The Corporate Quarterly Journal of
The National Gas Company of
Trinidad and Tobago Limited

GASCO NEWS VOL. 22, NO. 3, OCTOBER 2009

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gascoNEWS
VOL 22 NO 3

October 2009
The National Gas Company of
Trinidad and Tobago Limited (NGC)
Orinoco Drive
Point Lisas Industrial Estate, Couva
Republic of Trinidad and Tobago
West Indies

MANAGING EDITOR
Christine Punnett

CONTRIBUTING WRITERS
Edward Bahaw, Haydn I. Furlonge,
Arden Rodriguez, Daren Ragoonanan

PHOTOGRAPHS
NGC Archives, Kevin Reis

DESIGN
Lonsdale Saatchi & Saatchi
Advertising Limited

PRINTING
Zenith Printing Services Limited

ALL CORRESPONDENCE TO
GASCO NEWS
c/o NGC Marketing Communications
P. O. Box 1127, Port of Spain
Trinidad and Tobago

PRODUCED BY
The National Gas Company of
Trinidad and Tobago Limited (NGC)

Front Cover: Artist's impression (aerial view) of the completed Alutrint Aluminium Smelter which is now under construction at Union Industrial Estate, La Brea.

The Serrette Platform for bpTT under construction at Labidco's fabrication yard at La Brea.

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THE ALUMINIUM ALLURE – WHY THE ESTABLISHMENT OF AN ALUMINUM INDUSTRY IN TRINIDAD?

(Submitted by the Ministry of Energy and Energy Industries)

It's the most abundant metal in the Earth's crust and the largest of the non-ferrous metals in global consumption. It ranks second only to copper in value.

Aluminium's presence in the modern world is nothing short of pervasive. Its primary user is the transport industry, followed by the construction sector, and virtually all packaging demands some form of sheet or foil stock. With such a profile it's not difficult to understand why the Government of Trinidad and Tobago would want to enter the world of aluminium.

At a 2006 Symposium on the Aluminium Industry hosted by the South Trinidad Chamber of Industry and Commerce (STCIC) held at Paria Suites in La Romain, former Energy Minister Dr. Lenny Saith said that the Government had been considering an aluminium industry in this country since the 1960s. "Each decade thereafter saw various administrations either reviewing proposals tabled by companies, or commissioning studies on the benefits of the industry to this country." Government, Dr. Saith said, saw the aluminium industry as one of "very significant importance to the diversification of the nation's economy."

Still, when the State indicated that it was ready to take the plan to the next level, the announcement was not met with plaudits. Chamber President Mr. Rampersad Motilal in his welcoming address to participants at the Symposium acknowledged the debate that had ensued since Government announced its plans. The concerns raised by members of the national community, he summarized, were particularly focused on environmental issues and on the extent of the economic benefits that could be realized by this country. "These concerns have sparked public interest in this debate," Mr. Motilal noted. The Chamber President and Chairman of the Symposium, however, referred to a recent survey published in one of the daily newspapers which revealed that close to 50 per cent of respondents did not feel they had been sufficiently informed to offer a reasoned opinion about the development of an aluminium industry in Trinidad and Tobago. He said that it was necessary, therefore, that as much information as possible be made available to the general public and to promote discussion based on "facts and informed opinion."

Artist impression (aerial view) of the Aluminium Smelter when completed at Union Industrial Estate, La Brea.

The Minister welcomed the opportunity provided by STCIC, through the Symposium, to engage stakeholders, and by extension the national community, in a constructive debate to answer questions, and attempt to clear up some, if not all, of the misconceptions that had surfaced to date.

The contributions by the distinguished and expert panel were meant to answer the questions: Will the introduction of the aluminium industry significantly further the country's development relative to other available options? What model of such industry is appropriate for our small twin-island State? What are the downsides associated with any chosen model, and how can we ensure that these are minimized, if not eliminated, entirely?

Model of Alutrint Dock at Brighton, La Brea.

Project Overview

At the time of the Symposium there were two proposals for smelters on the table. One was the 125,000 metric tonnes per year Alutrint, a joint project between the Government of the Republic of Trinidad and Tobago and the Venezuelan firm Sural, proposed for the Union Industrial Estate at La Brea. The other proposed smelter project was Alcoa, the world's second largest aluminium maker. The latter project was earmarked to be built as part of a new Industrial Estate in Chatham, Cap-de-Ville on the southwest peninsula. The Alcoa plant was expected to produce some 341,000 tonnes per year of aluminium ingots and the project scope provided for 240,000 tonnes to be further processed to produce extrusion billets and other stocks.

It's been three years since the symposium. The Alcoa Project has been discontinued, two years after a Memorandum of Understanding was signed. In April, 2007, the Environmental Management Authority issued a Certificate of Environmental Clearance (CEC) to Alutrint and work has commenced on this project.

Smelter and the Developmental Agenda

Trinidad and Tobago is positioning itself to monetize its natural resources in a way that it has not been able to do before. This country's energy sector's contribution to GDP is well documented. Minister of Energy and Energy Industries, Senator the Honourable Conrad Enill said in a 2008 speech to petrol station operators: "We have reduced the level of poverty from 35 per cent just five years ago to 17 per cent based on the latest data available. We have been able to fund these programmes because of the energy sector. The importance of the energy sector to national development can be illustrated by its contribution to the Gross Domestic Product (GDP) and to the country's revenues."

In 2007, the energy sector is reported to have contributed 45 per cent to GDP, up from 31.7 per cent in 2001. Available data suggested that 64.4 per cent of government revenue and 78 per cent of foreign exchange earnings were energy related.

Minister Enill told the operators back then: "This build-up of resources available to government over the last few years was based on policy decisions, which today we are reviewing in the context of our new realities. The policy choice of this administration in order to equip us for the future of ongoing global change is the transformation of Trinidad and Tobago into a developed nation in the shortest possible time frame, and certainly before the year 2020."

In that same speech, Minister Enill acknowledged that Trinidad and Tobago can ill afford to continue on a given path simply because that's the way it's always been done. To fulfil its developmental goals in a global environment, he argued, T&T must "rethink the way we conduct the business of Government. "We have a responsibility to be relevant and must now address the way we organize and structure our institutions, the business processes that the institutions of Government utilize and the nature of the resources, particularly the human resource that we employ..."

The aluminium isndustry is one of the ways that Government has selected to pursue a new level of "relevance" in a value-added energy environment. Trinidad and Tobago is now the world's number one exporter of ammonia and methanol from a single site. Trinidad and Tobago is also the largest exporter of LNG to the United States. The country has also benefited from a vibrant iron and steel industry.

These industries have undoubtedly brought significant economic benefits. But while the revenues accrued from the operations of these industries are high, they have not been large employment generators. Significant inroads in correcting this imbalance are being addressed through the introduction of a Local Content Policy, however

these industries only offer limited opportunities for the establishment of local enterprise and the export of high value-added products.

And there is a pressing need to expand the gas-based industrial landscape to secure future development. Consequently, the planned programme of economic diversification involves the establishment of downstream industries which add value and have the potential to generate economic multiplier effects, through the creation of linkages between the energy sector and the rest of the economy. New investments like aluminium would both deepen and widen the nation's productive base and generate new manufacturing activities in Trinidad and Tobago.

In his presentation at the Smelter Symposium, UWI Lecturer Gregory McGuire suggested that in deciding on the attractiveness or appropriateness of an aluminium smelter for Trinidad and Tobago, we need to determine what makes an investment sustainable from an economic development standpoint.

"The first criterion is that we must seek to quantify net value added," McGuire argued. "Real sustainability is a positive function of increased value added. A crude rule of thumb is that an industry increases its net value added as it grows from primary to tertiary or finished goods production." He added: "In the specific case of aluminium, it is imperative that the country seeks to maximize linkages with the national economy. This means that the tremendous downstream potential of aluminium must be captured. The onshore economy must be stimulated so that domestic entrepreneurs, either by themselves or in conjunction with foreign partners, seize the opportunity to become involved in what is still a growing business."

This analysis is in harmony with Government's policy direction. The primary objective through Government's proposed stream of investments in the downstream gas sector is to obtain the highest value for the country's natural gas. At present, most natural gas-based activities fail to go beyond the primary processing stage. The aluminium Iindustry in general, more than most other options for gas usage, has a large potential for downstream activity, with associated creation of jobs.

T&TEC substation under construction at the Alutrint site, La Brea.

Aluminium Complex

The Alutrint Aluminium Complex is designed to realize this potential. The proposed aluminium complex consists of an aluminium smelter producing 125,000 metric tonnes a year of molten aluminium. Alutrint plans to develop and operate the Aluminium Complex. This complex will offer not only more employment opportunities than the traditional primary gas-processing industries, but more opportunities for high-skilled operations in the high-tech downstream facilities.

Government's belief that the Aluminium Complex is an excellent opportunity for Trinidad and Tobago is based on the following reasons:

- It will establish T&T as a world-leading technology provider;
- T&T would enter into dynamic industrial sectors in potential markets such as:
  - Cables and wires in Latin American markets
  - Automotive parts in North American markets;
  - T&T could benefit from > US$400,000,000 per year of high value added exports;
- Some 880+ direct employment opportunities will be created with 2,000 additional opportunities as indirect employment;
- It will develop the skills of T&T nationals;
- There will be competitive financial returns on the investment.

On a macro scale, the Alutrint Aluminium Smelter and Complex will help monetize Trinidad and Tobago's energy resources towards development and benefit citizens on a more direct basis, as compared to the more traditional approaches such as ammonia, methanol and LNG production. The value-added benefit of aluminium and downstream production to the natural gas chain is significant, and will provide substantial economic diversification from an energy-based industry to a manufacturing one. This brings with it an entire scope for new skills, technology, education, employment and entrepreneurship, which will help position Trinidad and Tobago as a leader in the CARICOM countries for this industry.

The Power Advantage

From an economical perspective, aluminium production is a power-intensive industry, which means that the competitive production of aluminium is dependent on competitive power rates. Trinidad and Tobago currently enjoys a relatively low cost of electricity

to its consumers when compared to the international world. This, coupled with its stable business environment and accessible deepwater ports, makes this country well poised to export to North America and Europe, both of which have a net growing import requirement.

The importation of the white powder alumina (aluminium oxide) as the raw material into the plant eliminates the need for the refinement of bauxite. The "Red Mud," a byproduct of bauxite refinement which has become synonymous with alumina refineries worldwide, will not be associated with the Alutrint Complex, which shall focus on the production of aluminium, not alumina.

The Alutrint facility's southerly neighbour on the Estate is expected to be the new power plant being built by Mann Ferrostaal, to provide power both to Alutrint and the National Grid.

Why Not Ingots?

One of the statements made by critics of the plan to set up an aluminium industry is that Alutrint could have forgone the construction of the smelter component of the project and imported aluminium ingots from international sources for use as feedstock for the manufacture of rods, bars, wire and cable locally. Those who support this view argue that the smelter component of the project is associated with most of the potential negative environmental impacts of the project.

Aluminium ingots can be purchased on the international commodities market through the London Metals Exchange. The London Metals Exchange commodities market deals in metals sourced from all over the world and thus delivery dates upon purchase is subject to the vagaries of the market. This option will require Alutrint to pay for its ingots at current market prices and to then arrange for shipment and delivery to the plant site at La Brea. In addition, this option will require Alutrint to add a high temperature furnace upstream of the rod mill line to transform the ingots into molten metal. The result would be higher energy consumption and an increase in the project investment costs and plant operating costs. Aluminium transformation facilities, on the other hand, are more efficient and have a higher degree of safety when the smelter is in close proximity to the downstream facilities.

Aluminium's contribution to modern life.
Source: Aluminium Smelting, Health, Envorinmental and Engineering Perspectives

Health, Safety and Environmental Concerns

Much of the health and environmental risks associated with smelters are mitigated through the construction of a modern Pre-bake smelting facility. There are two main types of aluminium smelting technology: Söderburg and Pre-bake. The primary difference between the two is the type of anode used. Söderburg technology uses a continuous anode which is delivered to the cell (pot) in the form of a paste, and which bakes in the cell itself. Pre-bake technology, on the other hand, uses multiple anodes in each cell which are then Pre-baked in a separate facility with automated process and emission control. The quality of the baked Soderberg anode is lower than the quality of the Pre-baked one. The Soderberg cells are always characterized by a lower current efficiency and a higher pot voltage, needed also to produce the extra heat necessary for the anode baking.

A modern Pre-bake smelter, complete with superior engineering controls, is the type that has been approved for Trinidad and Tobago. Fugitive emissions from these cells are characteristically low and the balance of emissions are collected inside the cell itself and carried away to very efficient scrubbing systems, which remove particulates and gases.

All new-built smelters adopt the Pre-bake technology. The higher current efficiency, lower specific energy consumption and lower emission (especially PAH), make them the more environmentally responsible design.

Oyebode A. Taiwo, MD, MPH, representing Yale University School of Medicine, in his paper entitled "Managing the Health Impacts of Aluminium Smelters," recalled that from 1950-1979 Canadian smelter workers who were exposed to high levels of coal tar pitch volatiles over long periods showed increased incidents of lung and bladder cancer. Dr. Taiwo compared this data to more recent studies among smelter workers in Victoria, Australia from 1984 to 1996. Those studies concluded no increased risk of cancer among those workers. The difference was attributed to a significant upgrade in smelting technology.

Risk Assessment

Dr. Harriet Phillips, a consultant with SENES Consultants Limited, conducted a Human Health and Ecological Risk Assessment for the proposed Alutrint Smelter in La Brea. This methodology

is used worldwide on many industrial facilities, including smelters. It employs international health-based criteria, so it goes beyond the standards usually set by Government for industrial air emissions. Dr. Phillips' study helped to answer questions such as "how safe is the facility to my health and the health of my environment? And how sure are we of the conclusions?" The study also addressed the question of what happens when the facility goes. Her findings were presented to the residents of La Brea at a Community Meeting held in February, 2007.

What Are the Facts?

There has been much talk about hydrogen fluoride. These emissions come from the smelter only. Other particulates (PM10, PM2.5) come from all three facilities on the Union Estate. Larger particles are usually filtered by the nose hairs but fine particles are the ones that can bypass those hairs and cause respiratory effects in humans.

The gaseous emissions coming from the plants in the area include Nitrogen Oxide, Sulphur Dioxide and Carbon Monoxide. Polycyclic Aromatic Hydrocarbons or PAHs are emissions exclusively from the smelter. Finally, there is aluminium which is, as expected, directly related to the smelter.

Emissions come from almost every aspect of human activity. It's common knowledge that people are exposed to many of these chemical emissions due to daily activities in the general population. Barbecuing and smoking, for example, result in exposure to PAHs. Burning coal releases Sulphur Dioxide, and driving releases Carbon Monoxide, Carbon Dioxide and Nitrogen Oxide into the atmosphere. Transport is said to be second only to electricity, in terms of sources of emissions in the United States. Agriculture, commercial operations, and residential homes are all contributors to everyday emissions.

Government is fully conscious that gases and particles at unacceptable levels can have an adverse effect on both plant and human health and is fully committed to working vigilantly with the relevant local authorities to ensure that Alutrint, like all business entities, complies with international standards for emission control.

In her presentation, Dr. Phillips also addressed the risk of human exposure through the consumption of fruits, vegetables and animals such as yard fowls. Using a series of graphs to illustrate the findings, residents were able to see that the concentrations of Carbon Monoxide and Hydrogen Fluorides projected from activities at the smelter and neighbouring plants on the Estate are well below internationally acceptable target levels. Sulphur Dioxide, and to a lesser extent Nitrogen Dioxide emissions, were observed to be close to the acceptable limit. Exposure of workers and residents of the surrounding community to aluminium is projected to be very low. Fluoride and PAH are slightly higher, but still well below internationally acceptable targets for risk levels.

In her concluding remarks, Dr. Phillips told those gathered: "People who live in the La Brea area can maintain their eating habits and they would not develop cancer or any other health effects because of the operation of these facilities, even after they have shut down." She added: "When you do the assessment for cancer it looks at your whole lifetime. It is therefore safe for children to play in their yards and it is safe for the community to spend as much time outside as they desire."

In January 2006, Alutrint submitted an Environmental Impact Assessment (EIA) study report to the Environmental Management Authority (EMA), as part of its requirements to allow the EMA to assess the granting of a Certificate of Environmental Clearance (CEC). This EIA contains a detailed description of the Alutrint project as well as an in-depth analysis of the potential impacts, risks and hazards of the project on people and the environment in the Ward of La Brea. The more important component of the EIA is the impact mitigation measures incorporated into the design of the Complex and into the operational controls for the plants that will prevent these potential impacts from being realized. Of equal importance are the environmental health and safety management systems and emergency response procedures to be enforced.

After a number of iterations and additions, the comprehensive and meticulous review of Alutrint's CEC Application by the EMA resulted in the successful award of a CEC in April 2007.

There are numerous monitoring and reporting requirements that are outlined in the EIA, to which Alutrint will be beholden, in order to prevent any notices of violations from the EMA. One such requirement is the performance of a Medical Monitoring Plan (MMP) that extends beyond Alutrint's direct employees.

The undertaking of the Medical Monitoring Plan is in no way the result of any higher than average risk profile of the operating of Alutrint's facility. Instead, it is viewed as a modern, pro-active and responsible approach towards the redevelopment of an industrialized area, which represents the interests both of the fence-line communities, Alutrint and other industry stakeholders.

Additionally, in conjunction with the Ministry of Health – which has approved the Plan along with the EMA, and will chair the Planning and Implementation Committee for the MMP – Alutrint will be encouraging an increased focus on the general health profile of its community, that includes awareness and prevention of legitimate health concerns to Trinidad's population, such as diabetes, high blood pressure, and so on.

The MMP will include the conducting of baseline measurements and the conducting of periodic monitoring on selection samples of the population, to quantify any future health queries that may arise during the many years of operation of the facility. The baseline monitoring will occur during the construction phase of the project over the coming years.

A REVIEW OF THE DYNAMICS BETWEEN THE ENERGY SECTOR AND THE ECONOMY OF TRINIDAD AND TOBAGO

Edward Bahaw is pursuing a Master of Philosophy degree and Haydn I. Furlonge is an Associate Professor at the Natural Gas Institute of the Americas, The University of Trinidad and Tobago.

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By EDWARD BAHAW and HAYDN I. FURLONGE

Based on the most recent available data (2007), the energy sector accounts for approximately 87 per cent of exports, 48 per cent of government revenue and 43 per cent of gross domestic product (GDP)

OVERVIEW: OIL TO NATURAL GAS

Trinidad and Tobago is a small, energy-based, developing economy of the Caribbean. The energy sector of Trinidad and Tobago dates back to 1908 which marks the first year of commercial crude oil production. Essentially, production of crude oil was the main focus of the industry from its inception straight up to the late 1970s. Subsequent to this, the industry transitioned towards focusing more on natural gas production and utilisation as a result of significant discoveries of this hydrocarbon[1]. The shift from crude oil to natural gas took place gradually with the growth of petrochemical production (such as ammonia and methanol) from the 1980s onwards and the emergence of liquefied natural gas (LNG) in the late 1990s.

Based on the most recent available data (2007), the energy sector accounts for approximately 87 per cent of exports, 48 per cent of government revenue and 43 per cent of gross domestic product (GDP)[2]. Because of the dominant role of the energy sector, it is essential to formally quantify the magnitude and dynamism of its relationship with the macro-economy. This would indeed foster a better understanding of the workings of the economy which would be vital to government planning and policy decision making.

This short paper analyses the relationships between energy sector parameters and macroeconomic variables using basic correlations. It is for instance shown that oil and gas production has been driven by foreign direct investment which in turn has bolstered government energy revenue. As the government revenue has increased, the concomitant increase in public expenditure has propelled economic activity which has invigorated growth in the overall economy.

Energy Exports and Economic Performance

In the literature there are many empirical studies on the economic performance of energy-exporting economies. Interestingly, in these studies some countries, such as Norway, Botswana, Indonesia and Malaysia, were found to achieve long-term stable economic growth. Other countries on the other hand such as Nigeria, Venezuela, Saudi Arabia, Libya and Ivory Coast experienced a less favourable economic performance (Ayadi and Chatterjee, 2000; Eltony and Al-Awadi, 2002; Siliverstovs and Herzer, 2007).

Further, some studies have demonstrated that countries which have focused on the exploitation of natural resources[3] as the 'engine of growth' have underperformed compared to countries less endowed with natural resources (Olusi and Olagunju, 2005; Mehrara and Oskoui, 2006; Collier and Goderis, 2007; Davis and Tilton, 2005). These studies make reference to the existence of the resource curse. The existing body of research identifies many reasons for this and highlights the steps that need to be undertaken in order to 'exorcise' the resource curse. To a large extent these measures hinge on the government's ability to manage their country's energy resources in a manner consistent with sustainable economic growth (Hjort, 2006; Mehlum et al., 2005; Arezki and Ploeg, 2007; Sanbu, 2006).

Overview of the Trinidad and Tobago Economy

One important feature of the economy of Trinidad and Tobago is the ownership of the energy production

[1] In 1998 natural gas production overtook crude oil production in barrels of oil equivalents.

[2] See Central Bank Review of the Economy 2008 and Statistical Digest June 2008.

[3] Examples of countries with low natural resource endowments and strong economic performances are: Singapore, Japan, Taiwan and South Korea.

facilities. Although energy accounts for the bulk of the country's export revenues, ownership is concentrated in the hands of multinationals. This is because Trinidad and Tobago depends largely on foreign direct investment to harness the productive potential of its energy resources. The main reason for this is that both the local private sector and the government sector do not have the resources or risk-taking capacity to pursue such investments. This means a commensurate proportion of the returns on investment in the sector accrue to foreigners. As a result the strength of the economic linkage between the energy sector and the rest of the domestic economy is limited compared to other countries where energy production facilities are owned locally.

A feature of the energy sector is its limited absorption of labour. For instance over the eight-year period from 2000 to 2007 direct employment in the energy sector in Trinidad and Tobago has averaged around 3 to 4 per cent of the labour force. This is low when considering that the sector represented between 30 per cent to 40 per cent of GDP during this period. Such a low rate of employment would also place a limit on the level of economic linkages domestically.

Given that foreign ownership and low levels of direct employment limits the strength of the economic linkage between the energy sector and the domestic private sector, the main link with the domestic economy occurs via the government sector. This is because revenue collected from taxes levied on the energy industry account for a sizable share of total state income. As such this source of funding plays a pivotal role in the financing of public sector investment projects as well as government recurrent expenditure.

Another salient feature of the economy of Trinidad and Tobago is the size of its energy resources. Although the country's reserves and annual production of hydrocarbons are less than 1 per cent of the aggregate global level, in terms of production per capita Trinidad and Tobago ranks sixth in the world. Table 1 presents the top 20 countries based on this measurement along with GDP per capita using 2007 data. In terms of GDP per capita, Trinidad and Tobago ranks twelfth which is considerably below its hydrocarbon production per capita ranking. In addition, the table shows that though the United Arab Emirates production per capita is on par with Trinidad and Tobago, its per capita GDP is over two times greater. Furthermore, the table also indicates that even though Equatorial Guinea produces about 13 per cent less hydrocarbons per capita than Trinidad and Tobago, its GDP per capita is about 50 per cent larger. The implication is that the energy sector contributes comparatively less to the economy of Trinidad and Tobago than it does to other economies.

Table 1: Top 20 Hydrocarbon Production per capita Economies

	Country/ Region	Hydrocarbon Production in BOE per capita (2007)	GDP – per capita in 2007 (US$ Purchasing Power Parity)
1	Qatar	757	$80,900
2	Kuwait	404	$39,300
3	Brunei	400	$51,000
4	Norway	352	$53,000
5	United Arab Emirates	286	$37,300
6	Trinidad and Tobago	283	$18,300
7	Equatorial Guinea	247	$28,200
8	Saudi Arabia	160	$23,200
9	Oman	132	$24,000
10	Bahrain	117	$32,100
11	Libya	116	$12,300
12	Turkmenistan	88	$5,200
13	Canada	67	$38,400
14	Gabon	66	$14,100
15	Russia	53	$14,700
16	Venezuela	46	$12,200
17	Kazakhstan	42	$11,100
18	Algeria	38	$6,500
19	Denmark	37	$37,400
20	Angola	37	$5,600

Source: Energy Information Administration and International Monetary Fund.

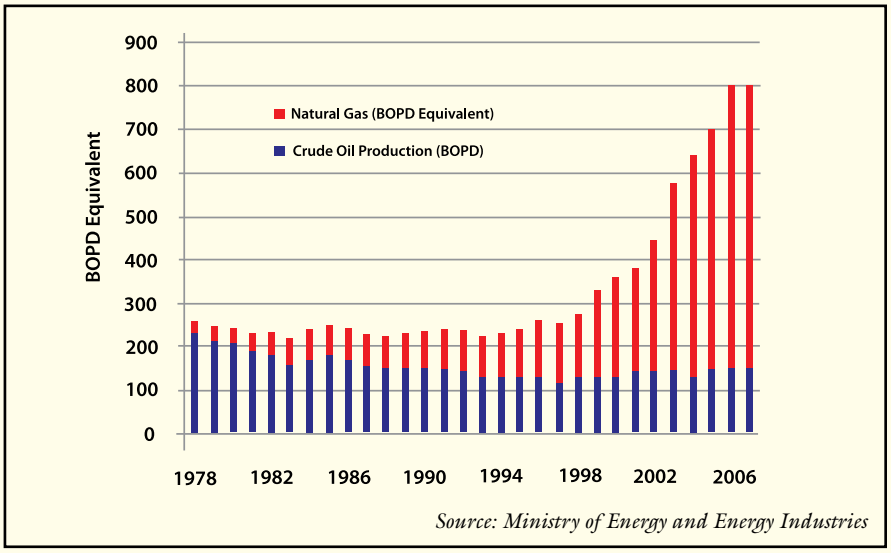
The largely energy-based economy of country makes it dependent on the prices of its main exportable commodities. Energy prices just like all other primary products are very volatile. In particular, small changes in the international demand or supply usually results in wide price swings. Consequently, the price of crude oil and natural gas is expected to be very volatile with wide price swings in times of oversupply or excess demand. Such price fluctuations impact significantly on the foreign exchange

earnings from the sector.

In terms of production on an energy equivalent basis, natural gas currently (2007) accounts for approximately 81 per cent with crude oil representing the remaining 19 per cent. In 1982 natural gas and crude oil accounted for 21 per cent and 79 per cent respectively of the total hydrocarbon output. This represents a major shift towards the exploitation of natural gas resources over the last two and a half decades (see Figure 1).

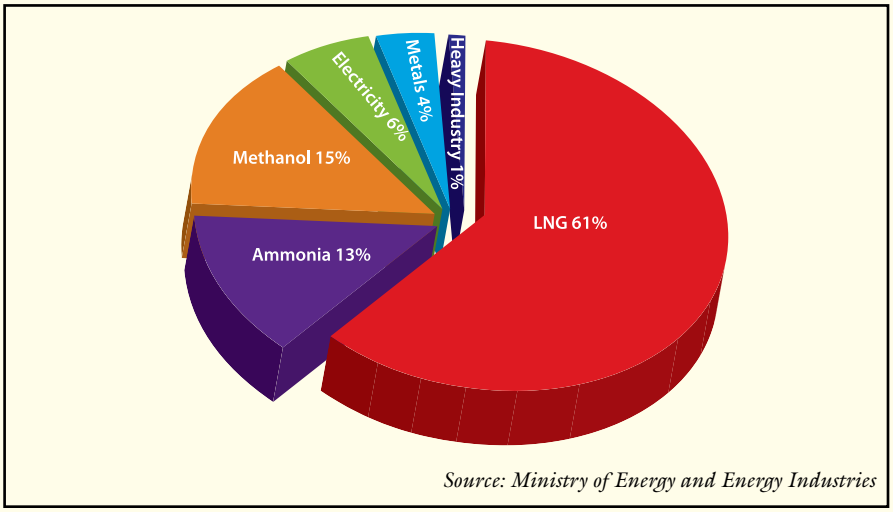
Figure 2 presents a decomposition of natural gas utilization in Trinidad and Tobago for the year 2007. This demonstrates that the portfolio of natural gas usage includes its application as a feedstock in the petrochemical sector all well as a fuel source for heavy industries and electricity generation. The figure also shows that a large proportion is utilized to produce LNG.

Figure 1: Crude Oil and Natural Gas Production



Source: Ministry of Energy and Energy Industries

Figure 2: Natural Gas Utilization (2007)



Source: Ministry of Energy and Energy Industries

ECONOMIC ANALYSIS OF THE ENERGY SECTOR

In this section the main macroeconomic variables and energy sector parameters in Trinidad and Tobago are examined.

Gross Domestic Product (GDP)

The Trinidad and Tobago economy has shown remarkable resilience over the last 15 years with consecutive economic growth being experienced since 1993. In particular, real GDP has increased by two and a half times over this period representing a compounded annual average growth rate of 6.7 per cent. Interestingly, the country had experienced a similar energy economic boom between 1975 and 1982 when both oil prices and production were quite buoyant. In this period, the compounded average growth rate was about 6 per cent per annum. In between these two economic booms was an extended 12-year period of economic contraction from 1982 to 1993 where the economy shrank by about 28 per cent. Such negative growth in the economy of Trinidad and Tobago occurred simultaneously with a decline in both energy sector prices and output.

Foreign Direct Investment (FDI)

The main impetus for the growth in the energy sector in Trinidad and Tobago has been through investments by multinational companies. To a large extent this has been the outcome of incentives offered by the government of Trinidad and Tobago to such companies. Over the last 20 years, Trinidad and Tobago has been the recipient of around US$500 million per annum in FDI. This has contributed to the accumulation of close to US$10 billion in production facilities in this country over that period. It must also be pointed out that over the last 10 years, direct investment inflows from foreign sources have grown to approximately US$700 million per annum.

Government Energy Revenue

Revenue generated for the government by the energy sector forms the main link with the rest of the economy. As the energy sector has

expanded, government energy revenue has grown in tandem. Over the period 1993 to 2007, government revenue from the energy sector has expanded from TT$1.8 billion to TT$21.4 billion representing a compounded average annual increase of about 18 per cent per annum. The rate of increase in government energy revenue however has accelerated over the last 10 years, rising to 34 per cent compounded average growth per annum.

Crude Oil and Natural Gas Production

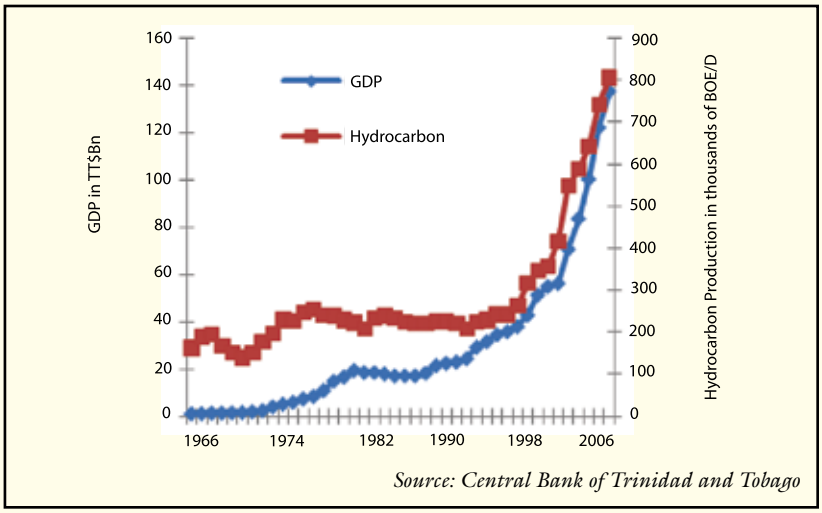
Crude oil production has averaged around 125,000 barrels per day over the past five years. This is quite small compared to the peak in oil production in 1978 when production was about 230,000 barrels per day. Since the early 1980s natural gas production gradually assumed greater economic significance. In particular, production has skyrocketed in recent years because of considerable investments in this hydrocarbon mainly from multinationals. In 2000, natural gas production averaged 1.5 billion standard cubic feet per day and in 2007 this increased to 4.1 billion cubic feet per day. This represents an average compounded rate of increase of about 13 per cent per annum.

Crude Oil, Natural Gas and Petrochemical Prices

Crude oil prices have fluctuated a lot over the last four decades. During the period 1973 to 1974 the Arab oil embargo imposed by the Organization of Petroleum Exporting Economies (OPEC) resulted in crude oil prices rising from US$2.30 a barrel to $10.41. Following this the Iran/Iraq war of 1980 to 1981 led to an increase in price to $36.01 which was an all time high at that time. The price of oil faced a steady decline reaching $12.97 in 1986 with minor fluctuations thereafter falling to below $10 per barrel in late 1998. Starting from 2003 though, oil prices began to rally upwards reaching almost $150 per barrel in July 2008. This recent spike has been attributed to the rapid increase in global demand coupled with constrained supply capacity as well as price speculation (Stevans and Sessions, 2008).

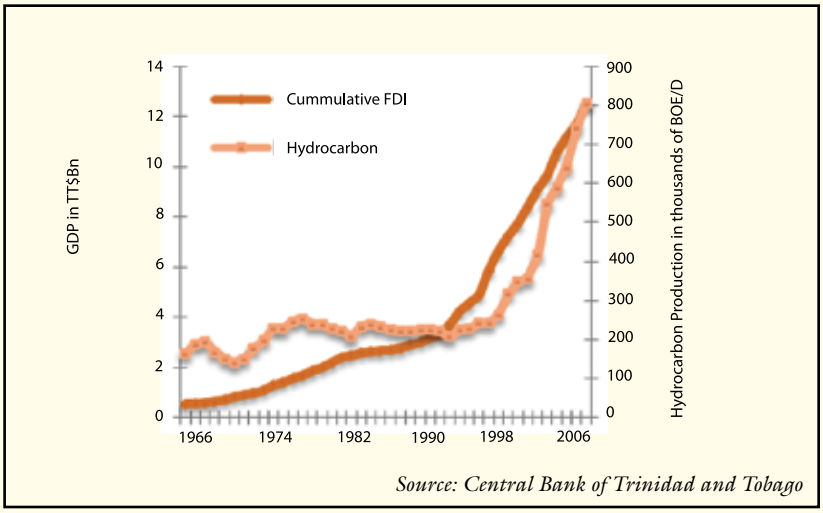
The price of natural gas and petrochemicals has followed a similar trajectory to crude oil prices in recent years. Since 2001 the price of natural gas has risen by an average of 17 per cent compounded per annum while methanol and ammonia have experienced a compounded average growth of 11 and 13 per cent per annum respectively.

Figure 3: Hydrocarbon Production and Real GDP



Source: Central Bank of Trinidad and Tobago

Figure 4: Cumulative FDI and Hydrocarbon Production



Source: Central Bank of Trinidad and Tobago

CORRELATION COEFFICIENTS

This section attempts to examine the nature of the relationship between energy sector parameters and key macroeconomic variables using correlation analysis. Figure 3 presents time series plots of hydrocarbon output and GDP of Trinidad and Tobago over the period 1982 to 2007. This chart shows a strong degree of positive correlation between these two variables with the correlation coefficient equating to 0.98. The relationship between cumulative FDI and hydrocarbon production is presented in Figure 4. This shows that as the level of

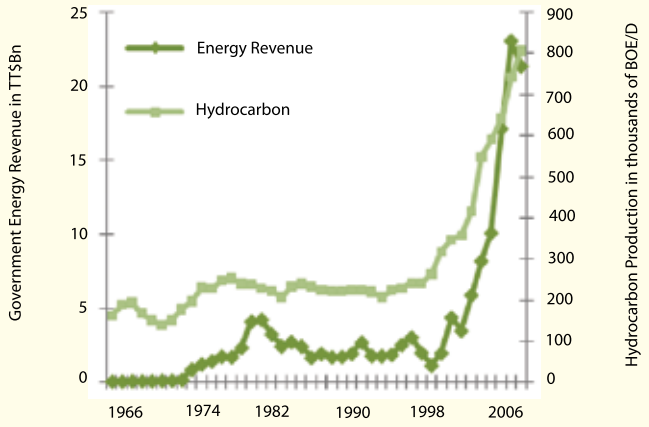
cumulative FDI increases, the volume of hydrocarbon output has correspondingly expanded. This is also reflected by the high coefficient of correlation of 0.95. Figure 5 shows the historical experience between hydrocarbon production and government energy revenue. These two variables produce a correlation coefficient of 0.92. Figure 6 shows a plot of cumulative FDI and GDP over the period 1955 to 2005. This chart also shows an extremely strong degree of correlation which is measured at 0.99.

Although correlations do not necessarily imply causation, the analysis presented suggests that there is enough evidence to warrant further investigation into the dynamics between energy sector parameters and macroeconomic variables. This would require econometric testing procedures such as Granger Causality and Cointegration analysis in order to obtain more robust results.

CONCLUDING REMARKS

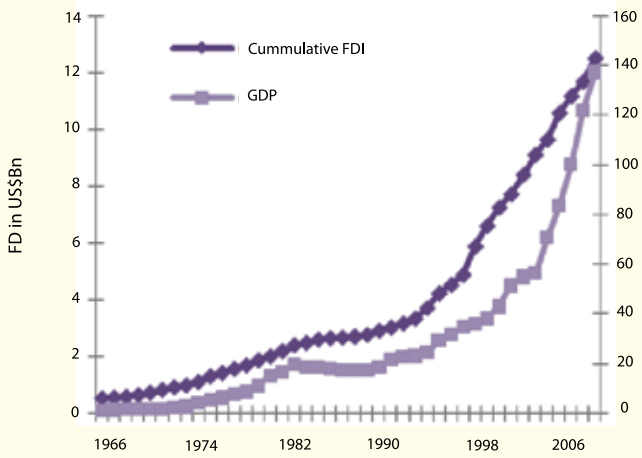
This paper presents a review of the energy sector and the economy of Trinidad and Tobago. In addition, it examines the dynamics between energy sector parameters and macroeconomic variables of the country using a correlation approach. The data suggests that as hydrocarbon production increased, the overall economy has expanded. To a large extent the growth in oil and gas production has been driven by foreign direct investment which in turn has bolstered government energy revenue. As government revenue increased, the concomitant increase in public expenditure has propelled economic activity which has invigorated growth in the overall economy. A more detailed understanding of these dynamics, in a quantitative construct, is necessary for effective short and long-term economic planning. This is the subject of future work.

Figure 5: Hydrocarbon production and Government Revenue



Source: Central Bank of Trinidad and Tobago

Figure 6: GDP and Cumulative FDI



Source: Central Bank of Trinidad and Tobago

As government revenue increased, the concomitant increase in public expenditure has propelled economic activity which has invigorated growth in the overall economy.

One natural gas installation in Trinidad.

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TAR SANDS – ALTERNATIVE SOURCE OF HYDROCARBONS?

By ARDEN RODRIGUEZ,
Business Analyst, NEC
DAREN RAGOONANAN,
Business Analyst, NEC

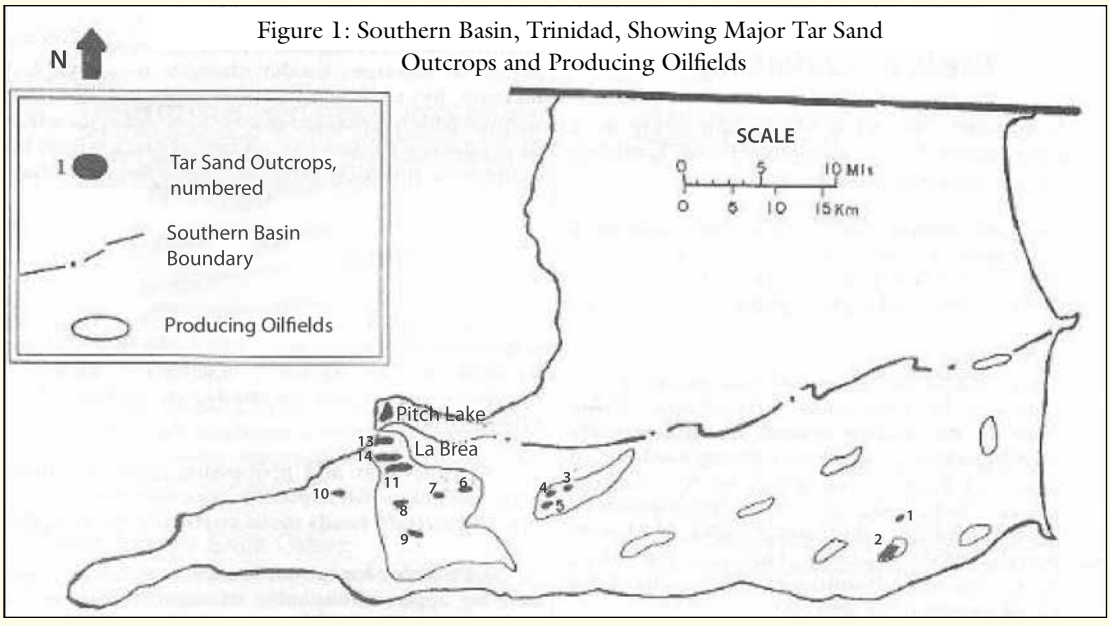
Substantial deposits of tar sands exist in the southern part of Trinidad, namely the Parrylands area (Figure 1). Tar sands development can be considered as an alternative source of hydrocarbon as compared with traditional oil and gas production. With such developments in may be possible for Trinidad and Tobago to reverse the recent trends in declining crude oil production. This article will examine two well-developed tar sands producers, specifically Canada and Venezuela, with emphasis on the characteristics, technologies and fiscal framework required for commercial production.

Oil sands, tar sands, or extra heavy oil is a type of bitumen deposit. Tar sands is a colloquialism for what are technically described as bituminous sands, and commonly known as oil sands. In Venezuela, however, it is known as extra heavy oil. The sands are naturally occurring mixtures of sand or clay, water and an extremely dense and viscous form of hydrocarbon which is not recoverable in its natural state by conventional oil well production methods.

Tar sands have only recently been considered to be part of the world's oil reserves, as higher oil prices and new technology enable them to be profitably extracted and upgraded to usable products. Oil sand is often referred to as non-conventional oil or crude bitumen, in order to distinguish the bitumen and synthetic oil extracted from oil sands with the free-flowing hydrocarbon

Oil sands, tar sands, or extra heavy oil is a type of bitumen deposit. Tar sands is a colloquialism for what are technically described as bituminous sands, and commonly known as oil sands.

Figure 1: Parrylands Tar Sand Deposits in Trinidad



Source: UWI, Civil Engineering

mixtures known as crude oil, traditionally produced from oil wells.

Many countries in the world have large deposits of oil sands, including the United States, Russia, and various countries in the Middle East. However, the world's largest deposits occur in two countries; Canada and Venezuela (Figures 2 & 3), both of which have oil sands reserves approximately equal to the world's total reserves of conventional crude oil. As a result of the development of Canadian oil sands reserves, 44 per cent of Canadian oil production in 2007 was from oil sands, with an additional 18 per cent being heavy oil, while light oil and condensate had declined to 38 per cent of the total.

Oil sands may represent as much as two-thirds of the world's total petroleum resource, with at least 1.7 trillion barrels in the Canadian Athabasca Oil Sands and perhaps 235 billion barrels of extra heavy crude in the Venezuelan Orinoco oil sands. Between them, the Canadian and Venezuelan deposits contain about 3.6 trillion barrels of oil in place, compared to 1.75 trillion barrels of conventional oil worldwide.

Figure 2: Canadian Oil Sands in Alberta

Source: Wikipedia

Characteristics

There are considerable heavy oil and oil sands resources around the world, but only some of these resources are in active development. Even so, there is a very wide range of technical and economic conditions to be considered.

For the purpose of this article, the heavy oil and oil sands will be defined as crude oils with gravity between 0 and 20 degrees API. Within this group one often separates heavy oils into heavy and extra heavy using the 10 degrees API as the dividing benchmark. It is customary to divide the group also in bitumen and heavy oils based on the viscosity of the crude oil in-situ in the reservoirs. If oil does not flow to the wells on the basis of primary or secondary production methods, it can be called bitumen. Other than that, it is termed as "heavy oil". The

Figure 3: Venezuelan Heavy Oils

Source: Rigzone

viscosity of the crude oil in the reservoirs is an important factor to consider when determining project economics.

Production Methodologies

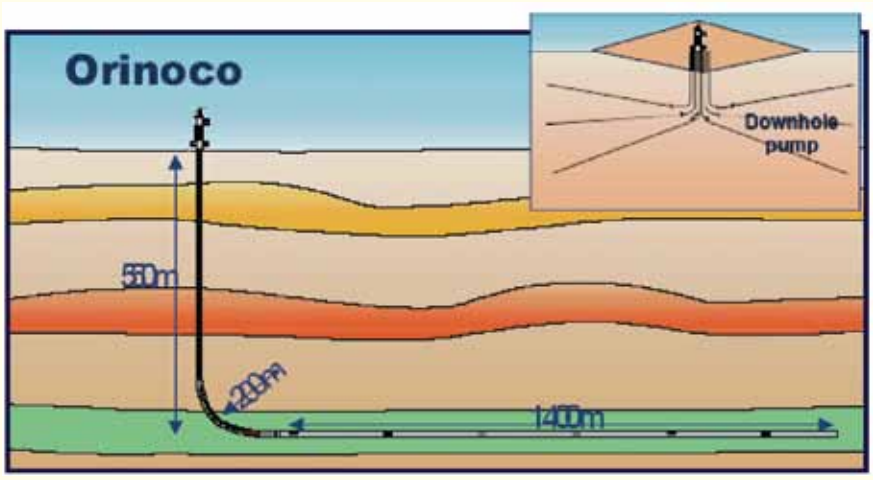
There are differing methodologies employed around the world to produce heavy oils/oil sands. Notwithstanding, there are three main methods currently being used in the world, as follows.

Cold Methods: Heavy oil production started around the world on the basis of production from conventional vertical wells. For example, in 1980, Venezuelan production rates were about 100–200 bopd per well. However, since then technological improvements such as the use of electrical submersible pumps (ESPs), horizontal wells, multilateral wells and the use of diluents have been introduced.

These factors have increased production to the 1,500–3,500 bopd per well range. Venezuela lies on the Orinoco Belt and still largely uses cold methods (Figure 4). This could lead to relatively low production costs per barrel. Cold methods are also employed in the Alaskan Arctic.

This methodology is usually economically preferable when:

Figure 4: Cold Production of Tar Sands



Source: TotalFinaElf

- the viscosity in the reservoirs is relatively low
- reservoir conditions are favourable (high temperatures and porosity)
- oil is 'foamy oil' – associated gas comes out of solution during oil production.

Under all these conditions, heavy oil will flow adequately to the wells. A special method of cold production is termed CHOPS (cold heavy oil production with sand) whereby the horizontal wells are in production due to the encouragement of sand into the wells along with the oil. In this way permeability is being improved around the well during production. This method is being used in Alberta with respect to some heavy oil deposits.

Generally, cold methods limit the recovery factor to the 10-20 per cent range.

Steam Injection: The viscosity of oil can be lowered significantly by increasing the temperature. This can be achieved by injecting steam. There are several production methods that are used based on the injection of steam. These are:

Steam Flood – This is traditionally done by having a five-spot pattern of wells with four producers at each corner and a steam injector in the centre. The application of steam makes the oil flow easier to the producing wells. The steam then extends through the reservoir to the producing wells. The injection of steam increases reservoir pressure which makes oil flow better to the wells. At some point in time, the breakthrough of steam occurs in the producers. Subsequently, the oil is produced through gravity. Steam injection of this type is being used in Kern River and in the Duri field in Sumatra, Indonesia.

Oil sands may represent as much as two-thirds of the world's total petroleum resource, with at least 1.7 trillion barrels in the Canadian Athabasca Oil Sands and perhaps 235 billion barrels of extra heavy crude in the Venezuelan Orinoco oil sands. Between them, the Canadian and Venezuelan deposits contain about 3.6 trillion barrels of oil in place, compared to 1.75 trillion barrels of conventional oil worldwide.

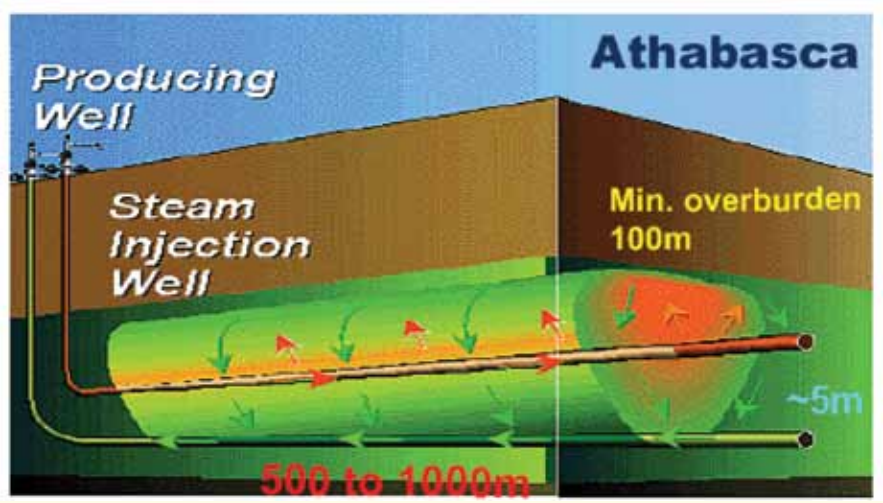
Cyclic Steam Support (CSS) – This method was developed in the Lake Maracaibo area located in Venezuela. In this case steam is injected in a well and subsequently oil is produced from the same well. It is also called the huff and puff method. The CSS method can be applied to vertical or horizontal wells.

Steam Assisted Gravity Drainage (SAGD) – This method employs two horizontal wells. The upper one injecting steam on a continuous basis and the lower one is used to produce the oil based on gravity drainage. This is a method that is now widely used in the Athabasca oil sands region of Canada and in Cold Lake for in-situ production of oil sands (Figure 5).

In general, steam flood and SAGD could result in a recovery factor of 30-70 per cent depending on reservoir conditions. CSS has typically lower recovery factors. As can be easily understood, the economics of all steam injection projects is very much impacted by the steam requirements per barrel of oil production and the cost of natural gas or other energy sources to produce the steam.

Mining: This is the well-known method used for the Athabasca oil sands whereby the bitumen is mined. This method has a recovery factor of better than 80 per cent. Of course, the mining methodology is suitable only for areas where the overburden is relatively thin. This method is therefore limited to a small part of the Alberta oil sands.

Figure 5: Steam Assisted Gravity Drainage



Source: TotalFinaElf

Other: Apart from the above methodologies, other methodologies can be applied and are in development, such as in-situ combustion. It is highly likely that over the next few decades technology will continue to improve dramatically with respect to the production of heavy oils/oil sands. This may make new resources accessible and will in the long term result in lower production costs.

The main problem of heavy oils/oil sands is that in a normal distillation refining process, they produce only a small percentage of light fractions, typically in the range of 15-30%.

Upgrading Methodologies

The main problem of heavy oils/oil sands is that in a normal distillation refining process, they produce only a small percentage of light fractions, typically in the range of 15-30 per cent. However, these light fractions which include gasoil (diesel), kerosene and gasoline have attractive premium markets and are in global demand.

Therefore, some heavy oils and all oil sands require further upgrading in order to make the product more marketable and easier to transport. The purpose is to produce synthetic crude oils (SCO) that contains a higher percentage of light fractions.

There are generally three levels of upgrading that can be done to accomplish this. They are as follows:

Dilution – In this case, the heavy oil or bitumen is simply mixed with diluents, such as naphtha in order to make a mixture that can be transported by pipeline and can be sold in the international markets. The aim is to produce upgraded oil with an API content of about 16–20 degrees API and with light fractions of 30–35 per cent of oil.

Medium Upgrading – Coking and thermal cracking processes are used to produce a SCO that is in the range of 21–25 degrees API and with light fractions of 40–50 per cent of oil.

Deep Upgrading – Hydro-cracking is used to create a SCO of 32-37 degrees API and with light fractions of 60–80 per cent of oil. The process uses large volumes of hydrogen derived from natural gas.

Higher degrees of upgrading naturally translate to higher costs. Therefore from an investor's point of view, there must be an optimal balance between the level of upgrading and the quantum of costs.

Environmental Concerns

Oil sand extraction causes greater environmental damage than conventional oil. The main concerns with oil sands are land damage, including the substantial degradation in the land's ability to support forestry and farming, greenhouse gas emissions, and water use.

On a life-cycle basis, including emissions related to transportation by pipeline or tanker, refining and end use, oil sands are about 10 per cent more carbon intensive than Middle East crude oils.

Fiscal Regimes

For tar sands production to develop in Trinidad and Tobago, there must a fiscal framework which appropriately addresses the needs of the State and the investor. As such, an examination of the taxation regimes of the two largest tar sands-producing countries, namely Canada and Venezuela are illustrated hereafter:

Canada

Prior to 2007, in the Alberta system, the terms were:

- 25 per cent profit share deductible from corporate tax
- 30 per cent corporate income tax

These conditions resulted in a boom in oil sands and heavy oil developments. However, in 2007 the Alberta Government initiated a review of the profit sharing royalties and subsequently decided to increase the overall Government take from 47.5 per cent to approximately 58 per cent under higher oil prices.

It should be noted that the fiscal terms are applicable to bitumen production as well as some of the heavy oil production. In case of bitumen production, its value is typically only about 45 per cent of WTI.

For upgrading operations, the corporate income tax rate is 30per cent.

The post – 2007 fiscal terms starts with a base or startup royalty rate for oil sands of 1 per cent. While the Alberta Royalty Review Panel opted to keep this rate, Alberta's new royalty regime will ensure that Albertans get a greater share of oil sands revenues from the very start. Under the new system, the base rate will start at 1 per cent, and increase for every dollar that oil is priced above US$55 per barrel, to a maximum of 9 per cent when oil is priced at US$120 per barrel or higher. The net royalty, applied post-payout is currently 25 per cent. In the future, it will start at 25 per cent and increase for every dollar that oil is priced above US$55 per barrel to 40 per cent when oil is priced at US$120 or higher.

Venezuela

In 2006, the Venezuelan terms were:

- 16.67 per cent royalty
- 50 per cent corporate income tax
- 38 per cent participation – not carried, normal Joint Operating Agreement (JOA)

However, these terms were revised in 2008 to:

- 30 per cent royalty
- 50 per cent corporate income tax
- 60 per cent participation – not carried, mixed company basis

The new fiscal package was strongly opposed by the petroleum industry. In this context, no significant new projects have been announced based on the revised tax structure.

Conclusion

Although new gas-based industries and infrastructure represent important steps towards building a sustainable economy, the production of crude oil from heavy oil reserves would provide significant added advantages in terms of increasing current production. This would provide a wider scope of opportunities for developing various downstream petrochemical industries from petroleum. Consequently it would also create more balance and diversification within our current energy portfolio.

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Pipelaying – Liquid Fuels Pipelines

Liquid Fuels Line

The Liquid Fuels Pipeline will carry unleaded super and premium gasoline, diesel and jet fuel from Petrotrin to Frederick Settlement, Caroni and to Piarco International Airport. NGC is constructing this multiproduct pipeline on behalf of the Government of the Republic of Trinidad and Tobago.

The Caroni site has been cleared and filled, and the site level is now raised to reduce any negative impacts, such as flooding, that could damage the pipeline. The Frederick Settlement facility will feature nine large tanks to buffer the supply of different fuels. There will also be two slop tanks, a fire-water tank for emergencies, and a tank for drinking water. From the tanks, fuel will be pumped to four structures housing 14 loading arms which will load the fuels onto the tank wagons used to ferry the fuel to gas stations throughout the country.

Jet fuel will be taken to Piarco International Airport by pipeline, but a backup loading arm at the Caroni facility will also be able to dispense it when necessary. It is to be noted that the loading arm will also be used to dispense kerosene and jet fuel for operators of light aircraft and helicopters. The new system replaces the bulk fuel that is shipped between Petrotrin and NP Sea Lots thus providing a centralized distribution point. Overall, work on the project is 70 per cent complete. Kellogg, Brown & Root (KBR) has completed 95 per cent of the work on the electrical designs. Civil designs are 80 per cent complete. All process, control system, fire prevention and mechanical designs are complete. KBR has completed 75 per cent of its procurement responsibilities and NGC has placed orders for the long lead items for which it is responsible.

The two local contractors handling the pipeline construction are South M Construction Limited and Trinweld Contractors Limited. Pipeline construction has begun and is 50 per cent complete, despite adverse weather conditions which compounded the difficulty of working in swampland. Several horizontal directional drills (HDD) of rivers and roadways have been successfully completed. The Frederick Settlement facility is scheduled for completion and commissioning by the third quarter of 2010.

North Eastern Offshore Pipeline (NEO)

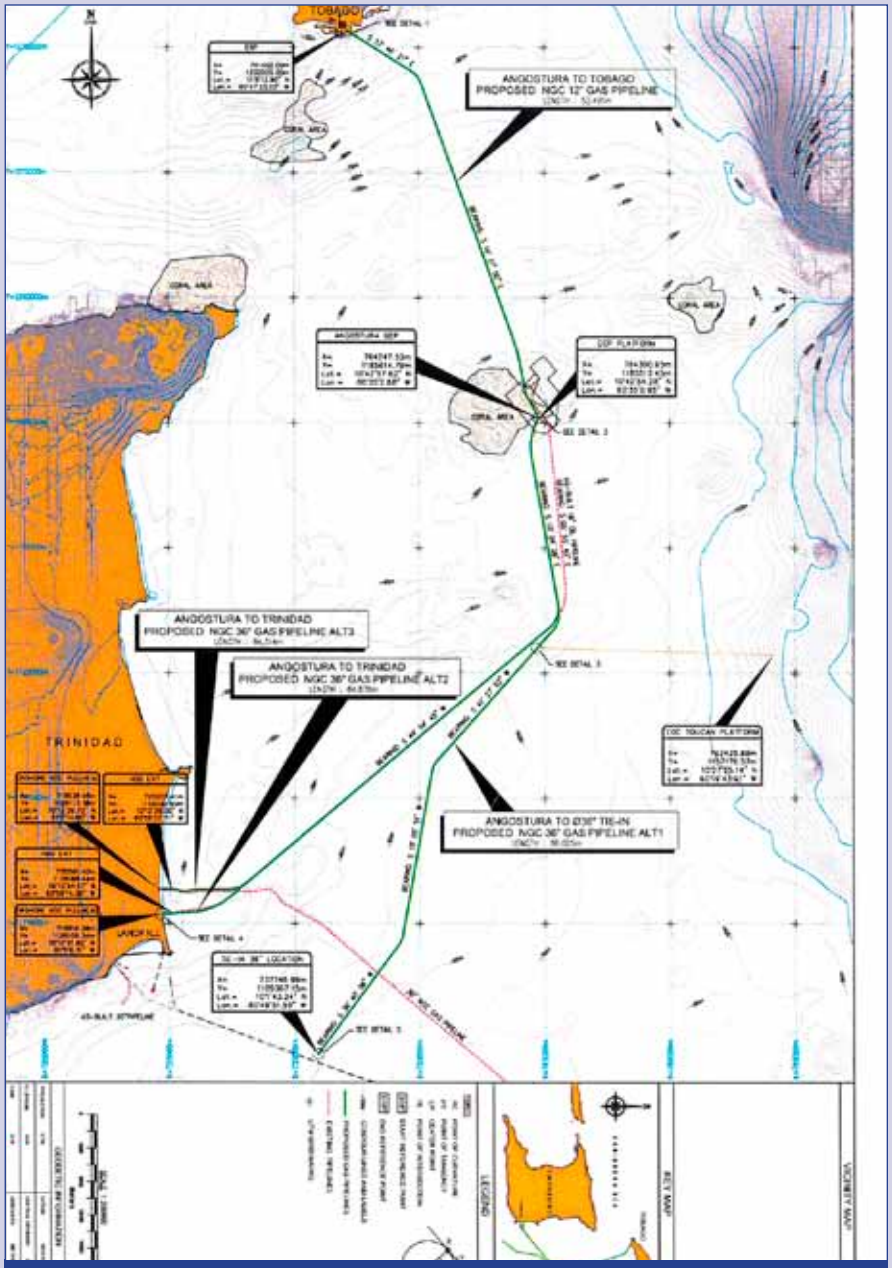
The 84km, 36-inch NEO line will travel south from the BHP Billiton processing facility in the Angostura Field to the Mayaro Bay Regulator station. The CEC for the pipeline project has been granted by the EMA.

Mobilization by Mears Group handling the Mayaro shoreline approach and Allseas Limited handling pipe stringing in the shallow water shore approach and HDD support is 10 per cent complete. This project is 55 per cent complete.

Tobago Pipeline

Detailed engineering designs for the pipeline, and receiving facility for the Tobago pipeline project are complete. Civil works on the Cove Landing Facility by Carillon, the contractor for that part of the project are 41 per cent complete. Mechanical, electrical and instrumentation tender submissions have been evaluated and sent for Board approval.

The Mears Group has been contracted to handle the HDD works on the facility's shoreline approach and Allseas will handle the shallow water pipe stringing and provide HDD support. Both contractors have begun mobilization, and progress is 10 per cent complete. Overall, the Tobago pipeline project stands at 62 per cent complete.



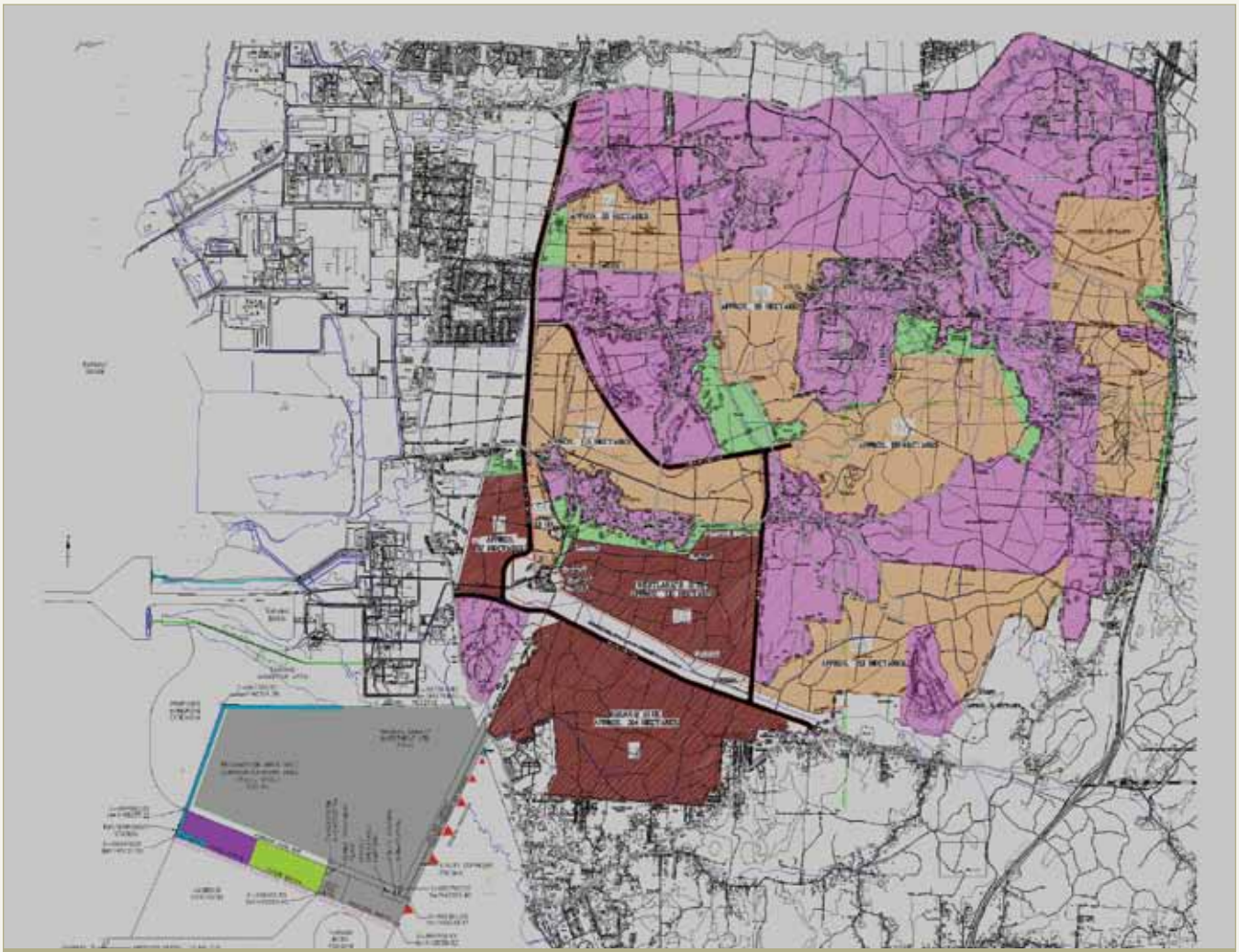
Proposed layout of pipelines – Tobago and NEO Project

The Commonwealth Heads of Government Meeting (CHOGM) in Port of Spain

NGC is participating in the Commonwealth Heads of Government Meeting 2009 as an upper tier sponsor of the Commonwealth Business Forum. This forum offers an opportunity for three days of intensive discussion and engagement for business leaders and policy-makers to bring new focus on the potential for investment and business in CARICOM.

The business focus will direct fresh attention to areas such as services, information and communications technology, banking and financial services, manufacturing, agriculture and natural resources.

More than 1,000 delegates are expected at CHOGM, representing 40 countries who will have an opportunity to engage in mutually beneficial business networking and learning opportunities, particularly foreign direct investment, new business partnership opportunities, competitive enhancement and more direct engagement with other Commonwealth nations.



Map highlighting Pt Lisas South and East Industrial Estate.

Pt Lisas Estate, South and East

Infrastructure designs on the proposed estate by BBFL Consultants are complete. These designs include the construction of an integrated road network, utility corridors for gas, power and communication infrastructure, drainage systems with detention ponds and sewerage collection systems tied into wastewater treatment plants. These subsystems will support a fully serviced light industrial estate of 50, two-hectare parcels. Discussions are ongoing with the Ministry of Works and Transport regarding the proposed upgrade of Rivulet Road to a four-lane roadway and the upgrade of the Couva flyover into an interchange. A consultant has been engaged to provide air, water and noise sampling services in fulfilment of the statutory requirements of the Certificate of Environmental Clearance (CEC).

Point Lisas South and East Industrial Port

In response to concerns expressed by stakeholders living in the area adjoining the proposed location for the new port, the Environmental Management Authority (EMA) has requested a supplementary report to the initial Environmental Impact Assessment (EIA) submitted by NEC. In the interim, NEC has made changes to the amount of mangrove acreage that would be removed during construction activities.

However, because of the length of time that has been involved in the CEC process, the contractor, Saipem, has demobilized, pending the response from the EMA. Upon the granting of a CEC, expected by the end of October,

construction activities will commence. Rapid Environmental Assessment Limited handled the EIA study, and in anticipation of the grant of the CEC, NEC has engaged a consultant to manage stakeholder concerns.

Galeota Port Project

NEC has received the EIA for the Galeota Port project and has prepared and submitted environmental monitoring plans for review by the EMA. The authority has requested some minor modifications which are being addressed, and the consultant on this phase of the project, Coastal Dynamics, has mobilized to begin the monitoring process. The first phase is the establishment of baseline conditions, which will be documented and provided to the EMA.

On acceptance of this data, construction will commence on the site with the fish landing facility. A Memorandum of Agreement has been prepared with bpTT by NEC on behalf of the Ministry of Energy and Energy Industries (MOEEI) and simultaneous operations' agreements are being finalized with bpTT.

The contractor, Grandi, Lavori Fincosit (GLF) has completed detailed designs for the construction of the port and access road, and all materials and sheet piles for the quay wall and anchors have been completed. All attempts will be made to procure as far as possible local labour, materials and equipment from the Mayaro area, the scope of influence for the project.

NEC is currently engaged in discussions with the MOEII to further strengthen support for the upstream sector for exploration and production with this project. In this regard, the new access to the port for the Coast Guard and the fish landing facility are considered to be preliminary works in the context of a larger vision for a light industrial estate at Galeota.

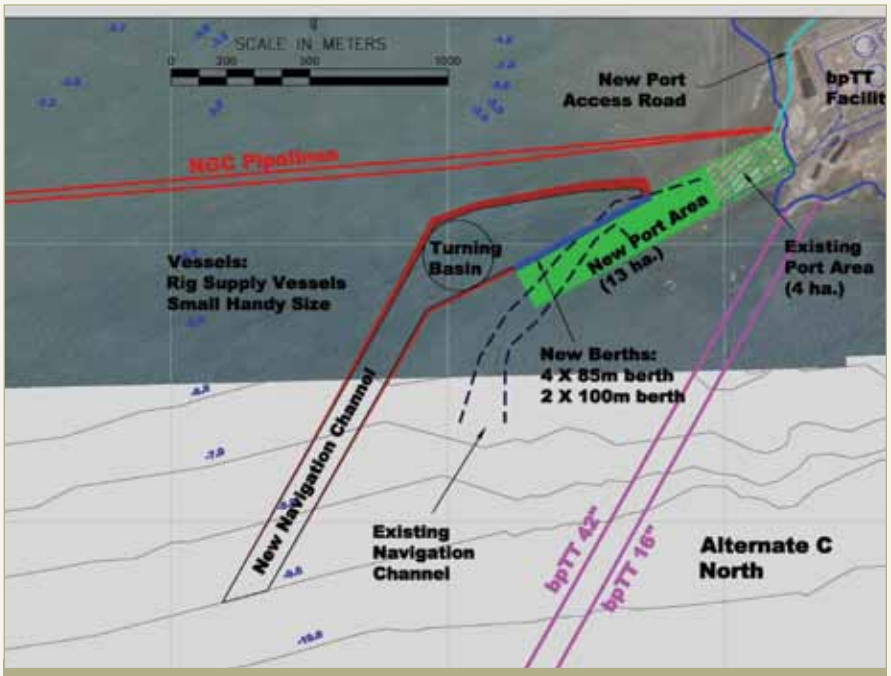


Illustration showing proposed Galeota Port.

Oropouche Bank

The optimum concept for the reclamation project has been finalized, describing the project's shape and location. Sited north of the Godineau River outfall, the location for the link between the reclamation project and the mainland has also been identified. A potential source of fill material for the project is being investigated, and the dredging methodology and stability issues for this large-scale reclamation are under investigation and review.

The EMA has drafted terms of reference and public consultations are currently being conducted with relevant stakeholders. On receipt of the final terms of reference from the authority, the environmental impact assessment and detailed engineering planning will proceed simultaneously.

Towage Operations

NEC maintained its position as the dominant supplier of local towage. In 2009, the towage arm of the company has had to supplement its fleet through charters of third-party tugs to supplement capacity to match demand. The extent of demand expansion will become part of ongoing considerations regarding the expansion of the fleet. Two tugs in the company's fleet completed survey dry-docking procedures as mandated by their classification requirements. The *NEC Majestic* completed its first survey dry-docking and top-end overhaul of its main and auxiliary engines and was returned to service in April. The *NEC Empress* completed its second survey dry-docking in Suriname on July 6.

NEC has awarded a contract for the establishment and implementation of an International Safety Management system to Trinidad Import & Export Company Limited. The company expects to receive an interim Certificate of Compliance by the end of 2009, allowing NEC to pursue contracts in new markets that require compliance with these internationally recognized standards of safety.

The Serrette Platform for bpTT under construction by TOFCO at Labidco's fabrication yard facilities, La Brea.

Brighton Port

Maintenance dredging of the refurbished Brighton Port is complete. Capital dredging works will commence on the granting of a CEC for the project. The reconstruction of Berth 1 is approximately 95 per cent complete. Construction of the deck has been completed, and paving of the marshalling yard is in progress. The project will be ready for handover at the end of October, 2009.

Alutrint Material and Storage Handling Facilities

Preliminary engineering design has been completed, and the detailed engineering design phase of the project is in progress, with 37 per cent of the designs complete.

Design work on the project is expected to be completed by March 2010. Procurement of materials for the project is in progress and is 14 per cent complete. Pile installation for the silo is complete, and foundations for other structures are in progress.

Fabrication Yard

TOFCO is constructing the Serrette platform for bpTT and a flare boom and bridge for BHP Billiton. The company has constructed a plant at Lot 16 to carry out expanded fabrication works. The company continues to maintain its policy of local engagement with close to 50 per cent of workers being drawn from the La Brea area.

Union Industrial Estate

Activity on the Alutrint site remains severely curtailed as a result of the High Court ruling of June, 2009. Royal Haskoning Caribbean has presented a draft report on solutions to manage problems associated with the Vessigny River. Their final report is expected by the end of October.

However, work proceeds apace at the Trinidad Generation Unlimited plant under contractor Mann-Ferrostaal after strike action by the local workers was resolved. The completed plant, a joint project of AES and the Government of Trinidad and Tobago will cost US$786 million with a generating capacity of 720 megawatts; the largest single power plant ever constructed in the country.

The project uses state-of-the-art Combined Cycle Gas Turbine technology to increase power generation capacity while maximizing environmental protection. Of the 480 workers employed on the project, 350 have been drawn from La Brea and its environs.

Alutrint Dock and Storage Yard

The construction of the dock facility is ongoing with scheduled handover in December 2009. Joint Venture contractor Pihl Besix has begun demobilization on the project, now in its final weeks. Reclamation works and the pile-anchorage system is complete. The final works outstanding are the finishing of the concrete deck slab, backfilling, shore protection, installation of cathodic protection, installation of dock furniture, crane rails and security fencing and lighting. The new access corridor to the dock is now 75 per cent complete, and coastal protection measures are 65 per cent complete.

The dredge disposal site has been approved by the Commissioner of state lands, and capital dredging will commence on receipt of a CDC from the EMA.

Cove Power Station

The new TT$600 million dual power facility at Cove Eco-industrial Estate, Lowlands, Tobago, was launched by the Honourable Prime Minister, Mr. Patrick Manning on October 23, 2009. Built by the Finnish firm, Power Plants Wartsila Caribbean, it is capable of delivering 64 Megawatts of power which is enough to supply Tobago, the Cove Estate when it comes on stream, and via submarine cable, feed into the Trinidad grid as well. The station will begin operations at 48 Megawatts. By comparison, the existing Scarborough power station generates 21 Megawatts.

The plant will draw fuel from the natural gas line being laid by NGC from the BHP Billiton platform in the Angostura field to the Cove Estate.

Finishing works in progress at the Brighton Port, La Brea Dock Berth No.1.

Measures to Manage Gas Reserves Decline

The September 2009, The Ryder Scott Report audit of Trinidad and Tobago's natural gas reserves noted a decline of under 10 per cent, from 1,623 bcf to 1,537 bcf. According to the report this decline translated to proven gas reserves capable of supporting 10 years of production at current rates of consumption, with an extra 20 years when probable and possible reserves were factored. The Government of Trinidad and Tobago has responded to the issue by announcing that six blocks are being considered for competitive bidding in 2010 with exploration scheduled soon afterward.

Fiscal incentives are planned to encourage investment in exploration, according to Minister of Energy and Energy Industries, Senator the Honourable Conrad Enill. "The new proposals in the new tax regime can be expected to inform bid rounds that are currently being planned," the Energy Minister said. Senior vice-president, Ryder Scott International, Herman Acuna noted that investors should not be discouraged from exploring in the territories. "We won't say you are running out of gas. I think there were some successes with exploration. I think the probable and possible resources did go up, but they have to be matured to be called proved. Exploration activities leading to drilling of exploratory prospects must be encouraged."

The view of the minister was also shared by energy consultant Mr.Trevor Boopsingh, who noted that investment is needed now when the cost of installing new infrastructure is relatively low. Speaking to the Port of Spain Rotary Club in August, Mr. Boopsingh noted, "A gas tax regime that was relevant in 2005 when gas prices were high will be entirely different from the current situation in 2009, where we need investment in infrastructure, capacity building and exploration, and the short-to medium-term prediction is for gas prices to remain low."

2009-2010 Budget Encourages Gas and Diversification Discussion

Senior Economist Dr. Ronald Ramkissoon has expressed satisfaction with the Government's price for natural gas in the government's 2010 fiscal package. Speaking at the post-budget session at the Chamber of Commerce, Dr Ramkissoon noted that "previous attempts at getting exploration and production going have not been as successful as the country would like, and we therefore want to see if the new measures will make things happen for energy."

In an executive overview of the budget presentation, another commentator, Ernst & Young, warned that the global recession could be a "black swan event," creating larger changes in the economic landscape than could be readily predicted by past experiences. The report noted that: "Natural gas prices

have hit a seven-year low and are now hovering around US$2.75 per MMBtu. Indeed, oil and natural gas prices have temporarily decoupled to a degree not seen in 25 years. Prices have been hit by the perfect storm of falling demand due to the global economic recession, and increasing supply due to the completion of various global LNG projects and increasingly successful exploration activities taking place in the United States."

This notwithstanding, the Government announced it saw ship-building and marine repairs as part of its plans for economic diversification in the 2010 fiscal year with the natural assets of the shoreline of the Gulf of Paria and the readily available supply of petroleum, natural gas and energy products as a natural fit. The Government is further considering proposals from the private sector for the construction of a major dry dock in Chaguaramas.

AUM Ammonia Plant commissioned

Methanol Holdings (Trinidad) Limited (MHTL) commissioned its new AUM ammonia plant on October 21 at Point Lisas, three months ahead of schedule and with no cost overruns. The achievement was notable given the global pressures on the project during its construction, which escalated project costs, created a scarcity of technical resources and increased demand for vendor fabrication capacity.

The plant was declared mechanically complete on March 30 and produced first ammonia on April 14. On the date of its commissioning, the plant was producing more than 2000 MT per day. The plant was built on an engineering, procurement and construction contract with Mann-Ferrostaal and Proman, utilizing local technical management provided by Industrial Plant Services Limited. The project was financed through a loan of US$1.2 billion from KfW IPEX Bank to MHTL's parent company, the CL Financial Group.

Port of Brighton, La Brea.

First Gas Production Begins on bpTT's Savonette Platform

BP Trinidad and Tobago announced first gas from its new Savonette platform, located 50 miles off Trinidad's south-east coast, operating in 290 feet of water. The unmanned platform is tied into bpTT's Mahogany B platform via a 26-inch-diameter 5.3-mile subsea pipeline. Gas is processed at Mahogany B and exported into the company's pipeline infrastructure and Savonette's expected production of 600 MSCFD will be earmarked for Atlantic LNG's liquefaction plant.

Savonette is the twelfth platform operated by bpTT and the fourth to be fabricated by TOFCO using a standardized clone design. TOFCO created the 1,898 tonne jacket and 871 tonne topsides at Labidco's fabrication yard at La Brea. Savonette was produced with 30 per cent local content in its engineering, procurement and construction value, 55 per cent local content invested in project management and 98 per cent of its total fabrication hours handled in Trinidad and Tobago. Savonette was designed by Fluor Daniel South America Ltd.

one moment please

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

View of a section of the North Coast of Trinidad from an elevated point on the Northern Range. The North Coast has many popular beaches including Maracas, Las Cuevas and Tyrico, but the scenic drive through the verdant mountains is part of the attraction and there are several points at which one can stop to take in the beauty of the sea and surf below.

Photo by Kevin Reis

THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO LIMITED

Orinoco Drive
Point Lisas Industrial Estate, Couva
Republic of Trinidad and Tobago, W.I.
P. O. Box 1127, Port of Spain
Tel: (868) 636-4662, 4680
Fax: (868) 679-2384
Email: info@ngc.co.tt
Website: www.ngc.co.tt