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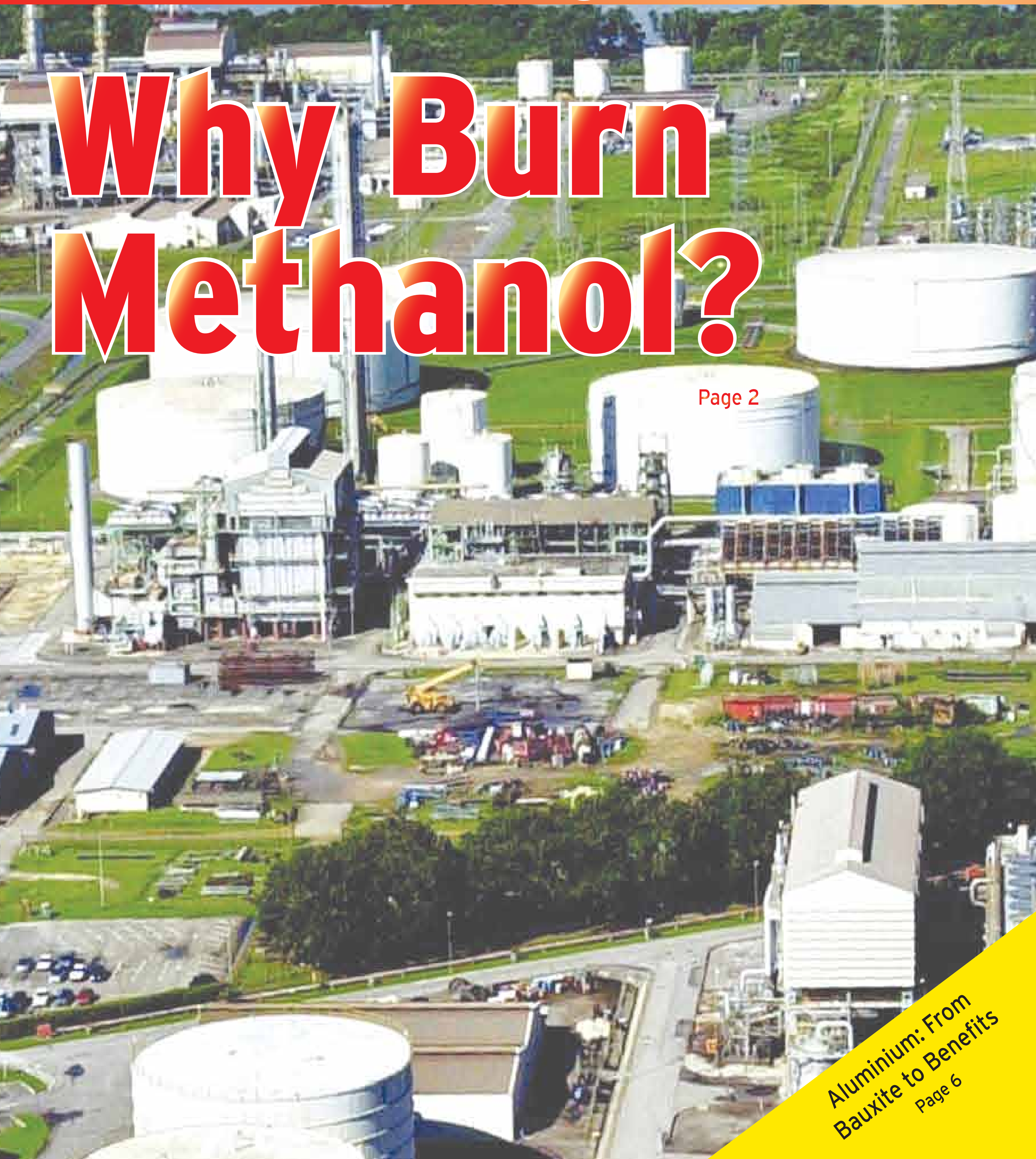

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Front Cover: Menthol Plant in Point Lisas

Tank under construction at Tobago Gas Receiving Facility.

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WHY BURN METHANOL?

The following is an excerpt from a paper published in the Journal of the Association of Professional Engineers of Trinidad and Tobago by Murray and Furlonge (2009). It examines the potential of using methanol as an alternative fuel for power generation in the Caribbean.

By RENIQUE MURRAY (Research Assistant) and

HAYDN I. FURLONGE (former Head of the Natural Gas Institute of the Americas), The University of T&T

Methanol is primarily known for its use as a chemical feedstock, for instance in the production of formaldehyde and acetic acid. It can also be used to produce olefins and other longer chain hydrocarbons such as proteins and gasoline, although these applications are not as extensive. However, as these markets develop, there are significant implications in the light of potentially peaking global crude oil production. Methanol's use is not restricted to chemical production. One such example is that methanol has been proposed as a solution to addressing stranded gas fields; the key advantages being increased safety and a potentially more economic means of transportation than LNG. As such, much work is being done to reduce methanol's cost of production.

Even using the conventional production route, methanol is being considered in fuel applications. With an excellent octane number, methanol has been used in spark ignition engines in various ways, including as a simple additive to improve engine performance, and in the development of special methanol blends for use in racing applications with modified engines. In particular, methanol's use soared in the late 1990s when MTBE, a derivative of methanol, was used as a common additive for gasoline engines. Several other tests were carried out to examine the technical feasibility of using methanol and di-methyl ether (DME), which is another derivative, in compression ignition diesel engines for transport purposes. However, most of these projects came to a halt at the end of the testing stage.

More recently, methanol is finding new fuel applications, namely in fuel cells. It can be catalytically reformed to produce hydrogen gas (H2) for use in fuel cells, or reacted with air in direct methanol fuel cells (DMFC). In general, methanol's use as a fuel is becoming more attractive. This is significantly being influenced by recent trends in the global energy market.

Firstly, prices of oil and its related products have been at a record high recently. This has been partly attributed to the rapid growth of Far East and Asian markets, which placed higher demands on limited oil resources. This has prompted consideration of other alternative energy sources that are not oil dependent. A second key issue has been growing global concern for the environment and emphasis being placed on the use of fuels having lower COx and NOx emissions. Methanol offers these advantages, being a derivative of natural gas which is partly de-linked from oil, and is a clean burning fuel.

This is of key significance to countries of the Caribbean region, given that almost all are net importers of fossil fuels, which have been negatively affected by recent fluctuations in crude oil prices. As such, there is a keen interest in sourcing cheaper and cleaner fuel alternatives. Consequently, this work investigates the potential for methanol as such an alternative for the Caribbean region.

The paper first gives an overview of some of the key technical considerations of the MtP, and outlines important characteristics of the Caribbean power market. Factors affecting MtP's feasibility relative to other means of supplying energy to the region are considered. A brief description of the economic considerations of the MtP value chain is presented. The paper concludes by highlighting some of the key findings on the suitability of MtP to the Caribbean region, and identifies future work on technical as well as commercial aspects of the technology.

Technical Considerations of Methanol as a Fuel

The use of methanol as a fuel for stationary engines has previously been investigated. The overall result was that methanol can be used successfully, with only minor modification of the standard machinery to account for the main differences in the fuel characteristics of methanol as compared to those of other liquid fuels.

Firstly, methanol has a significantly lower calorific value (22.7 Mega Joules per kg), which for example, is approximately half that of diesel (45 Mega Joules per kg). This is generally compensated for by a concomitant increase in the volumetric flow rate of methanol which can be achieved without significant difficulty or deviation from usual operating conditions. Special nozzles can be used for high fuel distribution with low pressure drop.

Secondly, the lubricity of methanol is relatively low. This poses problems with standard fuel-delivery systems, such as those involving the use of valves for flow rate control, and in situations where the fuel comes into contact with other moving parts within the engine. There are generally two approaches to addressing this. If preserving the chemical integrity and consistency of the methanol is not a major requirement, then the use of suitable lubricant additives may be employed, with a consequent alteration in combustion emissions. This may also impact the rate of wear and residue build-up on other engine components. Alternatively, an appropriate pump with effective coatings may be used. The third factor concerns methanol's combustibility and flammability, which consequently requires specific handling, controls and monitoring.

Despite the foregoing issues, previous work has confirmed that the use of methanol as a fuel for power generation is indeed possible. However, this has been mostly limited to an experimental scale on gas turbines.

In general, methanol's use as a fuel is becoming more attractive. This is significantly being influenced by recent trends in the global energy market.

Caribbean Market Assessment

Although the compatibility of methanol as a fuel for use in power generation equipment is important, it is not the sole factor in determining its use in the region. An assessment of Caribbean power markets is also a preliminary step in order to determine trends and key details that were unique to the Caribbean context and would influence the implementation of MtP in the region. Some defining characteristics of Caribbean power markets have been identified:

- *Size classification of markets.* It was found that the island markets could be differentiated on the basis of size. In general, generation capacities for the countries were either significantly below or above 100MW; there were only three islands with capacities close to 100MW. As such, markets were classed as either small (below 100MW) or large (above 100MW).
- *Technology classification of markets.* Another basis for differentiation between markets was the type of power generation technology used. For some islands, power is generated solely by thermal processes using turbines or reciprocating engines. However for others, power is generated using a mix of renewable energy technologies and thermal technologies. Countries with mixed technologies usually had lower yearly electricity prices than those without. Accordingly, power markets can also be divided into two other categories: single and mixed technologies.
- *Turbine and engine market share.* The two main types of machinery used for thermal processes are gas turbines and reciprocating engines. However, it was found that their distribution is correlated to the market size of the country. Generally, those with smaller market sizes tended to use reciprocating engines more, while larger markets used gas turbines.

In addition, the assessment revealed that most countries increase their installed generating capacity by 15% to 45% every 4 to 6 years. Consideration of these factors points to different motivations and configurations for the implementation of MtP in a country. For example, MtP may be implemented via the installation of new turbines to replace existing infrastructure. Alternatively, it may be implemented as a means of satisfying new demand. It is also possible to modify existing turbine and reciprocating engines to burn methanol, as was noted earlier.

Factors Affecting MtP's Feasibility

Present global concerns surrounding energy security and environmental impact have crafted a space for the emergence of a new type of fuel which can satisfy increasing energy demand in a sustainable and cost competitive manner. For countries of the Caribbean region, natural gas is one of the most promising fuel sources because of its relative abundance, cleaner combustion emissions and proximity to supply, Trinidad and Tobago being the primary one. This section presents a qualitative assessment of various means of transporting natural gas including via methanol.

The main options previously considered, for instance in Kromah et al (2003), are gas pipeline, gas to hydrate, gas to wire (GtW), gas to liquid (GtL), and the more familiar LNG and compressed natural gas (CNG). However, given the fact that the proponents of each of these technologies assume the use of the same natural gas source and with markets being small, these technologies cannot be jointly implemented. Consequently, the major focus here is on MtP's comparison to some of the aforementioned technologies for natural gas utilisation within the region.

> **It is important for the Caribbean region to move decisively away from its dependence on oil and its derivatives in order to reduce the overall power generation cost and high volatility of electricity prices**

Shipping/Transportation

Shipping of methanol uses no specialized containment or materials, methanol being relatively non-corrosive, and a liquid at room temperature and atmospheric pressure. In contrast, LNG and CNG require cryogenic alloy materials (and in most cases double containment), and materials capable of high pressure, respectively.

Infrastructure (Harbour and Import Facilities)

Methanol ships consist of a wide range of sizes, so smaller ones may be available which would not require harbours as deep as those for LNG and CNG vessels. Being a liquid fuel, storage and handling equipment at the import terminal would be essentially the same as that of other oil-based liquid fuels, which are already in existence in regional markets. However, compressors would be required for a pipeline, a regasification facility for LNG, and high pressure storage and compression facilities for CNG.

Implementation Time and Supply Flexibility

Unlike other gas transportation technologies, MtP can be implemented in a relatively short space of time given that methanol is a widely traded commodity with significant production from T&T. As such, there is flexibility in supply in terms of the number of countries in the Atlantic Basin region, and the ability to access incremental volumes on a spot trade basis. As mentioned above, no specialized equipment is required which also reduces the time to implement and expand facilities compared to pipeline, LNG and CNG.

Initial Capital Investment

LNG has proven to be economic only for long distances and large volumes, which are not characteristic of regional markets. CNG has been considered for closer and smaller markets but this has not yet been proven economic for this region. Consideration has been given to a single main gas transmission pipeline, with spurs to each market, since building separate pipelines for each country is not a feasible option. As such, the capital cost, and commercial, legal and political hurdles for such a project may be prohibitive.

Overall, the comparison of different natural gas transportation technologies suggests that MtP has certain distinct advantages, particularly for the unique Caribbean power market. Of the competing technologies, it is the most flexible and easily implementable, while potentially being the least costly. As mentioned earlier, MtP can be implemented using gas turbines or by retrofitting reciprocating engines, which is the most common power generation technology being used. Consequently, a more detailed economic analysis is required for determining the best solution for MtP's application.

Economic Considerations of MtP Value Chain

The MtP value chain comprises four key economic activities.

1) Methanol production – For the purposes of this study, the market price of methanol is used as the cost of methanol. This allows for a fair market-based comparison since it avoids issues such as rates of return and natural gas pricing in determining the cost of methanol production.
2) Methanol transportation – This approach considers the cost for the shipping of methanol to the various markets using standard vessels.
3) Methanol storage – Here, it is assumed that inventory at the import terminal would be large enough for 30 days of power generation demand. The cost involves the capital for construction of the necessary storage facilities.
4) Power generation – This element of the chain covers the cost of generating power from methanol using either gas turbine engines or reciprocating engines. Both the initial capital outlay and the subsequent operational expenses are considered here.

In order to quantitatively assess MtP's feasibility, an integrated economic model comprising these activities was developed. More details of the model and economic analysis are provided in Murray and Furlonge (2009).

Concluding remarks

Energy security and affordability are important ingredients to achieving sustainable development. In this regard, it is important for the Caribbean region to move decisively away from its dependence on oil and its derivatives in order to reduce the overall power generation cost and high volatility of electricity prices. As noted here, methanol prices on an energy equivalent basis have been historically competitive with diesel, as shown in Figure 1. Relative to other fuels and means of transporting natural gas, advantages also include lower capital cost, minimal infrastructure requirements, use of standard equipment and materials, and ease of shipping. Furthermore, because methanol can be shipped cost effectively in smaller quantities, MtP can be economic for small niche power markets such as in the Caribbean. The legal and commercial hurdles of supplying gas to the region via pipeline from Trinidad and Tobago do not arise with an MtP solution. Additionally, it is a cleaner burning fuel. Methanol is an attractive alternative fuel for meeting the energy needs of niche markets in an economic and environmentally sustainable manner, utilizing existing or new power generation infrastructure in the Caribbean.

In order to further assess MtP's potential, an integrated economic modelling approach of the MtP chain has been presented here, taking into account methanol production, shipping, importation and power generation. It is found by Murray and Furlonge (2009) that MtP proves to be cheaper in smaller islands which tend to pay slightly more for diesel and due to the lower economies of scale and efficiency of power generation at smaller capacities.

Because methanol can be shipped cost effectively in smaller quantities, MtP can be economic for small niche power markets such as in the Caribbean

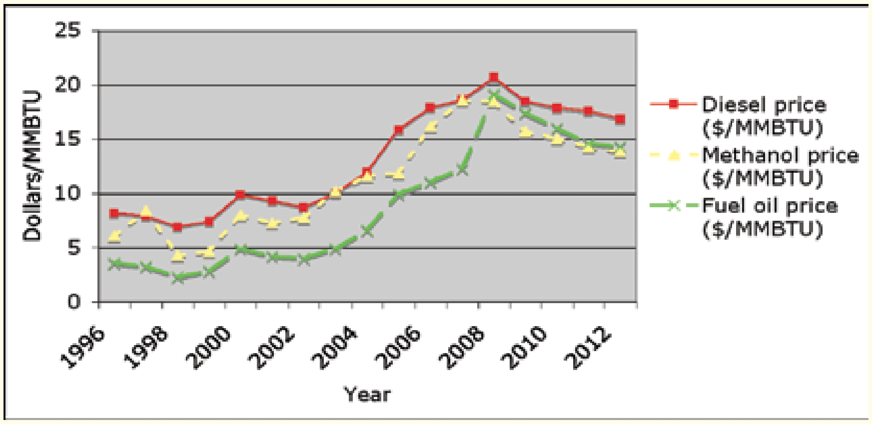

Figure 1: Comparison of Market Price for Different Fuels

Retrofitting reciprocating engines, which is the most prominent technology being used in the region, gives the highest savings for MtP, of up to about 10 US cents per kWh. For comparison, it is estimated that with just an average 1 US cent per kWh reduction in electricity prices via MtP, a total saving of roughly US$200 million can be realized per annum in the region. This highlights the potential impact of a cheaper power generation option, and makes MtP worthy of further consideration.

Based on these preliminary findings, there is a potential for MtP to replace at least 6,000MW, or put another way 16.2 billion kWh per annum of power generation in the Caribbean region. This will require approximately 7.1 million tonnes of methanol per annum (or 626 MMscfd of natural gas), thus providing a large new market for methanol, and hence for natural gas. Of course, there are several factors to consider in implementing a change-out of technology in any one island, including capital outlay and financing, project viability based on detailed engineering and economic evaluation, payback period, commercial arrangement and ownership structures comprising the various stakeholders in the MtP chain, and risk distribution.

Finally, the technical feasibility of MtP needs to be assessed, i.e. equipment efficiency, reliability, availability and maintenance programme. This work is currently being undertaken by The University of Trinidad and Tobago along with Methanol Holdings Trinidad Limited which is overseeing the operation of a demonstration power plant on the Point Lisas Industrial Estate, Trinidad (Furlonge and Chandool, 2007).

References

Furlonge, H.I. and Chandool, V. (2007), "Methanol to power demonstration project," GazChem 2007 Conference, Port of Spain, June. Available from: http://www.utt.edu.tt/utt/ngia/methanol_to_power.pdf [cited 20 February 2009]

Kromah, M. Thomas, S. and Dawe, R.A. (2003), Transporting natural gas around the Caribbean, West Indian Journal of Engineering, Vol.25, pp.18-32.

Murray, R. and H.I. Furlonge, Market and Economic Assessment of using Methanol for Power Generation in the Caribbean Region, The Journal of the Association of Professional Engineers of Trinidad and Tobago, 38(1), 88-99, 2009.

ALUMINIUM: FROM BAUXITE TO BENEFITS

Trinidad and Tobago is on the cusp of becoming a primary and secondary producer of aluminium and downstream products. There has been keen interest in our potential aluminium producing industry, both from international and local audiences. However, the aluminium industry goes beyond the smelter. From bauxite extraction, to smelting processes and to the environmental and economic benefits that a country can derive from the downstream aluminium sector, this article will seek to offer basic information on everything aluminium.

By NICOLA GHOURALAL
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What is aluminium?

The word aluminium was derived from *alumen*, the Latin name for alum (an aluminium sulphate mineral). Aluminium is the most abundant metallic element in the Earth's crust but was once thought to be a rare and precious metal. It was discovered to be a separate element in the 1820s. Aluminium reacts with water and air to form powdery oxides and hydroxides, and does not occur in a metallic state in nature. This means that it must be extracted and processed. The metal aluminium is a silver-white metal which is very light in weight (less than three times as dense as water), yet relatively strong.

How do we make aluminium?

The main ore of aluminium is bauxite, the source of 99% of metallic aluminium. Bauxite is a general term for a mixture of minerals composed mainly of hydrated aluminium oxides.

The main ore of aluminium is bauxite, the source of 99% of metallic aluminium. Bauxite is a general term for a mixture of minerals composed mainly of hydrated aluminium oxides.

For thousands of years, mankind has used other metals including copper, tin and lead. Over 2000 years ago, the Chinese developed a process to obtain aluminium; however, this process was lost to civilization. Over the years, small amounts of aluminium were produced but at huge costs. In fact, aluminium has only been produced commercially for the past 146 years and is still a relatively 'young' metal.

The process of aluminium smelting was invented in 1886, simultaneously by Frenchman Paul Louis Héroult and American Charles Martin Hall, two young and unknown scientists working independently and in ignorance of each other's attempts to separate the metal from the ore.

The scientists discovered that a combination of chemical and electrical processes could produce aluminium. If one dissolved aluminium oxide (alumina) in a bath of molten cryolite (sodium aluminium fluoride) and passed a powerful electric current through it, then molten aluminium would be deposited at the bottom of the bath. This process, known today as the Hall-Héroult Smelting process, is the foundation on which modern-day aluminium smelting is based.

The modern process

The modern process incorporates alumina undergoing electrolysis in electric-reduction furnaces or "pots", to separate the aluminium and oxygen. The pots are large, shallow, steel tanks lined with carbon and connected electrically in a series.

In each pot, an electric current flows from carbon anodes (the positive electrode of an electrolytic cell), through a molten bath containing alumina, to a carbon cathode (the negative electrode of an electrolytic cell) lining, and then onto the next carbon anode in the next pot. The current forces the oxygen in the alumina to separate from the metal, and join with the carbon to create carbon dioxide. This carbon dioxide rises to the top of the furnace pot.

The current usually generates heat between 920°C and 980°C. Because of the energy-intensive nature of the smelting industry, they must be located in areas with access to an abundant supply of power (natural gas, hydro-electric or nuclear).

At the end of this process, molten aluminium remains on the bottom. The aluminium is then siphoned into larger holding furnaces where other impurities are removed and alloy elements such as magnesium, silicon or manganese are added.

The molten aluminium is cast into various forms and sent to fabrication plants to be rolled or stretched or to a foundry for casting. A typical smelter can have about 300 pots, producing 125,000 tonnes of aluminium annually. The later generation smelters have over 400 pots and produce between 350,000-400,000 tonnes annually.

Aluminium technology

Most debates surrounding smelters have centred on the technologies used and their efficiency and safety with regards to human health and the environment. There are two main technologies in use in smelter plants throughout the world – The Söderberg Cell technology and the Pre-bake Cell technology.

The older Söderberg technology uses a continuous anode which is delivered to the pot in the form of a paste, which bakes itself. The Pre-bake uses multiple anodes in each cell which are baked in a separate facility and attached to 'rods' that suspend anodes in the cell. New anodes are exchanged for spent anodes, which are then recycled into new anodes. Part of the pot lining carbon can also be recycled.

The environmental benefits of pre-bake technology

Today, over 75% of the world's aluminium smelters use the Pre-bake technology. Virtually all new plants and plant expansions around the world are based on Pre-bake technology. This technology has been proven to be more environmentally friendly than the Söderberg technology. Pre-bake technology encourages recycling; therefore, there is waste minimization. It also has led to energy efficiency and a reduction in fluoride emissions.

Gases and solids which evolve from the pot and its electrolyte are controlled by various treatment processes. The most efficient method is that which utilizes a highly effective pot hooding system and removes more than 99% of the fluoride emission from captured pot gases.

This system prevents air pollution, conserves valuable resources for recycling and because it is a dry process, there are no liquid wastes to be disposed of. Fluoride gases are passed through a bed of alumina where fluoride is absorbed. The particulate matter is then collected in a fabric filter baghouse. The reacted or fluoride-containing alumina is recycled into the aluminium production process.

Other energy saving advances include improvements to bath chemistry to lower both the smelting temperature and heat losses, improvement of insulation to reduce heat losses, improved baking technology for anodes and reduced carbon anode consumption per kilogram

The emission of fluoride is the most debated aspect of aluminium smelting. Relatively small amounts of fluoride do escape from the process, typically when changing the anodes. Depending on conditions, fluorides could have an impact upon potentially sensitive flora and fauna. Studies have shown that fluorides in large quantities have the potential to accumulate in the teeth and bones, but not in the edible meat of animals such as cows, and can accumulate in vegetation. Substantial fluoride reductions have been achieved using new technology and have been demonstrated to pose no threat to health or the environment.

However, these fluoride emissions are still subject to strict controls and even discharge licences. These emissions and effluents must be strictly and regularly monitored by the relevant environmental authority as well as the management of the actual smelter.

Given the high energy and other costs associated with the Hall-Héroult process, the smelting industry is continuously looking at alternative methods of extracting aluminium.

Concurrently, effort has been made to improve the efficiency of the Hall-Héroult process. On an average, it takes about 15.7 kWh of electricity to produce one kilogram of aluminium from alumina. This is a reduction from 21 kWh in the 1950s, again, a testament to the design improvements that have taken place. This reduction is directly linked to the computerization of smelting cells, an improvement that has largely been unrecognized outside the industry.

Other energy saving advances include improvements to bath chemistry to lower both the smelting temperature and heat losses, leading to an increase in the efficiency of the use of electrical current, improvement of insulation to reduce heat losses, improved baking technology for anodes and reduced carbon anode consumption per kilogram of aluminium produced. Because of the energy intensive nature of the smelting industry, they must be located in areas with access to an abundant supply of power (natural gas, hydro-electric or nuclear).

Commitments by aluminium smelters throughout the world include the minimization of any impact on the environment by extensively researching energy and emissions reduction, initiating responsible, safe disposal or re-use of waste products and maximizing the use of recycled materials in the process of making aluminium.

From the kitchen to the construction site – the downstream aluminium industry

The product of aluminium itself is a sustainable material. Products made from aluminium can be recycled, saving both energy and mineral resources. Because it is lightweight and strong and conducts heat well, aluminium has many domestic and industrial uses.

Examples of everyday products made from aluminium.

When exposed to open air, it forms a film of oxide on its surface which makes the metal more corrosion-resistant or 'rustproof'.

Many of our domestic household items including beverage cans, pots, pans and of course foil are made of aluminium. Most vehicles used for transportation consist of aluminium. Cars are lighter and consume less gas because of lightweight aluminium. Trucks, boats and aircraft and aircraft engines are made of aluminium. In fact, there would be no air travel without aluminium. Its steel strength and of course lightweight properties are suited to the modern aircraft which must travel faster and higher. The aerospace industry also requires aluminium sheeting, plating, extrusions, forgings, structural castings and super alloy turbine blades.

High power voltage lines are also made mostly of aluminium because the material is an excellent conductor of heat and electricity. Aluminium is also used in road signs, roofing and form the frame of many modern-day window panes.

Aluminium – an industry for the future

The growth of the aluminium industry over the years is a demonstration of its value not just to the economy, but to society – consumers and companies – who have placed value in a material that is lightweight, affordable and recyclable. Realizing the need to improve its fundamental processes, which would not only benefit the industry, but international goals for energy-use reduction and environmental sustainability, the industry has pioneered the way in research and development.

In closing, the Trinidad and Tobago Government has as a goal to obtain the highest value for the country's gas. One of the strategies in achieving this is the development of the downstream gas sector. At present, most natural gas-based activity does not go beyond the primary processing stage. Aluminium, more than most other options for gas usage, has this remarkable potential for substantial downstream activity, with associated creation of jobs.

NGC's S&P Rating Raised

Standard and Poor's raised NGC's financial rating, including its corporate credit rating from BBB- to A- on October 19. The company's rating was removed from the S&P CreditWatch, where it was placed with positive implications in July 2009. This rating change is reflective of NGC's liquidity position and S&P's expectation that NGC will continue to perform its critical economic role in monetizing the nation's natural gas resources while adhering to the best principles of financial management.

Marine pipelaying activities – Tobago Pipeline

NEO Pipeline

NGC has imported 8,054 lengths of pipe for the project from India. Those pipe lengths which will be used underwater are concrete weight-coated to provide stability of the pipeline on the seabed and protection from third party damage. NGC will be carrying out a Horizontal Direct Drilling (HDD) operation starting 1.6 km offshore at Mayaro. This complex technique lays segments of the pipeline without open cutting, to avoid damaging the environment. To do this, a hole is bored horizontally under the area and the pipeline is drawn through it like thread through a needle. The HDD will be conducted on a 24-hour basis in Quarter 1, 2010. It will follow the initial pipelaying on the seabed which is underway in preparation for the pipe full into the drilled hole. Once the HDD and other preparatory works are completed, NGC will lay the onshore pipeline which will be tied in to the New Abyssinia Accumulator Station. The construction of the main marine pipeline will take place during Quarters 2 and 3, 2010. Supply of first gas is projected for January 2011.

HDD Liquid Fuels

Once the HDD and other preparatory works are completed, NGC will lay the onshore pipeline which will be tied in to the New Abyssinia Accumulator Station

Tobago Pipeline

Carillon is performing Civil and Structural works at the Cove Eco Industrial Estate, which involves the laying of foundation and underground infrastructure, including cables and pipes. These works should be substantially finished by the end of 2009. Phase 2 involves the installation of equipment, with piping and Electrical and Instrumentation works commencing in January 2010. The project is expected to be completed and first gas supplied in January, 2011. NGC imported 4,603 lengths of fusion-bonded epoxy-coated pipe for the project from Mexico. The main marine pipelaying work will take place in Quarters 2 and 3, 2010. NGC is currently performing a Horizontal Direct Drilling (HDD) operation at the approach to Cove Estate. This complex technique allows the laying of segments of the pipeline underground to avoid damaging the environment. The HDD will be finished in early 2010. The gas supply to Tobago will service the T&TEC power generation plant, small industries to be established at Cove Estate and eventually extend to users in other parts of Tobago.

Liquid Fuels Project

The pipeline system for the Liquid Fuels System consists of four phases, from Petrotrin to Phoenix Park, from Phoenix Park to Pierre Road, Chaguanas and from Pierre Road to Caroni and Caroni on to Piarco. All phases are being constructed simultaneously, and the segment between Caroni and Piarco is complete and testing is being done.

The project will transport unleaded super and premium gasoline, diesel and jet fuel between each of these phases along an eight-inch-diameter liquids line. Holding tanks will be constructed at the originating point, Petrotrin, and at Frederick Settlement where the routing of the different fuels along the line will be moved, stored and regulated. The main control systems will be also housed at the Frederick Settlement facility and two additional tanks will be constructed to supplement existing storage capacity at the airport. A fibre optic cable is being laid along with the pipelines for use by SCADA, a computerized monitoring system.

Frederick Settlement Facility – Liquid Fuels Project

The project will transport unleaded super and premium gasoline, diesel and jet fuel between each of the phases along an eight-inch-diameter liquids line.

Pipelaying works will be completed by first quarter 2010, and HDD techniques were used at sites on Rivulet Road, Caroni River, Couva River, Couva Main Road, Caroni Irrigation Canal, Camden Road, Cedar Hill Road, Roopsingh Road and the Solomon Hochoy Highway. HDD techniques were also used to route a pipeline under the runway lights at Piarco International Airport.

UIE Pipeline

By mid-2010, NGC expects to have completed an expansion of its natural gas distribution and transmission network with its installation of a pipeline and related facilities at Union Industrial Estate (UIE).

The project involves a 3.2km-long, 24-inch-diameter pipeline, which will connect to the 56-inch Cross Island Pipeline (CIP) near Pablito Trace. This pipeline will run westwards parallel to CIP. A 2km, 24-inch pipeline will be tapped off from the line and run northwards to UIE.

Within the estate, NGC will lay a 16-inch distribution line and an 8-inch pipeline which will supply natural gas to small customers located at the adjoining La Brea Industrial Estate. Facilities at UIE will be constructed for condensate removal, pressure regulation and metering of natural gas.

Tamana Service Main

The construction and installation of a 152mm diameter carbon steel supply pipeline running 3km from the existing pipeline near the Frank Kerry Estate will bring a natural gas supply to the Tamana Industrial Technology Park at Cumuto, Wallerfield. The project also includes the construction of a regulator/odorizer/receiver station and a 9km High Density Polyethylene distribution ring main. A critical upgrade to NGC's gas distribution network, this new supply will fuel the developments planned for this new nexus of computing technology.

API Pipeline Construction Company is the contractor for the project. Commissioning is expected at the end of December, 2010.

NAPA Pipeline Commissioned

The recently commissioned National Academy for the Performing Arts (NAPA), an impressive home for the development of artistic talent, benefited from the use of natural gas, used to fuel some of the building's components. The construction phase of the project required a connection to a future valve on an existing 102mm line at the Hilton Hotel which runs through the Queen's Park Savannah.

The supply line was a 50mm polyethylene pipe in a 203mm polyethylene pipe sleeve laid using HDD technology through the Savannah to the metering station on the NAPA compound at Queen's Park West. The project required a swift response from NGC from planning to commission. The project was completed in four months. On site, the pipelaying and connections were completed in 24 days, well ahead of a planned 35-day schedule.

Pipelaying at Tamana InTech Park

Executive Change at NEC

Prakash Saith, former NEC President

Andrew N. Jupiter, new NEC President

On August 5, 2009, former NEC President Mr. Prakash Saith passed the energy baton to Mr. Andrew N. Jupiter, who became the new President of the National Energy Corporation. Mr. Saith served NGC/NEC for 27 years. A civil engineer by profession, Mr. Saith became General Manager of NEC in 1999 and President in 2004. During his career at NEC he oversaw the construction, project management and contract administration of large civil engineering, infrastructure and energy-intensive projects which would house world-scale plants.

Mr. Saith was directly responsible for the construction, management and operation of over US$150 million in marine assets, including the Savonetta Piers I, II, III and IV, ISCOTT Dock, Point Lisas Harbour and NEC's fleet of 10 vessels. These assets service several petrochemical and steel plants to meet international standards on a 24-hour basis, 365 days a year.

Mr. Saith served as Chairman of the Board of the Rural Development Company and as a director on several state boards. He is a member of several professional societies, including the Association of Professional Engineers of Trinidad and Tobago (APETT) and the Association of Professional Engineers of Ontario, Canada.

His successor, Mr. Andrew Jupiter, has served the energy industry for 38 years, starting at Shell Trinidad Limited in 1971.

He holds a BSc. in Natural Sciences, a Postgraduate Diploma in Petroleum Engineering from the University of the West Indies and a Master of Engineering Degree in Mineral Engineering Management from Pennsylvania State University, USA.

During his public service, Mr. Jupiter held several senior positions at the Ministry of Energy and Energy Industries (MOEEI) from 1979-2004, including Petroleum Engineer, Senior Petroleum Engineer, Director Operations, Director Energy Planning, Chief Technical Officer, as well as Permanent Secretary. In 2004, Mr. Jupiter joined NEC as the Vice President, Business Development.

During his career, he served as an expert witness to the Government of Trinidad and Tobago on petroleum matters, led a negotiating team that signed 19 Production Sharing Contracts between the Government and multinational companies, and participated in the negotiations for the LNG trains at Point Fortin.

Mr. Jupiter is a member of the Society of Petroleum Engineers and the Association of International Petroleum Negotiators where he was the first Trinidadian to serve as AIPN Director. He is Chairman of the Caricom Regional Energy Policy Task Force and a Member of the Standing Committee on Energy and the Natural Gas Export Task Force.

Foreground – Savonetta Piers III & IV at Port Point Lisas.

Pt Lisas Estate, South and East

Designs for the project are complete and CARIRI has been engaged to create baseline data on air and water conditions on the Estate. The sampling process is underway; it will be done over one dry season and one wet season and will be completed by June 2010.

A consultant will be retained to respond to the EMA's review of the project's documentation and to assess and interpret the data which has been collected by CARIRI. NEC expects to be able to make a formal response to the EMA's review of the EIA with additional data by October 2010.

Pt Lisas Port (South)

Preparation for the construction phase is well underway. The project utilized international competitive tendering to engage the services of Saipem for engineering, procurement and construction (EPC) services. Procurement of all materials for the 700-metre quay wall has been completed. Saipem has also entered into negotiations for local services and materials' suppliers and has been working with NEC on minimizing cost exposures. The commencement of works is pending the grant of the final Certificate of Environmental Clearance (CEC). The Environmental Impact Assessment (EIA) has been reviewed and resubmitted by NEC through its consultant Rapid Environmental Assessment Limited in order to clarify information requested by the EMA.

Preliminary planning and design work undertaken by Parsons Brinkerhoff for adapting the port to serve the industries has been completed. The contract for dredging a new channel and turning basin has been awarded to Westminster Boskalis.

The public engagement process is now focused on ensuring that there is acceptance of the mitigation plans and environmental measures that have been adopted. Managing the natural environment and sociological impact of the planned construction works is a key element in NEC's social responsibility in implementing the port project.

Oropouche Basin

The Oropouche Bank project is a reclamation initiative to create a viable alternative to using land-based sites. The west coast was identified as offering the best potential, and the selection criteria demanded a marine environment without aggressive topography or the potential to damage protected flora or fauna. The site identified lies north of the Godineau River outfall, which met the preliminary criteria with a stable, shallow sea floor extending over 3,900 hectares in water varying between three and four metres deep. The site is very economical for the project, due to the shallow depth of fill required and it is located in a low energy marine environment in the Gulf of Paria. Preliminary designs have been completed, delineating the shape and location of the reclamation site. The project will eventually cover 1,400 hectares of reclamation and will be linked by a permeable causeway approximately 2.5 kilometres long. This optimal design is the basis on which further studies are to be undertaken and extensive geological and seismic exploratory studies have been undertaken to assess liquefaction risks, settlement and consolidation. The soil stability and coastal protection of the reclamation site incorporates the use of mangrove on the leeward side facing the mainland, and the remaining perimeter consolidation of the facility will use armored rock coastal revetment works. The project will require 100 million cubic metres of fill for the initial phase, which will comprise 300 hectares of reclamation. Fill sourcing studies have already begun and 14 million cubic metres of fill have been identified. The EMA has been provided with all information requested and the consultant, Technital, has been able to secure terms of reference for the conduct of EIA studies for the project. Detailed design for the project will proceed in collaboration with the EIA studies to ensure environmental compliance in all aspects of the design.

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Galeota Port

NEC is currently finalizing the post-CEC monitoring plan with the EMA. This plan, which includes stakeholder engagement and shoreline monitoring, was submitted to the EMA within the statutory time allowed. Contractor GLF/Jan de Nul JV is planning for the start of construction on receipt of the EMA's approval and the conclusion of an agreement with bpTT, the former site owner.

NEC is mindful of its role as a corporate citizen and is providing a meaningful contribution to the welfare of Galeota/Mayaro with the development of a fish landing facility. All statutory permits, approvals and designs are completed for the port, fish landing facility and new access road. Procurement of all quay wall pile materials is complete.

Union Industrial Estate

Royal Haskoning Caribbean Limited is preparing detailed designs to address issues with the portion of the Vessigny River on the estate and to manage general drainage issues on the Alutrint project site. Petrotrin has awarded a contract for the removal of their tanks in the buffer zone. Asphaltic base course works to cover 30,000 square metres of roadway have begun on the UIE Corridor by Sunco. Project deadlines are under review.

The Trinidad Generation Unlimited plant is underway, with 800 persons employed by the project. Of these workers, 560 are drawn from La Brea and its environs. Man Forrestaal, the contractor supplying the turbines and generators and managing the power plant's construction, expects the labour force to grow to 1,200 by early next year as the project ramps up. Foundations are being prepared for the turbines and 13 of these power generation engines have been installed.

Fabrication Yard at La Brea Industrial Estate.

Fabrication Yard

The estate is proving to be a model for local content participation in industrial development in Trinidad and Tobago. Since 2004, eight offshore platforms for new exploration and production projects were built at the Trinidad Offshore Fabricators Unlimited (TOFCO) facility at Labidco and two more are currently under construction.

The fabrication facility was expanded by 4.5 acres in 2008 to accommodate increasing demand for the company's services, and the fabricator, TOFCO, now operates on 29.5 acres at Labidco. TOFCO is a joint venture between Louisiana-based Chet Morrison Contractors Inc and Weldfab Limited, a Trinidad and Tobago company operating since 1979.

At peak times on the fabrication schedule, over 700 persons are usually employed directly with almost half of them drawn from La Brea and its environs. The policy of local content involvement and training has led to high levels of local employment in projects underway at the Labidco facility.

Many smaller operators with fewer than 20 employees working on site report 100 per cent staffing by employees drawn from La Brea and environs and most other companies operating at Labidco report local content ratios greater than 50 per cent.

This commitment to knowledge transfer and workplace training ensures the growth potential of the industrial estate and the encouragement of greater resources in the future from nationals who increasingly see the industrial activity at Labidco as a real, sustainable opportunity.

High Speed Cable for Offshore Platforms

The Trinidad Offshore Fibre Electronics Project, an initiative of Canada's Windward Telecoms, plans to launch two new offshore fibre optic communications networks aimed at linking the offshore energy sector. The fibre optic cable will land at Crown Point, Tobago to provide high speed Internet cable communications for that island and in Trinidad at Macqueripe and Galeota. The 12-pair design of the cable is promised to provide superior uptime and stability with little maintenance and self-healing capabilities for more than 25 years.

Deployment of the north ring of the system is expected to begin in July next year and will provide links to oil and gas production platforms operating on Trinidad's eastern coastline. Local telecommunications providers will be able to use the line for data, voice, land and wireless communications and may consider it as a backup for their current services.

GORTT Signs Equity Partner for Alutrint

In December 2009 Minister of Energy and Energy Industries Conrad Enill signed equity partnership agreement with Brazil's Votorantim Metais to participate in the Alutrint Project planned for Union Industrial Estate in La Brea. Votorantim Metais is a mining and processing company within the Votorantim Group, one of the largest industrial conglomerates in Latin America. A closed capital family owned company, it is headed by Brazilian billionaire Antônio Ermírio de Moraes.

Minister Enill announced that the signing does not move the project forward, and the smelter project will not commence until outstanding issues are settled in the courts of Trinidad and Tobago and a Certificate of Environmental Clearance is issued.

Atlantic LNG at Pt Fortin.

The Minister further noted that the environmental impact assessment study (EIA) commissioned by Alutrint in July 2005 details a design engineering stage for the project that will ensure the use of the best available pollution prevention and control technology to avoid potential major impacts.

The other partner in the project is the project's engineering procurement construction contractor, China National Machinery and Equipment Import and Export Corporation. The project's financiers are China Eximbank and the Government of the People's Republic of China.

Atlantic LNG Positive on Gas Outlook

Point Fortin-based natural gas processor Atlantic LNG announced that, despite plunging natural gas prices since November 2008 from US$8 per mmbtu to US$4.40, in 2009 the Company will meet targets for products while successfully maintaining safety as its highest priority at its facilities.

The four trains of Atlantic LNG are capable of producing up to 100,000 cubic metres of LNG per day, enough energy to power the United States for 1.4 months. The company is investigating project procedures with Bechtel, the construction company that built the plant to review the possibility of increasing the capacity of the existing trains I-IV without constructing new plants.

Guyana Looks to Hydropower

Guyana's plan for a US$2 billion renewable water power plant, the Turtruba Hydropower Project, has won the interest and support of Brazil's President Lula Da Silva. The 800 megawatt hydropower development planned for Guyana's Mazaruni River was conceptualised by Enman Services Limited, a Pt Lisas based engineering and development firm headed by Donald Baldeosingh, a former Chairman of Petrotrin.

Brazil, which shares a border with Guyana, will be linked by the project via the Takutu Bridge. In September 2009, the presidents of Guyana and Brazil, Bharath Jagdeo and Lula Da Silva met at the symbolically correct border town of Lethem in Guyana to open the bridge project.

Ten to 15 per cent of the power produced will be reserved for Guyana's use and the remainder will be earmarked for export either to Brazil or to the Caribbean archipelago. The project scope currently includes a 580km high voltage transmission line from the power plant site to Boa Vista in Brazil's northern Roraima state.

one moment please

to reflect on the beauty
that surrounds us here
in Trinidad and Tobago

SUNSET SWIMMING: A boy wearing life preservers looks at the majestic sinking sun in the waters near Pigeon Point, Tobago. Pigeon Point, situated near the western tip of the island is one of Tobago's most beautiful beaches and a major tourist destination.
Photo by Kevin Reis

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