From oil to gas: The evolution of T&T's energy sector, post-Independence

By David Renwick

With the advent of independence from Britain in 1962, the stage was set for the creation of a national identity within the energy sector

Despite Trinidad and Tobago's first barrel of commercial oil having gushed out of the ground in south west Trinidad in 1908, it was only in the decade of the 1960s that the twin-island Caribbean state's most important economic sector began to assume a 'national' hue.

By that we mean, until that time, virtually all upstream (production), mid-stream (refining) and downstream (marketing) activities were in the hands of international companies, with local state or private capital playing no part in the development and growth of the industry.

The individual domestic entrepreneurs active in exploration in the very early days, such as Randolph Rust and John Lee Lum, who themselves had been almost entirely reliant on foreign capital to fund them, had long since disengaged from the industry.

What turned the tide in the 1960s was both a historical event and fortuitous circumstance, the former being Trinidad and Tobago's independence from Britain in 1962, with the Oxford-educated historian, Dr Eric Williams, becoming the first Prime Minister (he lived on for another 19 years until his death in office, in early 1981).

The distinguished Trinidadian educator, Dr Ken Julien, an electrical engineer by training and someone who has been tapped in the past to play a key role in the formation and implementation of petroleum policy, puts it this way: "Dr Williams accomplished what had previously escaped the country – the creation of a national identity within the energy sector."

The 'fortuitous circumstance' was the decision of the then British Petroleum Company to relinquish its producing operations in Trinidad, which opened a door to the beginning of the creation of the "national identity within the energy sector" of which Dr Julien speaks – but more on that in a moment.

One of Williams's first initiatives in re-organising the government structure after independence was to establish a fully-fledged Ministry of Petroleum and Mines to oversee the industry that was clearly crucial to the country's success as an independent state. As the late Trevor Boopsingh, for decades one of the leading figures in the Trinidad and Tobago energy sector, who subsequently became Permanent Secretary in the energy ministry and, later, Chairman of Petrotrin, told us before his death in 2010: "Prior to the advent of the Ministry in 1962, all we had was something called the Petroleum Inspectorate as a part of the Ministry of Agriculture, Lands and Fisheries. It occupied a small upstairs office in San Fernando (Trinidad and Tobago's second largest city after Port of Spain). One inspector was initially all that existed to supervise petroleum industry operations."

The late Doddridge Alleyne, a senior civil servant and one held in high regard by Dr Williams, was appointed the Ministry's first Permanent Secretary. Mr Alleyne would also play an important role in the creation of the state-owned energy companies as lead negotiator in the government's purchase of the local assets of Shell, Texaco and Tesoro, more of which later.

An independent Trinidad and Tobago clearly needed to take a new look at its most important industry and see how it could be managed in such a way as to be more reflective of the 'national identity' desired by Dr Williams.

This exercise was obviously one that could benefit from independent advice, so in 1963, only a year after independence, the government set up a Commission of Enquiry specifically into the oil industry. It was headed by Dr Baghair Mostofi of Iran and assisted by Dr C.A. Heller and Dr J. Devaux-Charbonnel.

Dr Eric E. Williams

The Commission's terms of reference were:

• To examine the present situation and future prospects of the oil industry in Trinidad and Tobago in the context of the economics of the world oil industry.

• To recommend a legal framework for the oil industry in Trinidad and Tobago which would stimulate the operations of foreign investors while safeguarding the interests of the nation.
• To make recommendations designed to ensure the greatest possible stability compatible with growth in the industry, including the level of employment.

At the end of its four sittings, which extended into 1964, the commission made a number of proposals regarding exploration, enhanced oil recovery (EOR), employment in the industry, greater control by the Ministry of oil companies' activities, pipelines, refining, royalties, taxation, the need for oil companies to provide full information to the Ministry and other matters.

Ironically, the Commission had little to say about 'a national identity within the energy sector,' per se. The seven oil-producing companies of the day were all fully foreign-owned, as were the two refineries (at Pointe-a-Pierre in south-central Trinidad and Point Fortin in the south west) and all petroleum product distribution and marketing. The Commission did, however, display what, in hindsight, can be seen as a remarkably prescient position on natural gas and the subsequent role it was to play in the diversification of the energy sector.

It observed that, "the important development of a petrochemical industry in Trinidad requires the assurance of reserves in years to come. The Commission was satisfied that the existing gas reserves should take care of the requirements of this industry and its expansion programmes, as they are known today. The use of gas for the production of electricity and other domestic requirements should be encouraged as much as possible."

This was at a time when the only petrochemical industry in existence was United States (US) chemical company WR Grace's Federation Chemicals (FedChem) ammonia plant, established in 1959 and located in the vicinity of what was later to become the Point Lisas gas-based industrial estate.

Seven years after independence, in 1969, came the opportunity, as noted above, which allowed that 'national energy identity' referred to by Dr Julien to begin to take root.

British Petroleum (Trinidad) Ltd, the then third largest oil producer in Trinidad and Tobago, concluded that greener production pastures elsewhere necessitated the closure of its Trinidad operation.

British geologist George Higgins, who worked in Trinidad for decades and authored the definitive *A History of Trinidad Oil,* points out: "BP concluded that there was little to be gained by holding on to their land operations in Trinidad, particularly since it had managed to find major reserves in Libya, with more modest ones in South America and the Gulf of Mexico. It seemed to them that there were few remaining exploratory or development prospects on land, whilst secondary recovery operations were proving uneconomic."

BP Trinidad's production and the amount of employment its fields provided to oil-workers were much too important to the health of the Trinidad and Tobago economy and society for the government simply to acquiesce in its abrupt demise.

Dr Julien recalls: "Acquiring the local producing assets of BP was the first bold step of state ownership in strategic industries. It was prompted by the concern over the impact there would have been on unemployment, particularly in the St Patrick area of Trinidad. It also tied in with Williams's thinking, articulated as early as 1955, that there would come occasions when the State would have to take the initiative as an investor, without prejudice to the policy of encouraging and supporting private enterprise, in order to protect and promote the national interest."

Dr Ken Julien

But this historic initiative was undertaken with a certain degree of ►

The Commission of Enquiry set up by Dr Eric Williams in 1963 displayed a remarkably prescient position on the important role of natural gas

Williams realised as early as 1955 that there would be times when the State would have to take the initiative as an investor, in order to protect the national interest

caution, in keeping with the fact that, though the Petroleum Ministry had been set up as a regulatory body, the government had little experience of direct control of an industry as important, not to say as global, as oil.

As the late Barry Barnes, a lifetime oilman until his death in 2011, who became the country's Energy Minister at one point, remembered it: "Dr Williams preferred that Trinidad and Tobago not go it entirely alone in this first foray into oil, which was not without risk and approached his good friend, Augustus Long, President of Texaco Inc (which was then the largest oil producer in Trinidad and Tobago) and asked if they could help out, but Texaco said it had enough problems with its own stripper production."

A small US independent, the Tesoro Petroleum Corporation of San Antonio, Texas, then entered the picture and agreed to come in with the government, taking 49.9 per cent of the former BP operation and providing the top management, while the State retained nominal control with 50.1 per cent."The government put up US$100,000 and Tesoro a similar amount to form the Trinidad-Tesoro Petroleum Co Ltd," Mr Barnes told this publication in 2008. "A further TT$90 million was borrowed to pay off BP, pledged against the assets of the company and backed by government guarantee. And they agreed that Tesoro would come in and operate the company."

Longtime energy technocrat, Malcolm Jones, formerly Executive Chairman of the state flagship energy entity, the Petroleum Company of Trinidad and Tobago (Petrotrin) into which, ironically, Trinidad Tesoro was later subsumed after the government eventually bought out Tesoro's share, makes the point that the government of the day was careful not to let the BP asset acquisition be seen by the outside world in an 'ideological' light.

"It was definitely not nationalisation, per se," he says. "The government was, in a sense, forced into it because it felt the need to secure the livelihood of the thousands of workers involved."

Doddridge Alleyne

Other veteran observers agree that not only were well-paid oil-workers' jobs preserved but Tesoro managed the former BP producing assets more skilfully than the much bigger UK multinational had done.

Barry Barnes had noted to us: "Tesoro basically kept the thing going and, in fact, actually increased crude oil production. They were experts on stripper well production and a lot of money was invested in the company. The venture here was also Tesoro's first outside of the US, so they put a lot of attention into it."

R.A. (Gene) Thomas, former Permanent Secretary in the Ministry of Petroleum and Mines, which today is known as the Ministry of Energy and Energy Affairs, remarks that Tesoro also enjoyed the good fortune of increased oil prices only a few years after it set up shop in the Trinidad and Tobago oil industry.

"Oil prices doubled or tripled after the Arab-Israeli war of 1973," he notes. "That clearly helped the new company. But I have to say that it was really good decision-making that made it possible for a company like Tesoro to operate these small entities. Actually, for Tesoro this was really a big operation, whereas for BP it had been like a drop in the ocean, so Tesoro put a real effort into it."

In 1969, the same year that Trinidad-Tesoro was established, and following upon the Mostofi Commission's various recommendations – one of which was to "compile a consolidated ordinance containing all legislative provisions dealing with all aspects of the oil industry from exploration for, to exportation of, hydrocarbons" – the government moved to introduce an omnibus Petroleum Act, with regulations governing its various aspects receiving parliamentary sanction the following year.

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A key element in the Petroleum Act of 1969 was that it sanctioned the use of production sharing contracts between the government and the companies for the first time

▶ Anthony (Tony) Paul, a leading Trinidad and Tobago geophysicist and former Ministry technocrat, who is now Managing Director of local energy consulting firm, ACES, describes that legislation, which still exists today, as "very broad; the regulations were very specific, very clear as to what would happen in any instance, what was the Minister's role, the companies' roles and responsibilities and so on."

Trevor Boopsingh recalled that the Act "set a legal framework for everybody to operate in, though it did not try to define everything. Good law, I am told, must be general. The specifics must be in the regulations, which can be varied, as necessary, simply by an Order." A key element in the Petroleum Act was that it sanctioned the use of production sharing contracts (PSCs) between the government and the companies for the first time.

The Petroleum Act was followed five years later, in 1974, by a radical departure in petroleum taxation, embodied in the Petroleum Taxes Act, which came hard on the heels of the 1973 jump in oil prices triggered by the turmoil in the Middle East.

The emboldened Trinidad and Tobago Government wished to recoup for the treasury as much tax revenue as it could, consistent with the rise in oil prices and that piece of legislation had many controversial features, at least from the companies' point of view. These included:

- A tax reference price system, under which the Trinidad and Tobago Ministry of Finance itself set the price of a barrel of oil, irrespective of what market conditions at the time happened to be. "There was no appeal," Mr Boopsingh remembered.
- The separation of a petroleum company's business into three taxable parts – production, refining and marketing (and, remember, those were still the days when, with the exception of the BP Trinidad asset acquisition, the industry was still in the hands of integrated, foreign-owned companies, such as Texaco and Shell). The act did not allow any carry-over of losses from one part to the next.
- A special tax on crude processing, known as the refinery throughput tax.

Trevor Boopsingh

The legislation also inspired the setting-up of the oil audit section in the Ministry of Finance.

Whatever the companies may have thought of the provisions in the Petroleum Taxes Act, it appeared to have achieved its primary purpose. As Mr Boopsingh told us: "All of a sudden, in 1974, real money started flowing into the treasury. By 1976 there was even more, 1978 more yet and by 1980, it went out of sight."

This fiscal windfall enabled the government to underwrite what was to be the most significant development in the energy industry in the second half of the first petroleum century – the rapid commercialisation of gas reserves at the Point Lisas Industrial Estate in west-central Trinidad, but more on that later.

Major oil/gas discoveries offshore

The 1970s were significant from more than a revenue-generating perspective, however.

Several key events in the petroleum history of Trinidad and Tobago occurred in that decade, some of which helped contribute to the strengthening of Professor Julien's 'national identity within the energy sector.'

Chief amongst these energy milestones were:

- The discovery of natural gas off the north coast of Trinidad for the first time in 1971, following the extensive 1968 seismic survey of the area, sponsored by the government. These reserves were to play a major role in future gas monetisation and to form the basis of the expansion of the liquefied natural gas (LNG) industry in Trinidad and Tobago in the early 2000s.
- The commencement of oil production off the east coast by the Amoco Trinidad Oil Co (ATOC) in

1972 which opened up a new offshore province that became the mainstay of crude production in Trinidad and Tobago for the next 30 years, despite the fact that peak production was reached as quickly as six years afterwards in 1978, at 139,163 barrels per day (b/d).

Amoco had found oil reserves in 1968 after an extensive drilling programme that was nearly abandoned out of frustration at numerous initial dry holes. The other oil companies in the country had dismissed the possibility of offshore east coast oil, including the then main producer, Texaco. Trevor Boopsingh recalls that the Texaco man in charge in Trinidad and Tobago paid a price for that misjudgement. "Texaco was telling the government that there was no chance of finding oil off the east coast. When it was found, the local Managing Director was immediately transferred out of Trinidad."

• The setting-up in 1972 of the wholly state-owned National Petroleum Marketing Company of Trinidad and Tobago (known as NP) to assume ownership of the BP-controlled service stations in the country, which were relinquished the same year – three years after the UK multinational had sold its oilfields to Trinidad-Tesoro. This was the government's second direct incursion into the industry and it triggered the state's eventual acquisition, by agreement of the companies, of the fuels retail networks then owned by Esso, Shell and Texaco. As Ken Julien recalled: "By December 1976, all the local marketing operations previously owned and operated by the multinationals were assigned to NP. The word 'national' appeared for the first time on retail stations." He clearly regards this as all part of the movement towards 'a national identity in the energy sector.'

• The 'national identity' momentum took a quantum leap two years later, in 1974, when the government bought out the land fields and, more important, perhaps, the refinery, owned by Shell Trinidad Ltd located at Point Fortin in the south west of Trinidad. The refinery was processing Trinidad-Tesoro's crude, in addition to that of Shell. Texaco Trinidad owned the other, and much bigger, refinery in Pointe-a-Pierre, further up the west coast, which it had bought from its British owners in 1956, the year the People's National Movement – PNM – party, which Dr Williams headed, first came into office. Barry Barnes, who was working with Shell Trinidad at the time, recalled that the company felt it was being pressured by the government in negotiations for a commercial price for Trinidad-Tesoro crude. "It is fair to say there was a feeling at Shell that we were being hard done by, since we had to negotiate with the government which is, at the same time, telling you you must buy the crude. So Shell went to the government and said, look, you are sending this crude to our refinery, it ►

Trinidad-Tesoro Managing Director J.P. Schmaltz with Oilfield Workers Trade Union President General George Weekes

Barry Barnes

The commencement of oil production off the east coast in 1972 opened up a new offshore province that became the mainstay of crude production for the next 30 years

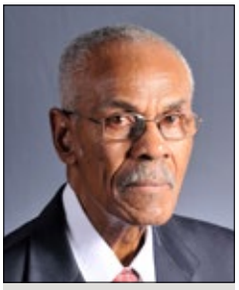
With the discovery of major gas reserves off the east coast, the government realised that there was enough gas to launch Trinidad and Tobago into its second petroleum revolution

► represents virtually 50 per cent of our throughput. It would be much more practical if we joint-ventured the refinery and you will put your crude in and we will put our crude in and the refinery will process for both of us and pay us both the same price."

This proposal was not, apparently, well received and according to Mr Barnes, there was a lot of 'emotion' involved. "The government appeared to feel affronted," he remembered. "And it decided it wanted to buy the whole refinery. Shell's offer had been 50 per cent of the refinery only but the government's position was – if we take the whole refinery, then we want the producing fields too."

The transaction cost the government £21 million or TT$93.6 million in those days, payable in three instalments. Shell Trinidad was re-named the Trinidad and Tobago Oil Company (Trintoc) and the late Walton (Wally) James, a chemical engineer employed as Manufacturing Manager and a Director with Shell, was appointed the first Trinidadian Managing Director. Shell had offered him a transfer to London but he opted to stay home and guide the fortunes of the new national petroleum asset.

While Trinidad-Tesoro was a 50.1 per cent state operation, with any expertise required being provided by the 49.9 per cent US partner, Tesoro Petroleum Corporation, Trintoc was 100 per cent locally-owned and therefore entirely dependent on its own resources. "One of our difficulties was getting technical people," Mr James recalled. "As Shell, we would get a lot of foreign support for technical matters, as needed, but that was cut off. Shell told us that they could offer us services but we would have to negotiate an agreement. They were hard businessmen. One of our big deficiencies was in geology. We had petroleum engineers, drillers, people like that, but no geologists. We had to advertise in Canada and the US for geologists with Trinidad and Tobago connections who might want to come back."



Wally James

With the discovery of major gas reserves by Amoco off the east coast, first with the Teak field in 1968 and then the huge Cassia field in 1973, the government technocrats realised that there was enough gas to launch Trinidad and Tobago into its second petroleum revolution – one based on natural gas, rather than crude oil. It was decided that this could not be left to the whims and fancies of private capital and that the state should take the lead in ensuring this gas was brought to shore and delivered to customers at a site ideal for the purpose – the Point Lisas Industrial Estate on the west coast, fronting the placid waters of the Gulf of Paria. So the National Gas Company of Trinidad and Tobago (NGC) was formed in 1975, as the sole seller of natural gas to local customers. One of its first tasks, other than pipeline expansion, was to capture the associated gas being flared on Amoco's Teak and Poui oil platforms and bring it ashore for use in the gas-fired boilers of the Trinidad and Tobago Electricity Commission, T&TEC. (A more detailed article on NGC can be found elsewhere in this publication).

• The gas-based development initiative commenced in 1977 when the Trinidad Nitrogen Company (Tringen) began production of ammonia in the Point Lisas area, though it was not actually located in what was soon to become the Point Lisas Industrial Estate itself. Tringen was the government's first incursion into ownership of a gas-based petrochemical plant. The then US chemical giant, WR Grace, which had been operating an ammonia plant in Trinidad since 1959, agreed to become the minority partner, with 49 per cent of the equity, leaving the state with 51 per cent.

• Two milestones which everyone concerned would probably have preferred not to reach occurred in 1978 – peak oil production off the east coast, earlier mentioned and peak oil production nationally, at 240,000 b/d, with the average for the year being 229,598 b/d. ►

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Tringen , which commenced production in 1977, was the government's first incursion into ownership of a gas-based petrochemical plant

► • In that same year, 'local content' in the energy industry – a key measure of the 'national identity' of which Dr Julien speaks – made a spectacular advance with the construction at home of two of Trinidad-Tesoro's four production platforms in its Galeota block nearshore the south east coast of Trinidad. This was a major achievement at the time but never expanded upon and it was not until 25 years later, in 2003, that the Anglo-Australian multinational, BHP Billiton, agreed to build in Trinidad the topsides of its Kairi One drilling and production platform in the Greater Angostura discovery in block 2c off Trinidad's north east coast.

Having been initiated in the 1970s, gas-based development speeded up in the 1980s, with the Iron and Steel Company of Trinidad and Tobago (Iscott) in 1980, which used gas in its directly-reduced iron process (100 per cent government-owned), the Fertilisers of Trinidad and Tobago (Fertrin) ammonia plant in 1981 (51 per cent government, 49 per cent Amoco Chemicals), the Urea Company of Trinidad and Tobago plant in 1983 (100 per cent government-owned) and the Trinidad and Tobago Methanol Company (TTMC) in 1984 (100 per cent government-owned).

These plants were all located on the Point Lisas Industrial Estate mentioned earlier, where the entity set up by the government in 1979 to partner NGC in facilitating gas-based industry, the National Energy Corporation (NEC), had built a port to cater to construction activity and later serve as the entry point for raw material imports and the export of product. The Point Lisas Industrial Port Development Corporation (Plipdeco), a company in which the government had assumed the majority share, meanwhile set about the task of preparing the site itself for occupation by tenants such as the four just mentioned.

Trevor Boopsingh had an interesting tale to relate about the birth of Iscott. "Dr Williams had been to Romania on a trip in 1975 and Nikolai Ceausescu, then President of the country, had persuaded him that the way to industrialise was via steel. He decided on his return to build a steel plant at Point Lisas."

The Fertrin ammonia plant, for its part, was facilitated by the fact that Amoco had an obligation, under the 1969 Petroleum Act, to build its own refinery in Trinidad and Tobago, if its oil production remained at 100,000 b/d, or over, for seven successive years. But the company was not desperately keen to do so – "it didn't fit in with its global plans," Dr Ken Julien remembers – so Amoco 'traded off' the refinery for a 59 per cent interest in Fertrin.

Barry Barnes recalled that "Amoco did it reluctantly, claiming that fertiliser production was not its real business and the government had to twist its arm. But it did come in because it needed Trinidad and Tobago's support on the crude production side."

Fertrin was the State's second majority-owned incursion into gas-based fertiliser manufacture and, along with steel, urea and methanol, symbolised the unprecedented role as investment risk-taker that the government had assumed in order to get the gas-based industrial initiative off the ground. The Trinidad and Tobago public sector was almost certainly the biggest risk-taker anywhere in the Caribbean and Latin America during the 1980s, employing billions of US dollars of taxpayers' money. But the fact is that without its willingness

Aerial view of Shell's refinery at Point Fortin, circa 1960; much of the site is now occupied by Atlantic

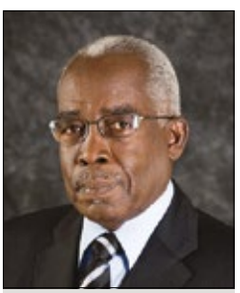
to do so, the monetisation of natural gas reserves would have taken much, much longer to come to fruition, if it had happened at all. It was only in 1993 that the first totally private sector-financed petrochemical plant at Point Lisas – Caribbean Methanol Company (CMC), owned by what eventually became today's Methanol Holdings Trinidad Ltd (MHTL) – came on-stream. The state eventually sold all its petrochemical plants to either local or foreign investors, who have carried the ball at Point Lisas ever since.

Texaco – The Big Prize

While the establishment of the firm foundation of the industrial revolution in gas development was the defining event of the 1970s and 1980s, Dr Julien's 'national identity' process as far as the oil industry was concerned probably reached its climax in the latter decade when, in 1985, the big prize of Texaco Trinidad Incorporated, the largest land producer and operator of the country's biggest refinery at Pointe-a-Pierre in central Trinidad, fell into the hands of the state.

Texaco had acquired producing interests in Trinidad since the late 1930s, through its association with the Antilles Petroleum Company and had provided imported crude for processing at Pointe-a-Pierre since the mid-Forties, so it was certainly no stranger to the country when it made a bid in 1956 for the refinery, owned by a UK company, Trinidad Leaseholds Ltd (TLL). The British Government of the day was not at all happy that a British company was falling under American control but the sale went through and Texaco ownership proved beneficial for the oil industry in Trinidad and Tobago as a whole.

"Texaco made a big difference because it brought a lot of capital and modern methods," said Trevor Boopsingh. "It was American and therefore not perceived to be the 'colonial masters'. They were more open with the government. Augustus Long, the Chairman of Texaco, struck up a famous relationship with Dr Eric Williams. Texaco eventually discovered new fields in Guayaguayare, helped expand the Trinmar offshore operation in the Gulf of Paria and brought in a huge amount of crude from Saudi Arabia to refine in Trinidad. By 1970, the refinery was the largest in the British Commonwealth and probably the second or third largest in the world."



Malcolm Jones

The asset the government eventually acquired in 1985, however, was not what the refinery had been at its height in the 1970s. As Malcolm Jones, a chemical engineer who has spent a lifetime in both the oil and gas sectors in Trinidad and Tobago, tells it: "Times had changed and by the mid-'80s, Caribbean refineries started to lose their prominence. Crude was taken directly to the US, instead of having to be refined in the region. The amount of crude needing to be processed at Pointe-a-Pierre decreased."

Trevor Boopsingh supported this. "The Texaco refinery was seen as no longer an international refinery but a small regional one. The company insisted that the proper size would be somewhere around 120,000 b/d, compared with 360,000 b/d in its heyday. This meant the refinery was over-manned and Texaco naturally wanted to reduce the workforce, to which the union, the Oilfield Workers Trade Union (OWTU), objected. At first, Texaco wanted to sell the refinery alone but the government insisted on taking the producing fields on land and some other assets. To my mind, the relinquishment of the land assets was very important, in that it repatriated a whole lot of land back to Trinidad and Tobago."

For three years before the actual sale of the refinery, Trintoc was forced to supply some crude for refining at Pointe-a-Pierre "in order to keep the refinery there going," according to the company's former managing director, Wally James. ►

The Trinidad and Tobago public sector was almost certainly the biggest risk-taker anywhere in the Caribbean and Latin America during the 1980s

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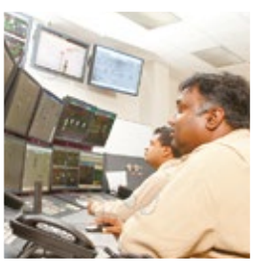



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► Texaco was careful not to cut its long-standing links with Trinidad and Tobago completely and retained its 50 per cent share in east coast offshore block 6, which is today an important producer of natural gas, some of which is exported as LNG and, for 14 years, held on to a one-third share in Gulf of Paria producer, Trinmar, until selling out to co-owner Petrotrin in 1999.

The government had acquired the rest for US$189.2 million. Trintoc ran the former Texaco assets for eight years until 1993, when both it and the other state-owned company, Trinidad and Tobago Petroleum Company Ltd (Trintopec), which Trinidad-Tesoro had renamed when the government bought out Tesoro's 40.9 per cent share in 1985, were merged to become Petrotrin.

Re-birth of the small domestic producers

The term 'national identity in energy' does not, of course, refer only to state ownership of oil or gas assets, even though a strong government role in these sectors, as seen particularly in the case of gas, has proved extremely beneficial.

The active involvement of private domestic capital is also necessary for a true 'national energy identity' to emerge. As noted at the beginning of this narrative, domestic oil entrepreneurs had virtually vanished from the scene as early as the beginning of the 1900s and for the next 50 years or so oil exploration and production was in the firm grasp of foreign multinationals and independents.

In 1989, however a significant development occurred: the then Trintopec, closely followed by the then Trintoc, began inviting small local companies, mainly drillers and other service operators, to take an active role upstream in reviving thousands of old wells and also assume control of small parcels of acreage on which they could do their own exploration and production.

This was known as the lease operatorship (LO) and farm out (FO) programme and opened the way for a return of private domestic capital to the oil industry.

True, it was to some extent a matter of self-interest: both Trintoc and Trintopec, highly unionised as they were, faced a rising cost base and determined that it made more economic sense to hive off a portion of their production to private local entrepreneurs (though the two companies' successor, Petrotrin, eventually also brought small foreign companies into joint ventures in other parts of its acreage).

Over 33 million barrels of crude have been supplied to the Petrotrin refinery by LOs and FOs in the last 25 years, which helped improve the refinery's margin because it is cheaper to process than imported crude.

You could call the return of local entrepreneurship the last significant 'structural change' in the Trinidad and Tobago oil industry because it provided a net new source of crude that has continued to this day, however modest in absolute terms.

At least one foreign multinational, the Anglo-Australian BHP Billiton, has also helped add to oil production by discovering new reserves offshore north east Trinidad in 2001 but the longevity of that may be in question. The company has continuously downgraded the reserve estimates and its actual production has plummeted from 40,948 b/d in 2005 to around 9,500 b/d in 2014.

Did the LOs/FOs/other local independents and then BHP Billiton represent the 'last hurrah' for the upstream oil industry?

That could well be the case, when actual new discoveries and output levels are taken into account, though we will consider towards the end of this review whether oil production has a chance of making a comeback in Trinidad and Tobago or not.

Natural gas takes over

The fact is that from the 1980s onwards, natural gas in all its manifestations has been the dominant preoccupation of politicians, planners, explorationists, bankers, investors and all who are involved at any level in the Trinidad and Tobago energy sector.

The rush to turn gas reserves into tradable products in the 1980s also included the first attempt ►

Texaco was careful not to cut its long-standing links with Trinidad and Tobago completely and retained its 50 per cent share in east coast offshore block 6

From the 1980s onwards, natural gas has been the dominant preoccupation of politicians, planners, explorationists, bankers, investors and all who are involved at any level in the T&T energy sector

► to commercialise compressed natural gas (CNG) as an alternative fuel for motor vehicles, when a demonstration station was set-up in 1985. CNG has not since then been adopted by a substantial number of motorists, even despite the effort by Amoco to set the example with its own CNG station near its on-shore base in the south east of Trinidad in 1995. In 2008, the government finally moved to make CNG less expensive to install and kept its price well below that of various grades of oil. Rupert Mends, a former Permanent Secretary in the Energy Ministry, now a senior executive of BP Trinidad and Tobago (bpTT) – the successor company to Amoco – believes CNG use will eventually take off when "mass transit starts using it, the price incentives remain in place and there are enough stations that deliver the product quickly, so you don't have to wait too long." The current People's Partnership (PP) government, which took office after the general election of 2010, has re-committed to CNG and set up a task force under veteran petroleum man, Frank Look Kin, former President of NGC, to promote its use. The state-owned Public Transport Service Corp. (PTSC) has said it will convert its 300-strong fleet to CNG in due course. Fiscal incentives have also been offered to private motorists to do likewise. State-owned NGC has also set up a special subsidiary, NGC CNG Ltd, to help give boost to CNG usage via the establishment of 22 new CNG outlets at service stations.

In the 1980s, the government attempted to take the 'national energy identity' to a new level by sanctioning the involvement of its two upstream companies, Trintoc and Trintopec, and NGC, in a state-sponsored attempt at natural gas production in competition with Amoco, the then sole provider of gas to local industry. The three established a company in 1990 called Trintomar, to develop gas reserves believed to exist in offshore acreage known as the South East Coast Consortium (SECC) block. Unfortunately, the experiment was a costly failure.

Frank Look Kin

The drilling programme was beset by misfortunes and the Pelican discovery, the first to be exploited, turned out to have much less gas than originally believed. The three shareholders in Trintomar were saddled with a large debt payment they had to settle out of their own companies' cash flows. Output quickly plummeted and the then Enron Oil and Gas from the US, subsequently de-merged before the collapse of the Enron Group to become EOG Resources, had to be hurriedly called in to salvage the rest of the SECC block (which, it should be said, it has done handsomely).

Trevor Boopsingh remembered: "Amoco had a stranglehold on gas supply at the time and in an attempt to diversify the government put in what I call political drivers so as to get alternative supplies, using the state enterprises. They were so focused on the political driver of diversifying supply that they didn't carefully work out how they would work this thing through. With hindsight, the mistake was that they ought to have had a joint venture partner, who might have been more cautious about the rate at which capital was applied to the project."

Suffice it to say, government companies never again attempted to fund exploration and development offshore (discounting Petrotrin's activities in the shallow water Gulf of Paria basin off the west coast and its small production activity nearshore the south east coast) and subsequent state participation in all such activities has been on the basis of minority positions for Petrotrin, which is carried by foreign majority partners through the risky exploration period.

In contrast with Trintomar, a very successful gas initiative in which the government was a major partner, was that of Phoenix Park Gas Processors Ltd (PPGPL), set up in 1991 to extract valuable liquids from the gas stream. Conoco and the US company which built the plant, Pan West Engineers and Constructors, joined forces with

NGC to remove the propane, butane and natural gasoline fractions and export them to markets in the Caribbean and North America.

In 1991, too, the Supplemental Petroleum Tax (SPT), which had been introduced in 1980 just after the second oil price shock – to capture revenue for the treasury on a quarterly basis, which companies could set against Petroleum Profits Tax (PPT) at the end of each fiscal year – was adjusted to take various price levels into account.

"It introduced predictability into the tax system," said Trevor Boopsingh, "so that the companies would know if the oil price was US$25, they would pay so much SPT. If it was US$30, they would pay so much. So predictability came into the investment scenario, which was a critical requirement."

Some further tweaking of the SPT rates occurred in 2005. Significantly, SPT has never been levied on what has long become the major hydrocarbon produced in the country – natural gas. According to Boopsingh, this was meant to "encourage the development of the gas industry at Point Lisas and ensure relatively low gas prices continued."

Although the Production Sharing Contract (PSC) had been the preferred method of sharing income with the companies since 1974, this had merely been theoretical, since no actual production had commenced in any of the blocks to which a PSC applied. Existing producing companies discharged their obligations to the government under Exploration and Production (E&P) licensing, first introduced with the start of commercial oil production in 1908. Those operating under E&P licences such as the biggest gas and oil producers, bpTT and Petrotrin, still do so up to this day. The first operational PSC, in fact, came into being in 1993, when British Gas (BG) and its partner Texaco (now Chevron) signed a PSC for the development of block 6 off Trinidad's east coast.

Rupert Mends

As Boopsingh wryly pointed out: "It took 22 years for the 1974 contract to start delivering results." But those results have since been outstanding with BG/Chevron having provided substantial amounts of gas from its Dolphin discovery in block 6 since 1996, when production first commenced.

One of the main reasons for the government turning to first, Enron, then BG/Texaco, as new gas suppliers was the shock effect of the Trintomar failure which had convinced the planners and NGC that more experienced and dependable suppliers had to be brought into the picture in order to provide real balance to the then Amoco.

It is an indication of the clear shift in the structure of hydrocarbon output in Trinidad and Tobago that PSCs first began having an impact on the tax system on the basis of gas, rather than oil, recovery even though the original intention of the change had been to maximise the government take from higher oil pricing and production. In fact, since 1993, the only PSC to deliver oil has been that with BHP Billiton/Total/Talisman (now BHP Billiton/NGC/Chaoyang) for block 2c off the north east coast and even that, as noted, has been something of a disappointment.

Natural gas officially established its production supremacy in Trinidad and Tobago in 1996 when it overtook oil as measured in barrels of oil or energy equivalent (boe) terms. It has not looked back since. In 2007, according to MEEA figures, the amount of oil lifted in Trinidad and Tobago averaged 120,018 b/d: the amount of gas produced was 689,200 boed, a huge disparity. That situation still obtains today but because it takes six times a unit of gas to equal one barrel of oil in energy equivalency and price terms, the rise in the price of oil since 2010, and the fall in the gas price in the US in particular, has meant that oil still delivers 55 per cent of the revenue for the government from the energy sector, compared with 45 per cent for gas. ►

Following the SECC experience, government companies never again attempted to fund exploration and development offshore

Natural gas officially established its production supremacy in 1996 when it overtook oil as measured in barrels of oil or energy equivalent (boe) terms. It has not looked back since

► Another key gas-related development in the 1990s was undoubtedly NGC's decision in 1993, at a time when the prices of the petrochemicals produced from gas, like ammonia and methanol, were fluctuating on the world market, to introduce a system that lowered the cost of gas for its petrochemical customers when prices of their own commodities fell and raise it when prices rose again. The calculations were based on a reference price for the commodities concerned and the system's success was evident from the fact that no petrochemical plants at the Point Lisas Industrial Estate, where they were all located, ever closed down during the worst days of ammonia and methanol pricing, whereas several did in the US, Canada and other developed countries.

The commodity-linked pricing system was in its way the bedrock of the Trinidad and Tobago model of gas-based industrialisation that is so admired by emerging countries with largely unexploited gas resources of their own, because it ensured there was no lack of investors to keep the development momentum going.

In 1996, there was an important adjustment in PSCs to take cost recovery and acreage surrender into account. It also separated the government's share into three categories – A in lieu of royalty, B in lieu of SPT and PPT and C to take account of what was called 'excess profit,' which yielded a higher share for the government at higher levels of production and pricing. This was modelled on the Indonesian system of the time, in contrast to the Peruvian system on which the 1993 BG/Texaco PSC had largely been based.

LNG – A quantum leap in gas usage

But the most outstanding event in the 1990s as far as the expansion of the gas industry was concerned was Trinidad and Tobago's entry into the production of liquefied natural gas (LNG) in 1999. This created a step-change as far as gas exploration and development was concerned, since the average LNG train required several times more gas than the average petrochemical plant.

The decision by the then Amoco, now bpTT, BG, Repsol, the then Cabot LNG (now owned by China's CITIC) and NGC itself to invest in an LNG plant which they called the Atlantic LNG Company of Trinidad and Tobago (ALNG) was the fourth – and ultimately successful – attempt to establish an LNG industry in Trinidad and Tobago. The three earlier efforts had begun as far back as 1971, when Amoco felt it had enough gas reserves to be able to support an LNG plant but the government of the day opted for the use of gas in domestic industry instead.

Circumstances in the mid-'90s, when the five resolved to proceed with an LNG investment in Trinidad, were quite different from those that had prevailed in the decades before. For one thing, Cabot, the largest purchaser of LNG into the US at its terminal at Everett outside Boston at the time, wanted a more secure source of gas than it had from Algeria and offered a market for LNG from Trinidad and Tobago. Cabot LNG's then President, Gordon Shearer, flew down to Trinidad in 1992 to talk over the matter with NGC, thus establishing Atlantic as 'buyer-led' from the beginning, which meant half the battle had already been won. Mr Shearer was henceforth regarded as the 'godfather' of the LNG industry in the country.

Natural gas reserves were considered sufficient to support both the local demand that had been classified as priority in the 1970s and the export trade, especially in the light of Amoco's string of new gas discoveries at the time and BG's recent arrival in Trinidad following its purchase of the then Tenneco interests. BG was anxious to find a larger market for the gas it knew existed off the north coast.

Perhaps the most important factor of all was the willingness of the PNM government of the day to sanction the export of gas, having previously decided against it.

Trevor Boopsingh recalled that it was Dr Julien who persuaded the PNM's political leader, Patrick Manning, to "alter the party manifesto for the 1991 general election to include a commitment to consider exporting gas. It was the general consensus ►

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Atlantic established a number of firsts in the world LNG business, some of which have stood the test of time

▸ among people like myself and Ken Julien that north coast gas would never see the light of day unless the companies were allowed to export it." Dr Julien himself has described the decision to take the leap into gas exporting as one of the 'riskiest' even a government as prepared to take risk with gas-based initiatives as the PNM had ever made.

"Here we were dedicating at least 50 per cent of the amount of gas reserves at the time, which were about 12 trillion cubic feet (tcf), to one industry," he recalls. "This small country, with less than 1 per cent of global natural reserves, was taking a major step and bringing the multinationals who controlled the reserves, along for the ride. And what a ride it has been!" What's more, Atlantic established a number of firsts in the world LNG business, some of which have stood the test of time.

• At 3 million tonnes a year output, Train 1 was the largest LNG facility in the world in 1999 and for some years thereafter. Its gas input was 164 billion cubic feet a year (bn cfy).

• It was the world's most inexpensive single train ever built, estimated to cost about US$1 billion but eventually coming in at US$950 million.

• It was the world's fastest LNG project, taking six and a half years from conception to completion, including 34 months for construction and handover.

• It was conceived on interlocking relationships among gas supplier (Amoco provided all the 475 mmcfd required, since BG at the time did not possess the infrastructure to contribute any gas from the north coast and its east coast reserves were pledged to domestic users in a 20-year contract with NGC), plant owners and LNG buyers.

• First-time financial arrangements for an LNG investment were used with bankers, including no pledge of shares, liberal ownership covenants, expansion of plant without lender approval under certain circumstances, and monthly dividend payments allowed to shareholders.

• Atlantic was the first LNG plant ever built in the Caribbean and South America, and only the second in the Western Hemisphere after the Marathon Oil and Phillips Petroleum-owned Kenai plant in Alaska, after which it was partly modelled.

• Atlantic also inspired the establishment of the 522MW Eco Electrica combination power plant and LNG receiving terminal at Penuelas in Puerto Rico, the first facility of its kind in the world, on the basis of a supply of gas from Cabot as part of its offtake from Trinidad.

Atlantic also helped popularise the Phillips optimised cascade process of LNG production, which had originally been installed at Kenai in 1969 but had gone virtually unnoticed in the LNG world since then, investors preferring to use Air Products and Chemicals' technology.

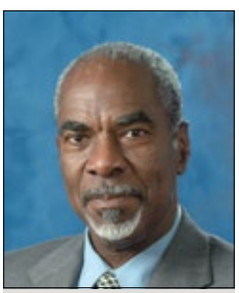
Aerial view of Atlantic LNG's Point Fortin site during the construction of Train 4

Atlantic's second non-executive chairman, BG's Martin Houston, (Dr Julien was the first, as representative of NGC on the board) records that the Train 1 start-up team at Atlantic "which included many with substantial experience on Air Products and Chemicals base load NGC plants, was continually surprised at how many traditional operational problems were either eliminated by the process or solved in a very simple manner."

One major advantage of the Phillips process was that it provided two-train reliability for the price of one train. As a spokesman for US construction and engineering giant, Bechtel, which built Train 1 and all succeeding trains at Atlantic, put it at the time: "Instead of building two identical plants, as other countries with LNG had done up to now, we built one plant with key equipment duplicated. Traditional plants line up three refrigerant turbine compressors on each train, which cools the natural gas to its liquid state. We put six of them in one train, using smaller, well-proven and easily operated units, specifically designed for mechanical drive. Of course, this also helped to reduce capital costs."

With its shareholders all involved in some way or another with Atlantic, it was prudent, both commercially and politically, to have a neutral Chairman who was also a Trinidad and Tobago national follow BG's Houston as non-executive Chairman.

Veteran Trinidad and Tobago civil servant, John Andrews, who had had lengthy experience of the energy sector as a senior official in the Ministry of Finance's oil audit section formed in 1974 and then as head of the government's Technical Advisory Group, "became aware," as he puts it, "that there was some difficulty in Atlantic having a representative of one of its shareholder companies as the Chairman and I got wind of the fact that they were looking for a neutral Chairman. I felt I could have done the job, having worked on the opposite side of the table with many of the people. I approached Martin Houston, since BG was sort of 'sponsor' of the chair and enquired whether they would consider me as Chairman. In April, 2000, I became Chairman of Atlantic LNG supported, I have to say, by all the shareholders. I stayed there for six years, until 2006."



John Andrews

Chairing board meetings of a company as important as Atlantic, owned by shareholders who were fierce rivals in other areas of the energy sector in Trinidad and Tobago and elsewhere in the world, was clearly a challenging exercise.

"They didn't come to blows or anything," Mr Andrews recalls with a chuckle, "but I often wondered how things ever got done with such a competitive group. I usually found myself having to adjudicate as to issues among the various shareholders. In the early days, when board meetings were coming up, I'd go and visit all the shareholders individually on my own in an effort to discover what would be of concern, what were the issues they would like to see resolved at board meetings."

Andrews believes the shareholders, in turn, "probably looked on me as someone who had worked with the government and might be able to make their relations with the government a little better. Having been active in the government at a high level, they knew I could approach ministers, could approach the Ministry of Finance to help justify some of what we were doing and be a good spokesman for Atlantic all round."

Under Mr Andrews' watch, Atlantic expanded no less than fourfold between 2000 and 2005, adding Train 2 in 2002 (3.3 million tonnes), Train 3 in 2003 (3.3 million tonnes) and the mammoth Train 4 in 2005 (5.2 million tonnes). The latter held the title of world's biggest LNG train for over two years but has now been superseded by even larger trains being built in the Gulf State of Qatar. ►

At 3 million tonnes a year output, Train 1 was the largest LNG facility in the world in 1999 and for some years thereafter

Exploration activity pushed proven gas reserves up to 20.7 trillion cubic feet (tcf) in 2002, the highest it has ever been

As mentioned earlier, these huge monetisation opportunities triggered a vigorous search for gas, certainly by the two main producers, bpTT and BG.

"If you want exploration to go on," Mr Boopsingh pointed out, "you have to have the markets. The companies are not going to drill exploratory wells costing US$50 million just to sell to domestic industry. I speak to the producers and they are not happy with selling gas to make steel, say, because the price paid is too low."

Exploration activity pushed proven gas reserves up to 20.7 trillion cubic feet (tcf) in 2002, the highest it has ever been. Proven, probable and possible reserves in that year totalled 5.09 tcf. Natural gas production for domestic and export use averaged 3.7 bn cfd in 2007 but proven, as well as overall reserves, have fallen since 2002. This slide unfortunately, has continued into the most recent data year (2012), when Ryder Scott consultants pegged proven reserves at 13.1 tcf, probable at 6.1 tcf and possible at 5.9 tcf, a total of 25.2 tcf.

The relentless expansion of LNG was clearly the most important development in the continuing saga of Trinidad and Tobago's natural gas in the first decade of the 21st century. But it was not the only one, by any means. In the year 2000, for example, NGC achieved the feat of one billion cubic feet a day (bn cfd) in gas sales to domestic industry.

In 2008, it catered to 41 per cent of the market or 1.57 bn cfd of gas sales in Trinidad and Tobago, divided among the following industries: methanol (15 per cent), ammonia (14 per cent), power generation (7 per cent), iron and steel (3 per cent), others (2 per cent). The rest of the market for Trinidad and Tobago gas is in LNG exporting, where NGC is not involved, save for the small amount of gas, about 88 mmcfd, that fulfils its 11.1 per cent quota in Atlantic Train 4, which it buys from bpTT and EOG Resources Trinidad.

LNG consumes 59 per cent of all the gas utilised in Trinidad and Tobago or about 2.12 bn cfd. Keeping a balancing act between export and domestic gas, at a time of caution over proven gas reserves, will require close attention as the decade proceeds.

The government will certainly be required to bear some sort of allocation system in mind as new gas reserves are discovered and claims are made on them. A fifth LNG train, for example, would need significant amounts of gas, probably as much as Atlantic's Train four.

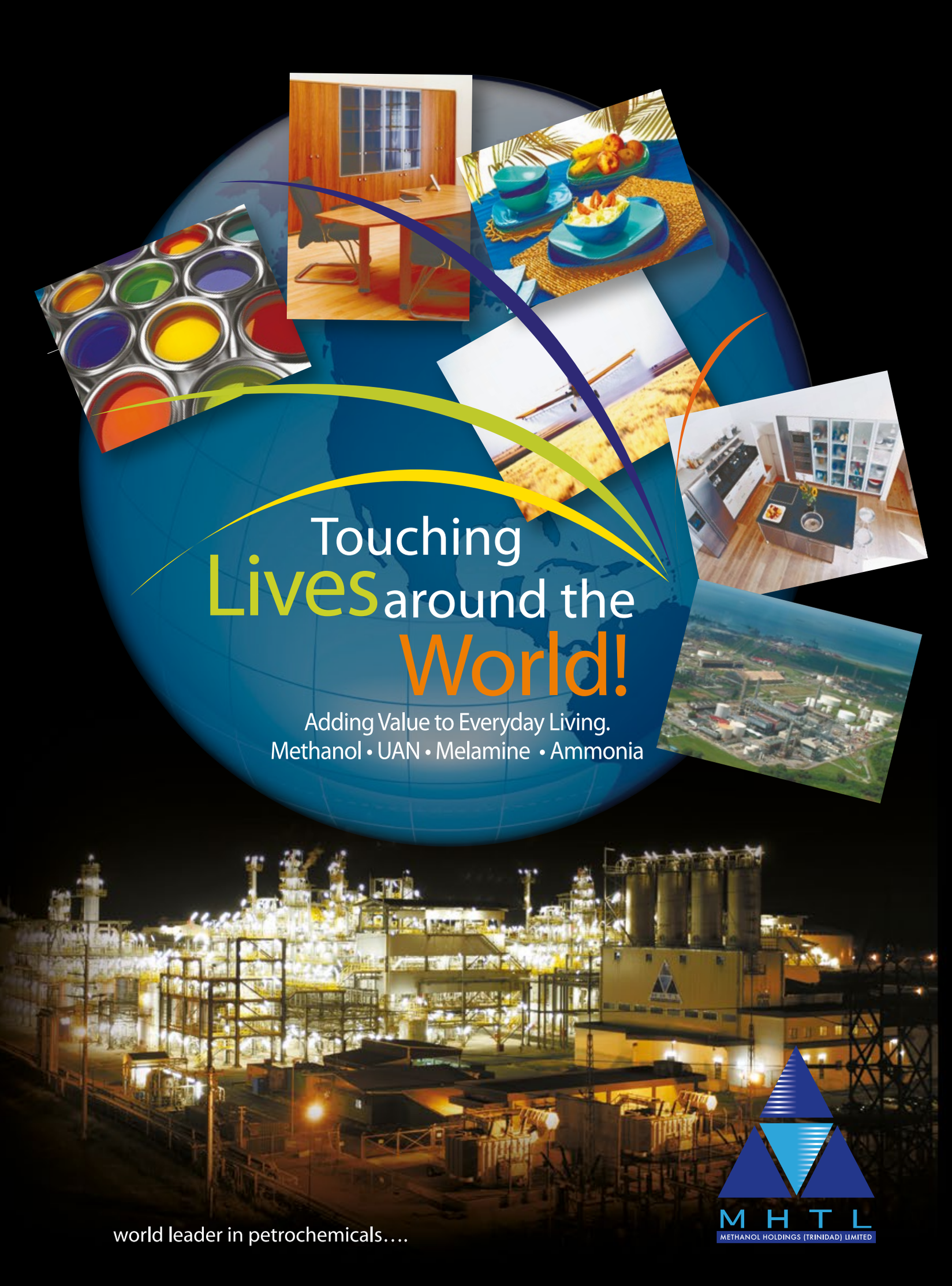
BG Group, which was mandated in 2007 to undertake an LNG expansion study for the government in conjunction with the MEEA, partly to facilitate the government's wish for Trinidad and Tobago to become an investor in parts of the gas value chain other than liquefaction, reported on the matter favourably, according to Derek Hudson, then President of BG Trinidad and Tobago (BG T&T).

"The reserves potential of the country is there – it only requires some work," Mr Hudson remarked at the time. He does stress, however, that, as Boopsingh himself had observed, "other opportunities" will be competing with LNG for the use of gas, that might even include expansion at Atlantic itself as well as the needs of domestic industry. Mr Hudson says the study also outlines ways in which the government can achieve its ambition to insert itself into the gas value chain and stresses that BG Group, with the largest access to the US market of any company in the LNG business, is eager to assist.

Tony Paul

This initiative is yet to be taken up, not only because NGC has itself started marketing part of its Train 4 quota, but because it seems to prefer to cut its value-chain teeth on the small Caribbean LNG train planned for La Brea, which will service regional markets and in which NGC will be heavily involved.

For its own natural gas production from east coast offshore fields, bpTT, the country's largest gas producer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The Bombax pipeline was an important element in helping push local content in the upstream forward after its long period in the doldrums

▸ (about 2.2 bn cfd in 2014 to date) began developing the concept of hubs in the year 2002. Its Cassia B hub was devised as a processing point for gas from several of its fields, with a capacity of 1.6 bn cfd, and was said to be the world's largest offshore gas processing unit at the time.

An offshore processing unit of this size was new to the Trinidad and Tobago energy industry. It included a large gas compression footprint, which would enable bpTT to improve gas recovery by over 10 per cent when that became necessary.

Concurrent with Cassia B, a new 48-inch pipeline was installed to bring gas to shore. Called Bombax, it was the biggest offshore pipeline ever built by bpTT at the time and the largest in the western hemisphere until NGC inaugurated its 56-inch Cross Island Pipeline (CIP) onshore Trinidad in 2006.

Local content assumes key role

The Bombax pipeline was an important element in helping push local content in the upstream forward after its long period in the doldrums following the 1978 achievement of fabricating the two Trinidad-Tesoro platforms for the Galeota field off the south east coast.

Local mechanical construction contractor, Damus Ltd, built the sub-sea manifold, the first installed in Trinidad and Tobago, which tied gas from various sources into Bombax, as well as the bridge and flare boom for Cassia B. Two years later, in 2004, BHPBilliton Trinidad and Tobago (T&T) pushed the revival of local content in the upstream even further forward with its decision to have the topsides of the first platform to exploit its Angostura oil discovery in its offshore 2c block, named Kairi 1, partly fabricated and fully assembled, in Trinidad. At 550 tonnes, this was a major advance on the much smaller Trintes B and C platforms of 30 years earlier and was also undertaken by Damus.

Eric A. Williams

BHP Billiton T&T launched a trend in local platform fabrication that has become unstoppable. The following year, 2005, bpTT completed the locally constructed 950 tonne platform for its Cannonball field off the east coast, which went twice better than BHP Billiton T&T in that the platform jacket was also put together locally and the whole structure had been design-engineered at home.

BPTT had actually announced in 2002, two years prior to Kairi 1's partial fabrication in Trinidad, its determined commitment to as much local content in the upstream as possible and had gone so far as to appoint a Manager for Sustainable Development to head it, in the person of Anthony (Tony) Paul, whom we have quoted on various subjects throughout this survey.

Cannonball ushered in what bpTT's then Chairman and Chief Executive Officer (CEO) Robert Riley described at the time as "a new concept in platform construction – a prototype that may very well find a place in offshore fields around the world." This 'prototype' has since been utilised in the construction of platforms to develop bpTT's Mango, Cashima, Amherstia, Savonette and Serrette gas fields.

Other companies have also jumped on the bandwagon – EOG Resources, with the entire topsides of its Oilbird platform followed by the deck and jacket of its Toucan platform, while BG T& T has also joined in with the topsides of its mammoth 3,000 tonne Poinsettia platform.

The pursuit of local content upstream became formal policy for the energy sector in October 2004, when a government-appointed committee issued a 'Local Content and Local Participation Policy Framework' under the watch of the then Energy Minister, Eric A. Williams.

Clearly, the platform fabrication industry has been the shining success of this effort, so much so that Mr Paul tells us that when, in his consulting

capacity, he advises governments in West Africa about Trinidad and Tobago's development of its gas sector, he is immediately told that "we want you guys from Trinidad and Tobago to come here and build our platforms for us because the prices we are paying are twice as much as it costs in Trinidad. In fact, they want to extend that to other infrastructure, like gas pipelines. As you know, NGC has built the largest gas pipeline in the Western Hemisphere."

It is estimated that platform fabrication has increased local content in the upstream from 10 per cent to over 30 per cent and rising. But there is still clearly room for growth, particularly in the myriad number of services other than platform fabrication that exploration and production companies need. This requires that locally-owned service companies be given the same opportunities under the 'local content and local participation policy' that fabricators like Damus and Weldfab were offered in platform construction.

A leading local provider of platform operations and maintenance services, Ken Ferguson, Chairman of the Kenson Group, insists that not enough effort is being put in by the authorities into safeguarding the interests of the general body of local service suppliers.

He feels they are still being overlooked when it comes to getting the first crack at services needed in the upstream, and foreign service companies still continue to obtain the best contracts.

"The producing companies I have struggled to help over the years all of a sudden tell me my services are no longer required," he recounts. "Out of the blue they accuse us of not having proper systems and processes or good managers. Local companies are increasingly being relegated to the role of sub-contractors but that situation deprives us of the chance to grow. I don't want to have a British company like the Wood Group replace me in Trinidad and Tobago. On the contrary, I want Kenson itself to have the opportunity to grow as big as the Wood Group, which started out, I understand, as a small fishing company and has grown into a large, international services provider."

Mr Ferguson must envy the platform fabricators, whom the government facilitated by mandating the National Energy Corporation (NEC, now National Energy) to establish a platform fabrication yard at the Brighton port it was already managing at La Brea in south west Trinidad in order to kick-start the business.

This was ready by early 2004, the same year in which NEC was formally assigned the task of managing the new wave of gas-based development to follow the ground-breaking Point Lisas model, to which we will return in a moment. Suffice it to say, the 'old wave' saw its culmination in 2004 and 2005, when, first, the Atlas methanol plant, owned 63.1 per cent/36.9 per cent by Methanex of Canada and BP, and then, Methanol 5000, MHTL's fifth methanol plant at Point Lisas, came on stream.

At a production capacity of 5,000 tonnes a day (t/d) or 1.7 million tonnes a year, Atlas was the world's largest methanol plant, requiring 164 mmcfd of gas to function. Equally important, Atlas was the first industrial application of German ►

It is estimated that platform fabrication has increased local content in the upstream from 10 per cent to over 30 per cent and rising

Former BP Group Chief Executive Tony Hayward visits the fabrication yard at La Brea during the construction phase of bpTT's Cannonball platform in 2005

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► engineering company Lurgi's proprietary mega methanol technology anywhere in the world.

But that record was short-lived, being exceeded by Methanol 5000 a year later, with a capacity of 5,400 t/d and a gas demand of 175 mmcfd. It's little wonder that, by then, Trinidad and Tobago had attained the distinction of being the world's biggest exporter of methanol from a single site. Simultaneously, it was also the world's biggest ammonia exporter.

Trinidad and Tobago's ability to establish huge gas-based projects was further entrenched in 2005 with the start-up of Atlantic LNG's fourth train, which had a gas requirement of no less than 800 mmcfd and could produce as much as 5.2 million tonnes a year of LNG. At the time, it was the world's largest single LNG train, continuing the tradition of record-breaking that Atlantic had first started with Train 1 in 1999.

Train 4 cost US$1.2 billion to build, a 'low spend' in international terms because many of the facilities needed were already in existence. The new train did, however, require a second jetty at the Atlantic site and a third LNG storage tank. NGC helped to further deepen Dr Julien's 'national identity in energy' by taking an 11.1 per cent share in Train 4, which unlike its holding in Train 1, enabled it to process its own gas (about 88 mmcfd) for the first time. The train was devised as a tolling facility, which liquefied gas for its shareholders according to the amount of equity each held in the plant. Theoretically, a tolling arrangement allows other companies with gas reserves also to put gas through the plant and pay a fee for doing so but that has not yet happened.

The arrival of Train 4 pushed Trinidad and Tobago up into fifth place in the international LNG exporting league and maintained its position as the world's single largest exporter of LNG to the US. Since then, with other countries having expanded their own LNG production, Trinidad and Tobago now ranks sixth in the world LNG trade.

With so much gas being exported, the government moved in 2005 to bring forward the date by which the biggest gas producer, bpTT, would start to pay 10 per cent royalty on exported gas under its exploration and production (E&P) licences for its offshore fields.

But the arrangement had a new twist to it, which was that this royalty was to be honoured in kind not cash because the government wanted access to what amounted to very low priced gas which NGC could, in future, provide to industries that it was government policy to encourage, such as aluminium. NGC now gets about 6 per cent of its gas supply under the royalty substitute system, which so far applies only to bpTT. ►

The arrival of Train 4 pushed T&T up into fifth place in the international LNG exporting league and maintained its position as the world's single largest exporter of LNG to the US

BG Group's Hibiscus platform: the company's Manatee well in block 6d confirmed the existence of cross-border gas reserves between Trinidad and Tobago and Venezuela

If 'unitisation' of gas reserves, between Trinidad and Tobago and Venezuela goes ahead, it would be the first such development in the Western Hemisphere

Cross-border gas becomes a possibility

Gas development moved into a totally new realm in 2005 when the Manatee well, drilled in BG T&T/Chevron's block 6d, confirmed that gas reserves did, indeed, straddle the Trinidad and Tobago/Venezuela maritime boundary delimitation to the south east of Trinidad and the area Venezuela calls Plataforma Deltana north east of the Orinoco Delta.

Chevron, which holds the licence on the Venezuelan side, had earlier drilled the productive Loran wells in the matching block 2 in Plataforma Deltana. A joint technical team has since estimated that cross-border gas between block 6d and 2 could amount to as much as 8 tcf of gas. 2.1 tcf of which is estimated to be on the Trinidad and Tobago side and 5.8 tcf in Venezuelan waters.

The delimitation treaty between Trinidad and Tobago and Venezuela lays down that joint agreement is required before any of this gas can be exploited and discussions are still continuing as to how best this can be done. Trinidad and Tobago clearly sees 2.1 tcf of gas as helping facilitate the continuing development of gas-based industrialisation, including further LNG production, and would probably want to bring some of the Venezuelan gas over to Trinidad too, but Venezuela may have other ideas.

With a diameter of 56 inches, NGC's Cross-Island Gas Pipeline is the largest in the Western Hemisphere, with a total capacity of 3.6 billion cubic feet per day

Another pair of cross-border blocks, bpTT's Kapok and Plataforma Deltana block one, held by Venezuelan state company PDVSA, has also been the subject of discussions by both sides but this is regarded as having fewer reserves than 6d/block 2. A third pair, block 5b (bpTT/Repsol in Trinidad and Statoil/Total/PDVSA's block 4 in Venezuelan waters, whose cross-border reserves have not yet been announced. If 'unitisation' of gas reserves, as it is called, between Trinidad and Tobago and Venezuela goes ahead, it would be the first such development in the Western Hemisphere. Rupert Mends who was involved with the process when he was Permanent Secretary in the Energy Ministry, observes that there is "goodwill" concerning the exploitation of cross-border gas and both sides are working to identify reserves "but there is usually a political dimension to these matters and politics often cramps the economics."

NGC's Cross Island Pipeline (CIP) in 2006 was designed to provide transmission capability for the producers sending gas to Train 4 as well as service tenants on the new Union Industrial Estate at La Brea and for future gas transportation requirements, such as gas from 6d/block 2, including any that might come from the Venezuelan side.

As noted, at the time, it was the largest in the Western Hemisphere and among the largest in the world. It is able to carry 2.4 bn cfd of gas on free flow and 3.2 bn cfd with compression. A pipeline not wholly-owned by NGC – it only had a 10 per cent interest in it – but was as ground-breaking in its own way as CIP moved out of the concept stage in 2007 and became an on-going project to provide natural gas from Trinidad and Tobago to Caribbean territories.

The Eastern Caribbean Gas Pipeline Company (ECGPC) was an initiative to help other territories in the region burdened with high prices of oil-based energy like fuel oil and diesel for electricity generation, by offering competitive pricing for gas instead. It is a mainly private sector effort, with the US's Beowulf Energy and First Reserve owning 60 per cent between them, Guardian Holdings Ltd 15

per cent, the Unit Trust Corporation 15 per cent and NGC 10 per cent, as noted. The Trinidad and Tobago Government's role is confined to agreeing to sanction the export of gas for the project.

Energy stalwart the late Trevor Boopsingh was part founder and first chairman of the company, whole role is to provide the transport capability for about 25 million cubic feet a day (mmcfd) of gas to be delivered to Barbados in the first instance.

An attempt at diversifying the uses to which methanol can be put in order to help safeguard the market for one of Trinidad and Tobago's premier export products was also launched in 2007 with MHTL's US$12 million methanol-fired 8.3MW demonstration power plants at Point Lisas, to test whether methanol was a suitable fuel for power generation. If so, it could potentially have a market in the Caribbean and elsewhere. Of course, this would provide potential competition for ECGPC and it remains to be seen how these energy projects, both gas-based, eventually proceed.

In light of the concerns over natural gas reserves as Trinidad and Tobago's first petroleum century was drawing to a close, the confirmation of two new gas discoveries was music to the ears of energy industry practitioners.

The then Minister of Energy and Energy Industries, Senator Conrad Enill, himself announced in 2008 that Petro-Canada (since bought by Suncor, which later sold out to Centrica), operator of block 22 north of Tobago, had found about 1.2 tcf of gas during its exploration programme there. Another Canadian company, Canadian Superior, for its part, had identified around 3.3 tcf of gas in block 5c off Trinidad's south east coast.

Conrad Enill

The new wave of downstream gas development

The 'new wave' of gas development mentioned earlier is focusing on extending the existing primary chemical route further down the value chain within the country itself.

The government strongly believes that more 'value added' can be obtained this way and building on what the country has already proved to be good at is the best way to enlarge the industrial and manufacturing base.

The programme had already been firmly worked out in the waning years of the first century and, it is expected, will come to fruition in the early years of the next one.

Methanol and ammonia, which are significant gas users, have been earmarked for major add-on downstream plants. Some examples follow.

- Ammonia: MHTL has already gone ahead and invested in an ammonia/urea/melamine (AUM) complex at Point Lisas, at a cost of about US$1.6 billion. It will consist of a plant producing ammonia, which will then be used for the manufacture of urea solutions. Nitric acid, ammonium nitrate and UAN mixing plants will then be added, taking the complex to melamine. Melamine will provide Trinidad and Tobago manufacturers for the first time with local access to a raw material for such products as decorative laminates, surface coatings, tableware, wood adhesive, resins and many others. The same company has since decided to duplicate the plant with what it calls AUM 2, which is estimated to cost US$1.9 billion and include the production of melamine urea formaldehyde resin (MUF).
- Methanol: The proposed Mitsubishi/Massy Group methanol-to-DME plant will be the country's first downstream add-on to methanol. DME is a versatile chemical that can be used in power generation, transport, cooking and heating.

The industrial activities mentioned above constitute part of the new wave of industrialisation emanating from natural gas. Analysts generally seem to agree with this approach. As former NGC senior executive, Gregory McGuire, notes: "We really need to be in the value-added game. The gas sector ►

The 'new wave' of gas development is focusing on extending the existing primary chemical route further down the value chain within the country itself

The current estimate of oil reserves, including condensate and tar sands, amounts to 317.9 million barrels proven, 119.3 million probable and 1,046 million possible

► is really well defined now in respect of primary production and the challenge is to get some downstreaming and some linkages."

Can oil make a comeback?

For the best part of this survey we have focused on Trinidad and Tobago's gas sector, since it is indubitably now the dog that wags the petroleum tail and has vast potential for expanding the country's manufacturing base downstream. But does this mean that the days of oil, the mainstay of the economy for the first 69 years of the petroleum century, are numbered?

Any suggestion that that is the case would be frowned on by the analysts and certainly by the MEEA, which is busy putting out blocks for exploration that it hopes will yield new oil as well as the new gas that is already beginning to appear.

Trinidad and Tobago's last oil discovery of any consequence was made by BHP Billiton T&T and its partners in block 2c with the Kairi and Canteen wells in 2001. But that has turned out to be a disappointment and instead of rising, as hoped, the country's oil production has been falling, and is expected to average about 83,000 b/d in in 2014, including condensate, compared with 121,754 b/d in 2007.

Highest production in the last 16 years was 145,114 b/d in 2005, the year Kairi and Canteen commenced production.

If new exploration taking place both offshore and in deeper horizons or land does not do it, are there other possible sources of incremental oil in Trinidad and Tobago? The answer is yes. Two in particular – the conventional oil that has remained 'stranded' in reservoirs because the gas pressure is no longer enough to get it to the surface and methods such as gas injection or water flood must be employed to do so and 'heavy oil' of a gravity of under 18 degrees API which requires to be lightened by agents such as steam in order to be able to flow at all.

The current estimate of oil reserves, including condensate and tar sands, amounts to 317.9 million barrels proven, 119.3 million probable and 1,046 million possible, with "exploratory" resources being 111.6 million barrels. These figures come from an oil reserves audit done by Ryder Scott in 2007.

Consulting company Association of Caribbean Energy Specialists (ACES) estimates that about 100,000 b/d of heavy oil (largely excluded from the above figures) could be lifted from Petrotrin's Trinmar acreage in the Gulf of Paria in the future, while around 50,000 b/d could be retrieved from land reservoirs.

"For 20 years we have not been doing what we ought to have done – encourage the production of heavy oil. They have been doing it in Venezuela for years. It is more expensive to retrieve it is true but the oil

Oilfield workers operating a horizontal drilling rig: the MEEA is bullish on the prospects for an onshore oil renaissance in Trinidad and Tobago

price is higher now," as Trevor Boopsingh, who was Chairman of the company until his death, told us. Heavy oil is defined by the MEEA as having an API gravity of 18° or below.

The heavy oil reserves in Trinmar "contain heavy metal content and acidity, which pose significant challenges for our refinery but it does represent an attractive opportunity."

As the second petroleum century proceeds, a renewed effort is also likely to be made to further deepen what Dr Julien calls the 'national identity in energy' in the upstream, with particular reference this time to the domestic private sector. It is just as important for private local companies to be contributing to oil and gas production as it is for state companies to have a presence there. It is generally agreed that the effort by local companies to maintain their position in the petroleum services business needs to be matched by greater involvement in the producing area. Incentives given for the operation of small and mature fields should make it more attractive for local players to participate more vigorously in the upstream.

Exporting Trinidad & Tobago's petroleum expertise

After 100 years in the oil and gas business, Trinidad and Tobago thinks it is more than equipped to export its petroleum expertise, especially as it relates to platform construction, as Anthony Paul has mentioned and, perhaps more so, to monetising limited reserves of gas successfully.

Mr Paul himself has visited several African countries in his capacity as an ACES consultant and in mid-2008, a delegation from the Economic Community of African States (ECOWAS), led by the ECOWAS Commission chairman, Dr Mohammed Chambas, visited Trinidad for discussions with the government and private sector.

Dr Chambas spoke of the "remarkable progress" in gas-based development he witnessed during his visit, the background to which was an offer of assistance to West African countries made by Trinidad and Tobago's former Prime Minister Patrick Manning, when he attended an African Union meeting sometime previously.

Trinidad and Tobago has also recently provided assistance to fellow member of the Caribbean Community and Common Market, Belize, which needed advice on how to tax the company that recently began producing oil there and with the training of petroleum inspectors to monitor the industry. In a way, this should be déjà vu for Trinidad and Tobago, since it has, in the past, even been asked to help the former colonial power, Britain, in relation to its oil discoveries in the North Sea.

R.A. (Gene) Thomas, a former Permanent Secretary in the Energy Ministry, recalls that "the British Government asked Trinidad and Tobago for technical assistance when oil was found in the North Sea, so I went up to London together with two other people and we found out that they wanted advice in various areas – what sort of grid they should set up in the North Sea, what sort of obligations to put on the companies and acreage surrender obligations. I gained the impression this sort of information was necessary to enable the British to deal with the US companies that were coming in."

Whatever assistance Trinidad and Tobago was able to provide may have helped play a modest part in allowing the British sector of the North Sea to develop into the major world petroleum province it is today and the Caribbean country's expertise continued to be in demand as the second petroleum century began in 2009.

Gene Thomas

Tony Paul, for his part, has achieved greater immediate success in transferring Trinidad and Tobago petroleum-related expertise to Ghana: he completed a local content policy for the Ghanaian petroleum industry in 2010, largely modelled on ►

After 100 years in the oil and gas business, Trinidad and Tobago thinks it is more than equipped to export its petroleum expertise

Local energy service companies are vigorously marketing their expertise in Africa as well as in the Caribbean

▸ the one he helped author for Trinidad and Tobago back in 2005.

Uganda and Kenya in east Africa and Mozambique in the south eastern part of the continent are also lining up to learn from Trinidad and Tobago in regard to the development of potential gas resources in the case of the former and existing gas reserves in the case of the latter.

"Africa is looking to us for help and guidance in establishing its own oil and gas industry," notes Kevin Ramnarine, a petroleum engineering graduate of the University of the West Indies (UWI) in Trinidad, who is the current Minister of Energy and Energy Affairs (MEEA), as the ministry was renamed after the arrival in office of the People's Partnership (PP) coalition, which defeated the incumbent People's National Movement (PNM) party in the May 2010, general election. "This presents an opportunity to actualise on south-south cooperation and the transfer of technology."

Other than Trinidad and Tobago-promoted investment, local energy service companies are vigorously marketing their expertise in Africa as well as in the Caribbean. The Energy Chamber, which represents their interests, has organised marketing visits to six African countries and three in the Caribbean and from all accounts has established strong business links.

Also in the Caribbean, Grenada has been seeking help from Trinidad and Tobago with oil exploration in its own waters, following the recent de-limitation of the maritime boundary line in the two countries exclusive economic zones (EEZs).

Trinidad and Tobago is also preparing to put its LNG expertise at the service of the surrounding Caribbean territories, who have need for small LNG cargoes as a means of diversifying into much cheaper natural gas out of the expensive heavy fuel oil and diesel they now use for power generation.

Kevin Ramnarine

The government has already entered into an alliance with a Luxembourg-registered company called Gasfin Development SA, to determine how the small-scale LNG supply chain in the Caribbean can best be established.

Minister Ramnarine sees this in the context of "energy security" for the Caribbean archipelago "and Trinidad and Tobago, with its developed LNG industry, should be prepared to play a leadership role in this."

He observes: "LNG provides Caribbean countries with an option cleaner than burning oil. LNG could be an additional part of a winning strategy for the Caribbean, with supplies coming from a small scale LNG project in Trinidad and Tobago."

He has entered the caveat, however, that "the expansion of the LNG industry in Trinidad and Tobago must be dependent on ensuring we have domestic energy security." In which connection, the continued fall in the country's natural gas reserves since 2009 is clearly a matter of some concern.

Each year, the US's Ryder Scott company audits the amount of identifiable 3P reserves and gas resources in the offshore Trinidad area. Proven reserves have decreased from 15.3 trillion cubic feet (tcf) at which they stood in 2008 to 13.1 tcf in 2012.

Probable reserves have also gone down, from 8.4 tcf to 6.1 tcf and possible reserves from 6.2 tcf to 5.9 tcf. So, almost 5 tcf of 3P reserves have disappeared over the four-year period, mainly because not enough drilling has been done to replace the gas used up by power generation, industry and LNG each year. The exploration resources figure has, however, *risen* from 29.6 tcf to 31.6 tcf thanks to increased identification of potential drillable prospects from seismic surveys.

The principal way of stemming this worrying decline, of course, is by renewed exploration.

Exploration activity has not been as buoyant in recent years as it should have been but Minister Ramnarine is ▸

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Trinidad and Tobago is preparing to put its LNG expertise at the service of the surrounding Caribbean territories

▸ moving quickly to try and rectify that.

Production sharing contracts (PSCs) for four blocks in shallow water off the north and east coasts of Trinidad – NCMA 2, NCMA 3, NCMA 4 and 4b – were inked by MEEA in April, 2011 and required the companies concerned to spend a minimum of US$214 million in exploration work over the next six years. NCMA 2 went to Canada's Niko Resources in partnership with Germany's RWE Dea AG (a newcomer to the country's petroleum scene), NCMA 3 to Niko Resources, NCMA 4 to the UK's Centrica Energy and 4b also to Niko Resources.

The chances of finding new gas reserves in all four of the blocks given out are considered to be good.

MEEA officials say NCMA 2 "has identified potential for over 1 tcf of gas," NCMA 4 contains "at least 300 billion cubic feet of identified resources and a speculative 2D survey has revealed some upside potential," in NCMA 3 "several anomalies have been identified" though the block is said to pose something of "an exploitation challenge" and in 4b "several structures have been mapped, showing around 2 tcf of gas in shallow structures and the possibility of more at depth."

The deep water exploration initiative mentioned above also has a good chance of leading to additional gas discoveries but that is not something that the companies which have bid for acreage there seem particularly happy about. However, as Minister Ramnarine points out later in this article, the prospects for oil are also considered favourable.

Norman Christie, BP's Regional President in the Caribbean, did not specify the hydrocarbon likely to be found in the Trinidad deep water when he noted that "we are very pleased to be given this opportunity to be pioneers as we work to unlock the deep water potential of Trinidad and Tobago, using the best technology and expertise available. in our deep water blocks 23a and TTDAA."

The strong possibility of gas in the NCMA blocks will tilt the hydrocarbon balance in the country even more in favour of gas in the years ahead and MEEA is anxious to change that. "Re-balancing" has been the buzzword at the ministry since the new petroleum century began.

The Point Lisas Industrial Estate: on the crest of a new wave of downstream gas development

Trinidad and Tobago has been losing hundreds of millions of US dollars in foreign exchange earnings and government revenue in recent years because of the fall in domestic crude oil output.

Leading geologist Wilson Lalla, an independent consultant, has pointed out that "in 2009, when the oil price was about US$65 a barrel, the revenue the government received from royalty was not significantly greater than the amount received in 1990, when the price was US$25 a barrel. That's the impact of declining oil production."

Current liquids production in Trinidad and Tobago is now only around 83,00 b/d and 12,600 b/d of that is not crude oil at all but condensate, the liquid that is in gaseous form in a

gas reservoir but "condenses" to form a liquid when it gets to the surface where the pressure is much lower.

The substantial component of condensate in the liquids total only further illustrates the dominance of gas in the country's hydrocarbon scenario and its little wonder that Minister Ramnarine has unequivocally declared "the increase in national oil production" to be his "number one priority."

Like geologist Lalla, he, too, puts a monetary spin on why oil production is so crucial:

- Assuming an oil price of US$90 a barrel, an increase of 10,000 b/d in crude output "translates into TT$1.4 million (around US$233 billion) in revenue collected by the State," the minister points out.
- Oil is always more valuable than natural gas. It takes six times the amount that gas is priced in mmbtu terms to equal the price earned from one barrel of oil.
- Despite the loss of royalty income mentioned by Mr Lalla, oil revenue from all sources still contributed 55 per cent of the amount received in taxation from the energy sector, as opposed to 45 per cent from gas "though the country produces seven times more natural gas than oil on an energy equivalency basis," Ramnarine points out.

So, while natural gas has been the foundation on which Trinidad and Tobago has constructed its much-vaunted monetisation programme, oil still provides most of the dollars needed to run the country.

Other than keeping his fingers crossed that deep water exploration will somehow strike oil, what is the minister doing about arresting, and reversing, the crude production collapse (the peak for oil production in Trinidad was an average of 229,589 b/d in 1978)?

Pending any oil surprises in the deep water (which could not be turned into actual production before at least 2021 anyway), Ramnarine has pinned his hopes on a number of sources.

One is the State-owned integrated energy entity, the Petroleum Company of Trinidad and Tobago (Petrotrin).

Petrotrin will contribute about 36,000 b/d to forecast 2014 crude oil production, which makes it the largest single crude provider in the country by far. It also holds the largest swath of land acreage and is the only current operator in the Soldado fields in the Gulf of Paria on Trinidad's west coast.

"Petrotrin is pivotal in this matter," Ramnarine says, "and central to what happens at Petrotrin in Trinmar."

Trinmar is known to be sitting on millions of barrels of undeveloped oil resources but the broken-down nature of much of the infrastructure and the state company's lack of capital, have both prevented any sustained attempt to access them.

That is about to change, with Petrotrin said to be embarking over the next five years on a TT$5-10 billion (US$830-1.5 billion) spending programme in its South West Soldado (SWS) field, regarded as the most promising of its five fields in Trinmar which, according to Petrotrin's prospect generation manager Carole Telemaque, should lead in time to "a tripling of production in SWS" to about 15,000 b/d, according to the energy minister.

Trinmar also holds a significant amount of heavy oil, which has tended to be ignored over the years. It will require a special development effort to try and retrieve it but the good news is that Trinmar's heavy oil (18 degrees API gravity and below) is of a "foamy" variety, which may make it easier to lift. The same techniques that are normally employed to recover heavy oil are also those used for enhanced oil recovery (EOR) – another initiative for assisting with incremental crude production that Ramnarine says he will support. The visionary Trinidad and Tobago geologist, Dr Krishna Persad, has suggested that, even in known oilfields, there are billions of barrels of conventional (not heavy) oil awaiting retrieval by EOR methods, principally carbon dioxide (CO_2) sequestration, and he has launched a pilot project in his own small Barrackpore field in south Trinidad.

On the new oil side, in 2011 Petrotrin completed the most extensive 3D seismic survey ever ►

The strong possibility of gas in the NCMA blocks will tilt the hydrocarbon balance in the country even more in favour of gas in the years ahead

While natural gas has been the foundation on which T&T has constructed its monetisation programme, oil still provides most of the dollars needed to run the country

► conducted on land in Trinidad and expects to commence a programme of exploratory drilling in 2014, once it has identified suitable prospects. It may well need joint venture partners to help it fund this and the company's new chairman, Lindsay Gillette, has said he will be seeking those who can bring "synergies and complementaries" to Petrotrin.

Under its renewed licence for the Trinmar acreage, off the west coast, Petrotrin also undertook a 300 sq km 3D ocean bottom cable seismic survey during 2013-14, the results of which will also inform a major exploratory and development drilling programme there.

With the new government having given tax incentives for the development of small fields (up to 1,500 b/d) mature fields (those that have been in existence for 25 years) and EOR, the role of non-governmental companies in the oil revival effort should not be overlooked.

Canada's Parex Resources has been doing good work in discovering some new small oilfields in south Trinidad.

Not all of the new wave of independent oil producers are foreign, however. "I believe Trinity Exploration and Production is well positioned to help reverse the decline in Trinidad and Tobago's oil production," insists Hywel John, the former CEO of Bayfield Energy, which merged with Trinity in 2013. "We have a very high degree of confidence in the Galeota block which has been well-defined by previous drilling and we have acquired very high quality data through our recent 3D seismic survey."

As the second petroleum century meanders on its way, Trinidad and Tobago, despite its self-sufficiency in low-cost energy, will not be able to avoid paying some attention to renewables, if only to be seen to be assisting in the worldwide carbon emission-reduction drive.

The government has given some incentives for the installation of solar water heaters and wind turbines, and agreed to the setting up of a Regional Renewable Energy Research Centre (RERC) in Port of Spain, partly funded by the US Department of Energy (DOE). But even the Energy Minister himself says: "It will be very difficult for RE to compete with natural gas for power generation in Trinidad and Tobago because the price of electricity here is among the lowest in the world. RE projects will require capital investment that may not justify the commerciality of the project, so that certainly has to be taken into consideration."

While RE, along with energy efficiency, both of which comprise what is known as 'energy sustainability', will inevitably become part of the landscape in the years ahead, fossil fuels are not going to disappear and will remain the cornerstone of the energy sector in Trinidad and Tobago going forward.

As noted earlier, geologists reckon there are billions of barrels of "stranded" crude oil left behind in conventional reservoirs, particularly on land and of heavy oil, both onshore and offshore.

Recent discoveries of medium-to-light oil, by Parex (on land, in south Trinidad) Petrotrin (in the Gulf of Paria) and Trinity (off the south east coast), are clear indications that there is also "new oil" to be found.

Whether the Trinidad and Tobago oil and gas industry actually lasts for another 100 years, is a moot point but it is not going out of business just yet.

Hywel John

It will remain indispensable to the local economy on an indefinite basis: after all, RE does not have the potential to earn any foreign exchange and, with the low prices that will be necessary to kick-start it, will make very little contribution to GDP either.

The most notable feature of the last five years was the continued relentless fall in the output of crude, the country's financial lifeblood.

Minister Ramnarine's hopes for an end to the constant haemorrhage and ►

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Geologists reckon there are billions of barrels of "stranded" crude oil left behind in conventional reservoirs, particularly on land and of heavy oil, both onshore and offshore

▸ a reversal in output seems likely to remain resolutely unrealised. The minister must be vigorously scratching his head about what to do about this, though he has set a number of courses of action in train.

He has responded to Dr Krishna Persad's injunction mentioned earlier for a major effort to recover the substantial amount of conventional "left-behind" oil in thousands of reservoirs throughout south Trinidad.

"I have mandated the National Gas Company (NGC) to study the building of a pipeline to take CO_2 emissions from the petrochemical companies at Point Lisas to the oilfields. NGC will probably build it with their own money and operate it like a business to provide CO_2 commercially to whoever wants it in the fields."

What's more, sequestering CO_2 could earn Trinidad and Tobago some carbon credits so, overall, insists the minister, "its going to change the whole game."

Using CO_2 to retrieve "stranded oil" on a large scale (its already being done in isolated pockets, along with using other injection agents like steam and water, to recover a modest percentage of old oil) is clearly a major move in the battle to halt and reverse the decline, but it will take many years to show results.

Heavy oil is also another potential contributor to crude recovery using the same injection measures mentioned above. The added expense of doing so, however, is what has traditionally deterred the companies. Many analysts regard it as a crying shame that heavy oil, though challenging to refine, has been allowed to remain unretrieved for so many decades.

Even the minister has noted: "Depending on who you talk to, Trinidad has anywhere between 3 to 7 billion barrels of heavy oil."

Then there are tar sands, admittedly dirty stuff but Canada has been recovering the oil locked up in these sands for many years now and the authorities there are as environmentally conscious as anywhere else.

A Canadian company has in the past actually conducted coring exercises in relation to tar sands in south Trinidad and found that "the cores recovered from down to depths of 500 feet in some instances proved highly successful, with recoveries reaching 90 per cent or more."

Trinidad and Tobago mineral geologist, Herbert Sukhu, has been actively lobbying the MEEA on starting to take tar sands seriously. The MEEA itself has conservatively estimated that there are 300 million tonnes of tar sands scattered around Trinidad's southern basin. Mr Sukhu has set up a special company to pursue the tar sands idea. "I want to see the country get more oil," he insists. "There are technologies now available that we can use to extract tar sands environmentally, so its definitely worth going after."

While enhanced oil recovery (EOR) through CO_2 or other agents and tar sands languish for the time being, Minister Ramnarine has chosen the more risky, though obviously sensible, path of attempting to identify new oil through exploration. This has two prongs to it – encouraging companies with existing production, particularly Petrotrin, which holds the largest block of acreage on land, to engage in exploration activity and to offer new acreage to companies, particularly overseas ones, to undertake entirely new exploratory drilling.

The former has achieved some success; in 2012, the State company identified in the course of an exploration programme, 48 million barrels of "new hydrocarbon potential," as it put it, in its Trinmar acreage earlier referred to. The discovery, promptly named Jubilee in honour of Trinidad and Tobago's 50th year of independence, was made "at between 4,000 to 5,000 feet in several reservoirs," according to company president, Khalid Hassanali. In addition, the crude was of a light variety, making it easier to refine, thus helping shore-up the refinery margin.

Spain's Repsol is also going forward with exploratory and development drilling in its Teak/Samaan/Poui (TSP) block, out of which has already come one discovery of 40 million barrels

in an extension of the Teak field, and Trinity, as mentioned, has also made some discoveries. The smaller private sector upstreamers, collectively referred to as the Independents (see other story in this publication) will also be pitching in to drill exploratory wells on their existing holdings in 2013 and beyond.

The other prong to the oil search – providing entirely new acreage for companies to do wildcat drilling – is being pursued with even greater vigour.

As earlier noted, blocks NCMA 2, NCMA 3, NCMA 4 and 4b, are now in the exploratory phase, after having been offered in 2010 under what MEEA dubbed its "shallow and average water" block round.

In the same year, the first deep water (1,000-3,500 metres) round since 2006 was held, which resulted in the award of blocks 23a and TTDAA 14 to BP.

Subsequently, after further negotiations, blocks 5d from the shallow and average water auction and block 23b from the deep water round, were given to BG International and a consortium of BHP Billiton/ Repsol, respectively.

In 2012, another deep water block auction took place, out of which emerged successful bids by BHP Billiton for blocks TTDAA 5, TTDAA 6, TTDAA 28 and TTDAA 29, for which production sharing ►

The MEEA estimates that there are 300 million tonnes of tar sands scattered around Trinidad's southern basin

In 2012, Petrotrin identified 48 million barrels of "new hydrocarbon potential" in its Trinmar acreage, a discovery named Jubilee in honour of the country's 50th anniversary of Independence

► contracts (PSCs) have already been signed. To this will shortly be added the two blocks bid for in the 2013-14 deep water auction.

Minister Ramnarine prides himself on being more energetic than most of his predecessors and is certainly the first one known to have instituted block offerings on an annual basis. The question is, though: will this frenzy of exploration activity over the next 4-5 years, produce the desires results – new oil discoveries?

The NCMA blocks are regarded as definitely gas-prone, in view of the substantial amount of gas that has already been identified in the long-productive NCMA 1 and block 22 to the north. So much so, that Germany's RWE Dea AG which, as earlier noted, is partnering Niko Resources in NCMA 2, has put forward a proposal to the MEEA, through its RWE Supply and Trading GmbH unit, for the consideration of floating LNG for the monetisation of offshore gas reserves in the future. This reflects the company's confidence in eventual gas discoveries, following the start of exploratory drilling in NCMA 2 in Q3, 2013.

Manfred Boeckmann, General Manager, New Ventures Africa/Middle East for RWE Dea AG told this publication that "state of the art processing of the 3D seismic in the block not only revealed prospectivity in the Pliocene but also shed light on deeper geological strata, for example, the Miocene. Due to the existing production in NCMA 1 from the same stratigraphic intervals and the positive exploration/appraisal results in block 22, the Pliocene targets in NCMA 2 exhibit a high chance of success."

Mr Boeckmann clarifies earlier reports that RWE Dea AG had decided to dispose of its oil and gas exploration and production assets worldwide by stressing that this did not apply to "on-going exploration and field development projects," including NCMA 2 in Trinidad and Tobago.

"We are committed to our host government and partners," he insists, "and will fulfil our obligations in a prudent and diligent manner."

By contrast, the three land blocks are definitely

Offshore rig in Petrotrin's Trinmar acreage

seen as oil-prone, sitting as they are in the prolific southern basin of Trinidad.

On the other hand, the jury is out on the deep water blocks. The betting is that gas is the most likely hydrocarbon in BP's two blocks, 23a and TTDAA 14 (in which the company recently farmed out a 70 per cent in each, and operatorship, to BHP Billiton). MEEA estimates are between 4.7 trillion cubic feet (tcf) and 8.2 tcf. In BHP Billiton's TTDAA 5, TTDDA 6, TTDAA 28 and TTDAA 29 blocks, however, Ramnarine seems to think there is a probability of oil as well as gas, which he puts at between 428 to 4,200 million barrels, with gas at between 2.4 tcf to 23.6 tcf.

BHP Billiton's Trinidad and Tobago President, Vincent Pereira believes the minister's optimism is not misplaced. "I am very, very hopeful that there are hydrocarbons in the deep water," he says. "In fact, I am convinced about that."

Probing for oil in another "new frontier", so to speak, also gathered momentum in 2012-2013 and that was in the deeper horizon area on land, traditionally under-explored.

No such wells had been drilled at the time of writing, so it can not yet be said with certainty that productive deep land plays exist or not. Parex has decided to relinquish the Central Range Shallow and Deep blocks, so no drilling is likely there in the near future. One mandatory deep horizon well is due for the Guayaguayare Deep block, likely to be drilled by Range Resources, which has farmed into Niko Resources' interest in the block. Other companies may themselves try to drill deep, either on land or offshore, since the Minister of Finance and the Economy, Larry Howai, did extend incentives for them to do so in his 2012-2013 national budget. The period 2012-13 also saw NGC, probably Minister Ramnarine's favourite State-owned energy company, significantly extend its business activities by commencing the marketing on its own account of 30 mmcfd of the 88 mmcfd of gas it is entitled to have liquefied as part of its processing quota in Atlantic's Train 4. This had previously been done on its behalf by BP Gas Marketing. It earned US$9.25 per mmbtu from its first cargo of around ►

2012-13 saw NGC significantly extend its business activities by commencing the marketing on its own account of part of its quota from Atlantic's Train 4

Workers inspecting Petrotrin's Pointe-a-Pierre refinery

Predictions of an ineluctable decline in Trinidad and Tobago's oil industry are clearly premature

▸ 118,000 cubic metres and even more from subsequent ones, which the company says is considerably in excess of what BP used to earn for it.

NGC was also vested in the 2013-2014 Budget with responsibility for promoting the uptake of CNG as a motor vehicle fuel. Its mandate is to encourage the construction of 22 new CNG stations over the next two years and the conversion 17,000 vehicles to CNG.

NGC has been designated as the state energy firm that will expand Trinidad and Tobago's footprint in the energy sector at home and abroad and in that regard, increased its ownership in gas liquids producer Phoenix Park Gas Processors Ltd. (PPGPL) from 51 per cent to 90 per cent, at a cost of US$600 million in mid-2013.

This has generally been welcomed as a good investment, since PPGPL is a very profitable company, based on its sales in regional and international markets of the propane, butane and natural gasoline it extracts from the country's gas stream.

NGC's Phoenix Park Valve Station

Its current gas processing capacity is 1.95 billion cubic feet a day (bn cfd) and it can fractionate up to 70,000 b/d of liquids.

Its well-regarded President, Eugene Tiah, says he is going ahead with a second processing unit, to be located at the Union Industrial Estate, near La Brea, to capture the liquids from the 300 mmcfd that will be flowing through the estate for supplying new industries before long.

Trinidad and Tobago combines to maintain its reputation for pioneering industries in gas development. One example is the initiation of negotiations by Centrica Energy to export gas in compressed form (CNG) by ship to Puerto Rico in the north western Caribbean. This has been temporarily suspended while Centrica firms up its gas reserves in its blocks 22 and NCMA 4 but if it does come to pass, could qualify as the world's first use of CNG delivered by vessel.

Another is the agreement on cross-border gas exploitation going forward between Trinidad and Tobago and Venezuela, the first such activity in the Western Hemisphere. There is an estimated 8 tcf in the Manatee and Loran finds in Trinidad and Tobago and Venezuela respectively, split 2.1 tcf and 5.9 tcf between the two.

The US major, Chevron is the operator on both sides of the border and therefore is likely to be the operator for the unitised development, perhaps in collaboration with Venezuela's State energy giant, PDVSA.

Judging from the above, the predictions of an ineluctable decline in Trinidad and Tobago's oil industry are clearly premature and both the oil and gas sectors are likely to be a significant feature of the economic landscape for many decades to come, with an important, though small contribution from renewable energy sources. ▪