, and there ought to be a transformation of current energy systems to be cleaner and less dependent on fossil fuels;
- Governments placing tighter limits on carbon emissions may be instrumental to facilitating carbon footprint reduction;
- Vehicle manufacturers ought to improve fuel efficiency and support other initiatives that would allow for a reduced use of oil;



- Public-Private Partnerships to build clean energy economies by investing in efficient energy technologies and approaches.

The Solar Energy Park Project

Due to the importance of renewable energy in creating a sustainable energy future, National Energy has included renewable energy as one of its key areas of focus for development and continues to work with governmental and private partners to advance the implementation and use of renewable energy technologies in Trinidad and Tobago. One of the exciting undertakings the company is currently spearheading is the Solar Energy Park Project.

The project involves the development of a new manufacturing industry based on advanced technology. If implemented, Trinidad and Tobago could see the creation of an energy park consisting of four (4) plants: a metallurgical grade silica plant; a poly-silica plant, a float glass plant, and an integrated PV plant. Utilising silica sourced within the region as raw material, the complex would produce components for use in PV-based technologies.

In 2016, National Energy engaged Sitek Limited, a locally based Renewable Energy consultancy firm, to update the 2013 feasibility study, examining the economic models of the project, among other aspects. The updated study is currently under review by National Energy's Board of Directors.

The Solar Energy Park Project, at an estimated capital cost in excess of US$1 billion, represents a monumental leap forward for Trinidad and Tobago in entering the Renewable Energy business, thereby diversifying the country's energy portfolio. The new industry will also lead to the diversification of technological skill sets and the emergence of ancillary business clusters to support the industry.

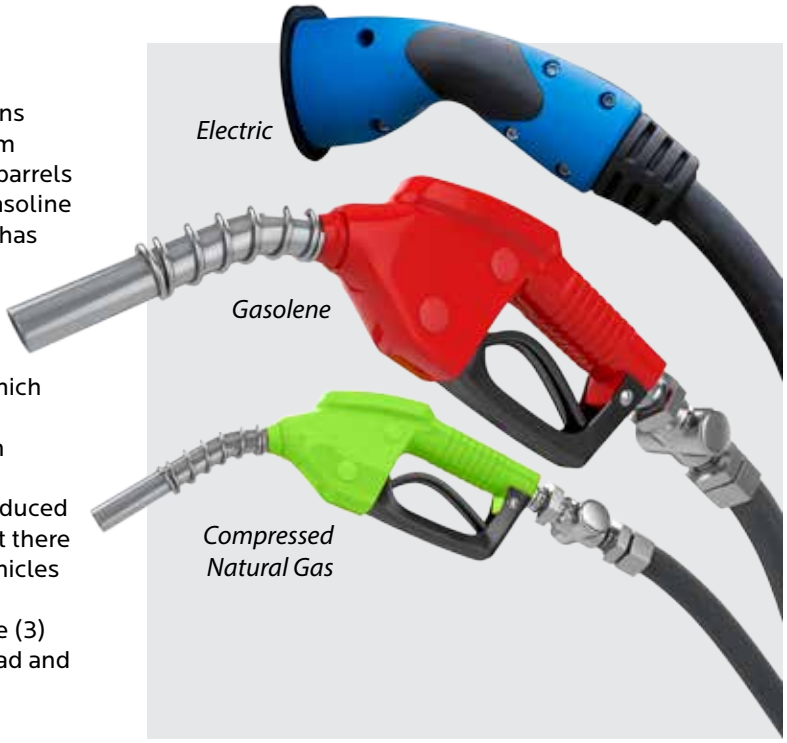
National Energy recognises that in order for Trinidad and Tobago to succeed in the current global economic environment, new approaches must be embraced. We are therefore holding discussions with various stakeholders including governmental ministries, state enterprises and regulatory bodies as we work together to achieve national development.

Sources: *Renewable Energy Policy Network for the 21st Century – Renewables 2016 Global Status Report*
UNEP – Global Trends in Renewable Energy Investment 2016

ALTERNATIVE TRANSPORTATION FUELS- WHAT IS THE BEST OPTION FOR YOU?

By Tamara Gildharry

Super, Premium or Diesel. Visit most service stations across the country and these are your options. From January to June 2016, approximately 2.68 million barrels of oil were dedicated to the production of motor gasoline on the local market (MEEI, 2016). The World Bank has indicated that although Trinidad and Tobago was ranked as 59th in the world in terms of total carbon dioxide emissions in 2014, the country was the 2nd largest contributor of Greenhouse Gases (GHGs) per capita at 35 tonnes/person of which roughly 6% was due to the transportation sector. According to the "Strategy for Reduction of Carbon Emissions in Trinidad and Tobago, 2040" carbon emissions from the transportation sector will be reduced by 15% - 20% by 2030. Research has indicated that there are eight (8) main alternative fuels available for vehicles that will assist in the shift away from traditionally powered vehicles. This article will explore the three (3) most popular options for alternative fuels in Trinidad and Tobago, natural gas, electricity and biofuels.



Compressed Natural Gas (CNG) can be used in place of traditional gasoline for transportation. In 2012, NGC CNG Limited, a wholly owned subsidiary of The National Gas Company of Trinidad and Tobago Limited (NGC) was established to drive the use of Natural Gas Vehicles (NGVs) in Trinidad and Tobago. Any existing gasoline vehicle can be fitted with a CNG kit and thus be converted into a bi-fuel vehicle. According to NGC CNG President, Mr. Curtis Mohammed, CNG powered vehicles were initially viewed with apprehension by the public of Trinidad and Tobago. However, with more international offerings, interest is increasing. Mr. Mohammed indicated that unfortunately, "Conversions have not proceeded according to plan due to the stringent qualification process to become registered as a licensed provider." However, unlicensed converters have been adapting vehicles and NGC CNG continues to work with them to ensure that their operations conform to the existing rules and regulations. Additionally, Mr. Mohammed stated that most interested parties view the conversion process as too expensive or bureaucratic. On average, its costs TT$8,500 to convert a vehicle and non-business consumers are allowed a tax credit of up to 25% or TT$2,500 per vehicle by the GORTT.

Mr. Mohammed further stated that, "It is not only conversions that will make the difference in Trinidad and Tobago – new Original Equipment Manufacturers (OEMs) are also significant. Based on the sales of OEMs, this has been more than double our expectations." Despite this positive response, resistance to change, by most stakeholders is the most challenging aspect of implementing CNG. Mr. Mohammed stated that to create demand for CNG the GORTT needs to further remove the fuel subsidy. Currently, CNG costs TT$1.00/ litre of gasoline equivalent. This makes CNG roughly 50% cheaper than diesel, 72% cheaper than Super gasoline and 82.6% cheaper than premium fuel. CNG vehicles are also not subjected to Motor Vehicle Tax and Value Added Tax (VAT). Additionally, one litre of CNG will take you the same distance as traditional fuels. National Energy employee and CNG user Ms Sarah Leigh Baldeo indicated that her strategic decision to purchase an OEM CNG vehicle "has been a beneficial move, both for the environment and economically. The advantages outweigh the drawbacks by a landslide." In 2017, NGC CNG plans to continue its efforts by focusing on the public transportation segments such as maxi taxi and buses. Mr. Mohammed stated that these efforts are challenging due to the limited number of CNG stations throughout the country. Additionally, whereas a traditionally powered vehicle can emit roughly 4.7 tonnes of GHGs per year, a CNG powered vehicle will emit between 13% and 21% fewer GHGs for the same period.

It will take roughly five (5) hours to completely charge the vehicle using 220 voltage. The charging station would be installed by Smart Energy Limited.

Mr Curtis Mohammed, President NGC CNG (centre right) hands over the keys to a CNG 21-seater Omnibus to Patricia Charles, VP T&T Association for the Hearing Impaired.

Electricity; you use it every day for a variety of reasons, but imagine waking up one morning, heading out your door, unplugging your car and zooming off to work. Sounds strange, right? According to EV-Volumes (2016), electricity can be used as an alternative transportation fuel for battery-powered electric and fuel-cell vehicles. Battery powered electric vehicles store power in batteries that are recharged by plugging the vehicle into a standard electrical source. Managing Director of Smart Energy Limited, Mr. Ian Smart successfully imported the first battery powered electric vehicle in Trinidad and Tobago on June 10th 2016. The basic Tesla Model S will cost approximately TT$700,000. However, Smart Energy Limited intends to import the Tesla Model 3 which will be more economic at a cost of approximately TT$250,000 to TT$300,000. According to Mr. Smart, it will take roughly five (5) hours to completely charge the vehicle using 220 voltage. The charging station would be installed by Smart Energy Limited. Mr. Smart further stated that the Tesla Model S was the fastest four-door sedan in the world going from 0 to 60 km in 2.5 seconds.

Electric cars will indirectly increase demand for natural gas as 99% of all electricity produced in Trinidad and Tobago is generated from natural gas. Mr. Smart claimed that the Tesla Model S was tested over a two-month period and it was observed that the electricity bill increased by approximately TT$200.00. When asked about the demand for the vehicles, Mr. Smart indicated that while the VAT and Motor Vehicle Tax were removed, the import duty of 30% was still in place, making the cars expensive to import. Furthermore, there are currently no income tax rebates available for citizens purchasing electric vehicles. Despite this, Mr. Smart stated that electric cars were “no engine, no fuel, no emissions, no hassle.” With this push into electric vehicles, not only will you have to charge your phone every night, but you will need to charge your car too.

Vehicle engines can be converted to burn pure biofuel or it can be blended with petroleum diesel and used in unmodified engines.

External shot of NP St Christopher's service station on Wrightson Road in Port of Spain. A CNG supply was made available to the public at this station on June 30th 2016.

Biofuel is an alternative transportation fuel made from vegetable oils or animal fats. This includes those that are recycled after restaurants have used them for cooking. Vehicle engines can be converted to burn pure biofuel or it can be blended with petroleum diesel and used in unmodified engines. Biofuel is safe to use, biodegradable and has been confirmed to reduce air pollutants associated with vehicle emissions, including particulate matter, carbon monoxide and hydrocarbons (Alternative Fuel Data Centre, 2015).

One environmentally conscious citizen, Mr. Troy Hadeed successfully converted his Ssangyong Musso into a biofuel vehicle. Unfortunately, this did not last long as it was "cost ineffective" and "a hassle to run." Mr. Hadeed had no choice but to convert it back into a diesel vehicle. In an interview with Mr. Hadeed, he stated that, "the cost of traditional fuels in Trinidad and Tobago makes any alternative source of fuel for transportation unjustifiable." He further stated, "Based on the options presented and considering the cost of fossil fuels and electricity in Trinidad and Tobago, CNG is the most financially viable at this time."

Since both CNG and electric vehicles essentially use the same fuel Mr. Mohammed was asked for a comparison of the two. He stated that unless power generation in Trinidad and Tobago becomes more efficient, there may be a situation where more natural gas is used to move an electric vehicle the same distance as an NGV. If, however, renewable energy was used for electricity generation then an electric vehicle may be more viable. Mr. Smart however, stated that electric cars were in fact the best option because of the ease of refuelling and the low additional cost to the monthly electricity bill.

So, what will it be? The choice is yours.

BON VOYAGE!

Maria & Marva

Sharing a moment with colleagues from NGC

President, Dr. Vernon Paltoo, thanks Maria for her service to the company

Colleagues celebrate with Maria on her retirement

Former National Energy President, Prakash R. Saith and Mrs. Saith attended the function

Staff of National Energy and LABIDCO pose with the guest of honour

President, Dr. Vernon Paltoo, thanks Marva for her years of service to the company

In 2016, National Energy bid farewell to two (2) long-serving employees – Maria Bridgemohan and Marva Bellamy-Bostic – who had both been with the company since 1995.

The Wellness Centre at National Energy's offices was washed in bright colours as employees came together to celebrate with Maria on Thursday 4 August 2016. She was pleasantly surprised to see a number of NGC employees including then Acting President of NGC, Maria Thorne, who worked with Maria in her early days at NGC. Ms. Thorne reminisced about Maria's stellar work ethic and commitment to timely delivery of assignments and everyone was in agreement.

On Thursday 27 October 2016, a group of colleagues, friends and family said farewell to Ms. Marva Bellamy-Bostic in a simple ceremony held at Krave Restaurant in Marabella. A highlight of the evening came when former President of National Energy, Mr. Prakash R. Saith, surprised Marva by attending the event along with Mrs. Saith. He recalled some of the challenges faced in the early days of building the La Brea Industrial Estate and how Marva's passion and determination contributed towards making the company profitable.

Both retirees expressed gratitude to their colleagues and the company for supporting their work over the years. They also urged present employees to give their best to ensure the organisation's future success.

Congratulations on your retirement, ladies and all the best for the next stage of your life's journey...
From the Management and staff of National Energy.

10 Questions
with Marva Bellamy-Bostic

Ms. Marva Bellamy-Bostic was one of the pioneers of the development of the La Brea Industrial Development Company Limited (LABIDCO). She retired from service on 31 October 2016 after working at NGC, National Energy and LABIDCO for over 20 years.

The following is a parting interview with Ms. Bellamy-Bostic.

On a scale of 1 to 10, how excited are you about your retirement and why?
It's a 10! Reasons being, I always loved and wanted to be a homemaker.

Would you consider yourself prepared for retirement? Did you plan for it?
Yes, I was prepared for retirement and made plans for this new era in my life. My retirement countdown was up on my computer screen since the month of April.

Name two of your fondest memories at work?
The Company's first Team Building Retreat in Tobago with Mr. Prakash R. Saith and the original NEC group (I even have a picture to remind me of that wonderful time we shared.) The second was NEC's Latin-inspired Christmas Dinner at Tamnak Thai.

What was a pivotal moment in your life?
Receiving sound advice and support from Mr. Saith regarding one's work ethic. I fondly remember him telling me that, "All you have is your name which should always be associated with positive things."

What would you suggest to foster good relationships with customers?
Always be willing to help and guide them.

Do you have a list of adventures planned or will you be relaxing at home?
Adventure is my middle name. I do not think you have enough lines in this article to list the things I plan to do once God grants me strength and good health. High on my list is a Caribbean cruise with my family, followed by a European tour. I will be sure to send pics.

What will you miss most about the work life?
The many friendships and my salary.

Do you have any regrets? What/why?
Yes, I have one regret. We did not build the proposed LABIDCO Administrative Building during my tenure; an architect's rendering of it adorns the wall of the LABIDCO Office reception area.

If you could choose another career path would you? Why?
I would choose to be a full-time homemaker due to the fact that I love cooking and ensuring that my family is well taken care of.

When is a retiree's bedtime?
What is bedtime? Retirees are in a privileged class. We don't have to follow the rules. We do our own thing.

BONUS QUESTION: What would you say to someone now entering the world of work?
Serve your company to the best of your ability and start planning for your retirement.

Marva, we wish you all God's blessings, good health, strength, lots of love and laughter.

National Energy

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