

Building on a Century of achievement

By Senator The Honourable Kevin Ramnarine

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From a standing start in 1908, crude oil production rose dramatically, thanks to discoveries onshore, in the Gulf of Paria, and offshore Trinidad's east coast to an overall peak of 240,000 b/d in 1978

As Trinidad and Tobago enters its second century of commercial hydrocarbon production, it faces the twin challenges of arresting declining crude oil output and maintaining its natural gas reserves base in an effort to sustain the production of natural gas.

The two are both crucially important: crude oil provides a key chunk of the government's tax revenue because of the high prices received by oil producers, and natural gas underpins the internationally acclaimed gas-based, heavy industrialisation programme which makes Trinidad and Tobago unique in the Caribbean and Central America.

From a standing start in 1908, crude oil production rose dramatically, thanks to discoveries onshore, in the Gulf of Paria which separates Trinidad from Venezuela on the west and offshore Trinidad's east coast, to an overall peak of 240,000 barrels per day (b/d) in 1978, with the average for that year being 229,529 b/d.

Crude oil production on land had peaked 11 years earlier, in 1967, at 111,883 b/d, in the Gulf of Paria at 76,948 b/d the year after, (1968) and that off the east coast at 139,136 b/d in 1978, the same year national production itself reached its highest level. Gas production, on the other hand, has not yet peaked and averaged 4.1 billion cubic feet a day (bn cfd) in 2013, a remarkable achievement for a small Caribbean twin-island State that is hemmed in by Venezuela, both on the west, north west and south, and thus has relatively modest onshore and offshore acreage to exploit for hydrocarbons.

Crude oil output has fallen because of the decreasing output from conventional reservoirs and the failure, until recently, to find new conventional reserves on land or offshore. For example, the 139,136 b/d of oil production off the east coast mentioned earlier, almost all of which was contributed by the then Amoco (now BP's) Teak, Samaan and Poui (TSP) fields, now yields a mere 11,700 b/d.

In the Gulf of Paria, where the Trinmar fields are operated by the State-owned Petroleum Company of Trinidad and Tobago (Petrotrin), production is now around 21,800 b/d.

Contributing to the decline in crude production has been the fact that the Angostura field in block 2c, off north east Trinidad, has not lived up to expectations. Gross recoverable reserves had originally been estimated by the operator at between 90-300 million barrels, with a mid-case range of 160 mmb. But 90 million is now generally regarded as the ultimate potential of the output from the two discoveries, named Kairi and Canteen. The fact that the find was in an unfamiliar geological horizon (the Oligocene) as well as the faulted nature of the block, have both contributed to production difficulties. Gas production has had a much shorter lifespan to date than crude oil (commercial use only began in 1953, when gas was first sold to the Trinidad and Tobago Electricity Commission's Penal station in south Trinidad for power generation), so perhaps it is not surprising that it has not yet peaked. Increasing output has been fuelled by the continuous installation of gas platforms off the east and north coasts to commercialise earlier discoveries and meet regular increases in demand.

But proven gas reserves, as opposed to gas production, have been declining and the US consultancy Ryder Scott has estimated our proven and probable reserves at over 17 trillion cubic feet (tcf) in its most recent audit, relating to year-end 2013.

In the case of both oil and gas, the key to increasing the reserve base is, of course, more exploratory drilling, not enough of which has been undertaken in the last few years.

The Ministry of Energy and Energy Affairs (MEEA), as the department of state with oversight of the country's energy sector is now named, has, under my stewardship, been speeding up block distribution rounds and encouraging companies with existing acreage to undertake exploration on their own account, with a focus on oil-prone acreage where possible. Current proven oil reserves, according to a 2007 national oil audit, also conducted by Ryder Scott, stand at 317.9 million barrels (proven) and 119.3 million barrels (probable) including condensate, which comes with gas production.



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Within an 18-day period in March 2012, two new oil discoveries were announced. One was by the UK's Bayfield Energy (since merged with Trinity Exploration and Production) in the Galeota block off the south east coast of Trinidad, which the company estimated at 32 million barrels with a bonus of 69 billion cubic feet (bn cf) of gas. Trinity has since made another discovery in Galeota with the TGAL 1 well in 2013, with estimated OOIP (original oil in place) of 50-115 million barrels.

The other was by the State oil company, Petrotrin, in the East Soldado field in its Trinmar concession in the Gulf of Paria, of about 48 million barrels. And there have been new discoveries of crude oil on land too. Seven months before the Bayfield find, Canada's Porex Resources had found a productive reservoir in the Herrera formation in the Cory Moruga block. The Snowcap 1 well flowed strongly on test, though Porex has not publicly given an estimate of the reserves' potential.

All of this activity in existing acreage has been encouraged, we feel, by the tax reliefs offered in successive national budgets. (See separate article in this publication).

Many geologists feel that a "short-term lift" in crude output is best obtained from the operated producing blocks and three of the discoveries above fall into that category. One estimate is that there is additional potential of as much as 500 million barrels of proven reserves, with an upside of 1.5 billion barrels, in these operated producing blocks, which could potentially yield an additional 10,000-15,000 b/d. This would certainly achieve a welcome turnaround from the current situation of constant decline.

Oil discoveries from exploratory activity in entirely new acreage, on the other hand, will provide the major boost for crude oil in the medium to long term that we at the Ministry desire. Petrotrin will commence exploratory drilling on land in 2014 after the interpretation of its recent 312 sq km 3D seismic.

All this relates to conventional medium and light recoverable oil but it is worth stressing that Trinidad contains an abundance of 'stranded' medium gravity

crude, which is still sitting in reservoirs awaiting retrieval as well as difficult-to-flow heavy oil and even tar sands, most of which are not even entered into the reserves, still being largely regarded as "resources." The stranded crude requires enhanced oil recovery (EOR) techniques to retrieve it, as does heavy oil, which my Ministry classifies as having an API gravity of 18 degrees or less. No attempt has yet been made to recover tar sands, which the last MEEA estimate in 2007 put at 300 million tonnes.

A sustained onslaught on the two categories of unexploited oil – stranded conventional reserves and heavy oil – would certainly provide a sustainable boost to the country's crude production, but it would be crippling expensive to mount. The facilities that would be required to support the application of EOR in retrieving the stranded conventional reserves, for example – and CO₂ injection and sequestration has been advocated in this regard by experts – would mean accessing the CO₂ from local petrochemical companies at affordable rates and then piping it to the selected oilfields on land and, eventually, into the Gulf of Paria. I have mandated the State-owned National Gas Company, NGC, to investigate the feasibility of this. Petrotrin's heavy oil would also have to be made more easily retrievable by EOR methods, of which CO₂ could be one.

As for natural gas, much of the exploratory drilling taking place will be specifically targeting gas reserves, which, if successful, will help restore the current declining proven reserves base.

Particular confidence rests in new gas discoveries in blocks off the north coast of Trinidad – NCMA 2, NCMA 3 and NCMA 4 – which showed earlier evidence of gas accumulations. The first two are operated by Niko Resources and the other by the UK's Centrica. State company Petrotrin is a minority partner in all three.

The nearby NCMA 1, operated by BG Trinidad and Tobago, is estimated to contain reserves of at least 2 tcf, which strengthens the prognosis for the other three.

It is crucially important for Trinidad and Tobago ►

Gas production, has not yet peaked and reached 4.4 billion cubic feet a day in January 2011, a remarkable achievement for a small Caribbean State with relatively modest acreage to exploit for hydrocarbons

Trinidad contains an abundance of 'stranded' medium gravity crude, which is still sitting in reservoirs awaiting retrieval, as well as heavy oil and even tar sands

*Port of Spain:
The skyline that
oil and gas built*



► to sustain its natural gas reserves base and natural gas production in order to be able to continue its internationally-acclaimed gas monetisation programme well into the second petroleum century.

By skilfully exploiting relatively modest gas reserves, the country has created what is probably the most diversified gas-commercialisation sector in the world, which today includes: 11 ammonia plants, 7 methanol plants, one urea plant, 4 iron and steel plants, 4 LNG trains (one, until recently the largest in the world) and about 4,000 vehicles using compressed natural gas (CNG). It is government policy to expand the uptake of the latter, in order to contribute to the reduction of carbon dioxide emissions and release more gasoline and diesel for export. NGC has set up a new subsidiary, NGC CNG Limited, in order to promote greater CNG usage by motorists. Trinidad and Tobago will also be using gas for export by pipeline once the proposed Eastern Caribbean gas line from Tobago to Barbados is built in a few years' time. The green light has also been given to the project known as Caribbean LNG, which involves the establishment of a 500,000-1 million

tonne complex at La Brea in south west Trinidad to export exclusively to Caribbean markets. It is a joint venture between Luxembourg's Gasfin Development SA and NGC. The export of gas in CNG form is also being examined.

Other projects will be added to these as the new petroleum century proceeds, including a second ammonia/urea/melamine (AUM) complex, a vertically integrated iron and steel complex, a melamine resin/oriented strand board/veener plant and a methanol to DME project, among others.

A significant energy development in 2014 and going forward, which could lead to the discovery of either oil or gas, is the revival of the effort to identify hydrocarbons in deep water off the continental shelf on Trinidad's east coast. An earlier effort was made in 1998-2002 but without commercial success. A second attempt was mounted in 2006 but only one bid was received out from 8 blocks and that did not progress to any satisfactory conclusion.

The present initiative includes a BP Group entity named the BP Exploration Operating Company, which has signed two production sharing contracts (PSCs) relating to blocks 23a and TTDA 14, both north east of Tobago. Deep water in Trinidad is defined by the MEEA as ranging from 1,000 metres to 3,500 metres. BHP Billiton, which seems the most enthusiastic company in relation to the deep water, has entered into PSCs for five deep water blocks, TTDA 5,6,28,29 and block 23b, the latter in conjunction with Repsol. BG International Plc (BG) has also signed a PSC for block 5(d) located off the east coast of Trinidad, with an area of approximately 684 sq km. This area lies in water depths ranging from 300 to 700 metres.

Improved incentives have now been offered for deep water exploration, including a reduction in petroleum profits tax (PPT) to 35 per cent, an 18 per cent SPT, cost recovery for companies of 80 per cent and no carried participation for State firm Petrotrin, as was most recently required in the shallow and medium water block round in 2010.

Another deep water block offering took place

in 2013, When TTDA 1,2,3,7,30 and 31, were offered. The round Closed on March 28, 2014.

Roadshows to publicise the second offering of Trinidad and Tobago deep water acreage in the space of two years, have taken place in Doha, Milan (at the American Association of Petroleum Geologists [AAPG] conference), Houston (at the North American Prospect Exhibition), Houston again, sponsored by the MEEA and the State-owned National Energy Corporation and in London, at the Trinidad and Tobago High Commission.

The 2013 land-based or onshore bid round, the first of its kind since the late 1990s, is linked to the Ministry's strategy of facilitating and encouraging exploration. The bid acreage of this round lies within the Southern Basin onshore Trinidad and offers a range of opportunities related to block sizes, production potential and hydrocarbon types. The three blocks offered are Rio Claro, St. Mary's and Ortoire blocks, covering approximately 63,715 hectares.

In fact, the signs are already very encouraging. Compared to five years ago, when only one rig was drilling for oil offshore Trinidad and Tobago, in

2014 at least eight rigs are looking for hydrocarbons in the country's waters.

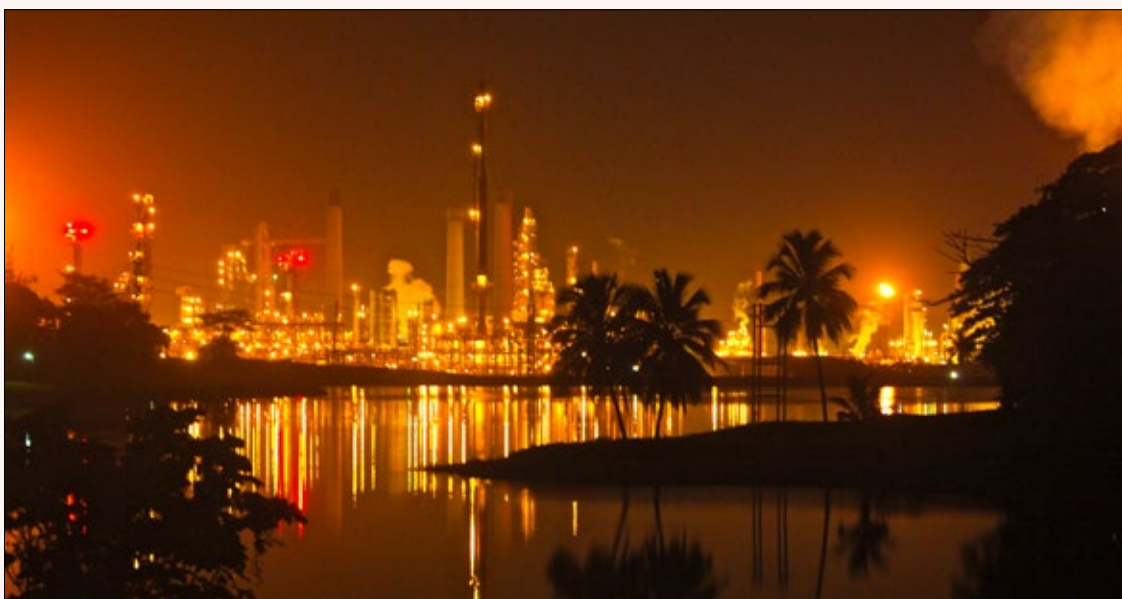
In September 2013 I signed with my Venezuelan counterpart, Rafael Ramírez, an agreement that establishes the functional and governance structure to oversee the development of the giant Loran-Manatee gas field that straddles the Trinidad and Tobago/Venezuela maritime border. This field has approximately 10 trillion cubic feet of natural gas. The signing was described as historic and as a first for the Americas. It comes 10 years after an MOU was signed by both countries to develop crossborder reserves.

The Trinidad and Tobago Government, local conglomerate Massy Group and Mitsubishi have agreed to a US \$850million methanol to di-methyl ether (DME) project which would be located on 50 hectares of land at the Union Industrial Estate in La Brea in the south western part of Trinidad.

Approximately 3,000 jobs are expected to be created at peak construction. This project is expected to start in 2015, subject to regulatory approvals.

Significant also in 2013 was NGC's acquisition ►

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Photograph: Stephen Broadbridge

The future's bright: Petrotrin's refinery at Pointe-a-Pierre

One of my principal objectives for our second century of petroleum will be moving Trinidad and Tobago capital out to international locations for investment in energy activities that have proved so successful at home

► of Total's Trinidad and Tobago exploration and production assets for US\$473 million. This is the fulfilment of the view that the NGC should be vertically integrated in the value chain, venturing into upstream activities, beyond its traditional middleman role of distributor to downstream customers. This acquisition included Total E&P Trinidad BV and Elf Exploration Trinidad BV, two of Total's subsidiaries that comprise a 30 per cent working interest in Block 2(c) and 8.5 per cent in Block 3(a), with a production capacity of approximately 15,000 barrels of oil equivalent per day and a gas volume of 220 million standard cubic feet per day.

This was the second major acquisition made by the State-owned natural gas distributor in 2013. In August, NGC paid US\$600 million for ConocoPhillips' 39 per cent share in Phoenix Park Gas Processors Ltd.

Beyond petroleum, the MEEA, under my leadership, will be making the first real effort in Trinidad and Tobago to adopt forms of renewable energy (RE). Though we are completely self-sufficient in oil and gas, and don't have the RE drivers present in other Caribbean territories, we feel it is incumbent on us to make our contribution to the amelioration of global warming and to release some of the oil and gas consumed locally for export. For its size, Trinidad and Tobago is actually a high per capita emitter of CO₂, due to our high level of industrialisation.

Trinidad and Tobago has agreed to be the site of a Regional Renewable Energy Research Centre, funded jointly by ourselves and the US Department of Energy (DOE).

One of my principal objectives for our second century of petroleum will be moving Trinidad and Tobago capital out to international locations for investment in energy activities that have proved so successful at home.

I am encouraging State-owned companies in the first instance to examine how they can invest in such west African countries as Ghana, a recent discoverer of oil and gas, which wants to emulate

what we have done in Trinidad and Tobago with our own gas resources. The same applies to Nigeria, a long-time oil and gas producer which has never monetised its mainly associated gas in any serious way; Mozambique, which also recently found hydrocarbons, Tanzania and others.

Closer to home, in Central America, we plan to exploit our relationship with Latin countries under the umbrella of the newly-formed Community of Latin American and Caribbean States (CELAC) to have state-owned firms, specifically Petrotrin, the NGC and the National Petroleum Marketing Company (NP) seriously look at investment opportunities in bunkering, retail marketing, lubrication, oil blending and LNG importing facilities in Panama and other Central American states. We are also looking at India, to which the Prime Minister of Trinidad and Tobago, the Hon Kamla Persad-Bissessar led a very well received delegation on an official visit in February, 2012. The Prime Minister, accompanied by a ministerial Party, including myself, also visited China in March 2014. Out of that came opportunities to sell TT LNG to China and Chinese assistance with our drive to substitute compressed natural gas (CNG) for gasoline and diesel in motor vehicles.

In July 2014, Trinidad and Tobago signed an MOU on energy cooperation with Haiti, that includes the sale of diesel, LPG and bunkers to CARICOM's French-speaking member state. State companies Petrotrin and National Petroleum (NP) will supply the products, with NP also planning to set up nine service stations in Haiti.

I would expect Trinidad and Tobago's private energy companies also to participate in the investment outreach overseas, as well as continuing to provide energy-related services to the new hydrocarbon-producing countries.

The MEEA is currently preparing a Gas Master Plan, which we hope will be ready by the end of the year. Its purpose is to guide the development of the all-important gas-based sector up to the year 2024. ■