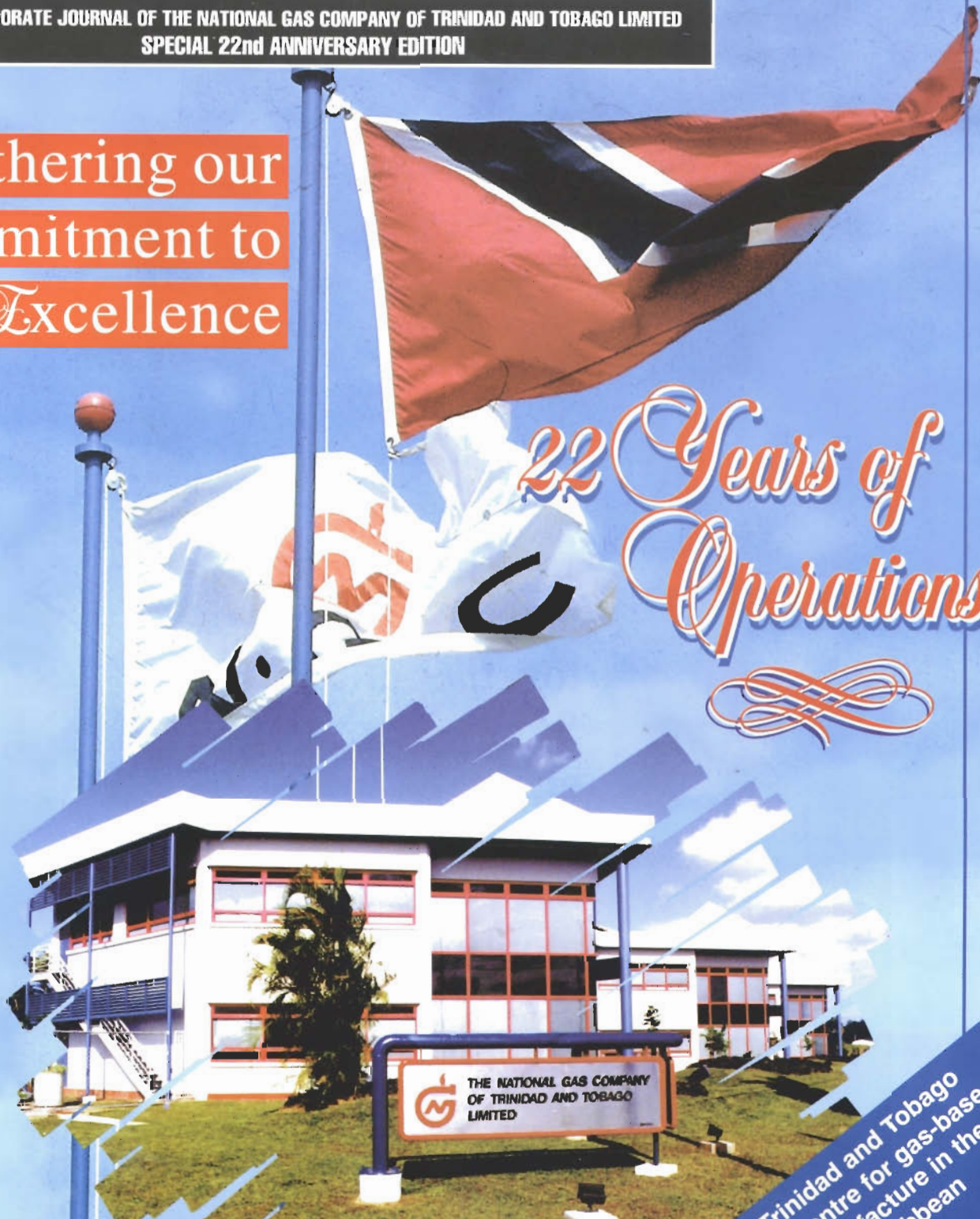


GASCO NEWS

THE CORPORATE JOURNAL OF THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO LIMITED
SPECIAL 22nd ANNIVERSARY EDITION

Furthering our
Commitment to
Excellence

22 Years of
Operations



Trinidad and Tobago
the Centre for gas-based
manufacture in the
Caribbean



The National Flag
and NGC's,
together aflutter.
Symbolic of our
energetic future.
And in celebration
of our 22 years'
continuous contribution
to the national economy.

GASCO NEWS
 .Our special 22nd Anniversary Edition –
 August 1997.

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THE PEOPLE WHO MADE NGC

BY CHRISTINE PUNNETT

According to the great philosophers, people are largely responsible for events that leave indelible marks on history. In fact, so many of the things we see around us, were seemingly insignificant when they started. Yet, the people with the imagination and foresight make things grow and happen. And so with NGC the same rings true. People made NGC what it is today.



Mr. Bernard Primus – Chairman of NGC: 1975-1981

In 1975, an outsider might have been skeptical of the prospects for the gas industry. After all, the country was at the height of its oil 'boom' and natural gas discoveries seemed more of a hindrance than an opportunity for the companies engaged in oil exploration activity. However, Amoco Trinidad Oil Company was discovering significant quantities of gas and the country was entering into a new era in petroleum development in Trinidad and Tobago.

The rest is history. The decision was taken to develop a natural gas industry predestined to play centre stage in the country's economic future. NGC's formation in 1975 was one of the key initiatives for the realization of this goal. The presence of key people from various government institutions, the professions and the University of The West Indies on the Company's first Board of Directors was an early indication that NGC – then a small unknown company – would one day mature to national significance. Amazingly, NGC opened its doors with just a mere TT \$80,000.00 advanced to it by the Government. In those days, this sum could

probably have bought a sizable home in a high income neighbourhood, but in the Petroleum Sector that was not a lot of money to start with. A distinguished group of persons formed the first Board of Directors who brought to the Company their knowledge and experience of the petroleum industry and macro-economic policy. At the Company's helm were the eminent economist and lawyer, Mr. Bernard 'Ben' V. Primus who became NGC's first Chairman and Mr. Knollys Ahloy, Gas Engineer, the Company's first Chief Executive Officer.

These two men brought different things to NGC. Mr. Primus was already Chairman of Trinidad Tesoro Petroleum Company and the Industrial Development Corporation. He was therefore experienced and knowledgeable about the role of public and private enterprise. Mr. Primus was also one of the architects of the Industrial Act of 1972. On the other hand, Mr. Ahloy, at that time the only local natural gas engineer in Trinidad, brought a practical, hands-on approach to NGC's fledgling Technical Operations (then called Field Services). Himself from T&TEC, one of Mr. Ahloy's first tasks was to recruit trained and qualified personnel to maintain the pipeline system brought under NGC's control.

In the early years from 1975 to 1981, the Board headed by Mr. Primus comprised Dr. K. S. Julien, Electrical Engineer, University Professor and Chairman of T&TEC; Eldon G. Warner, Economist and General Manager of the Industrial Development Corporation (IDC); Mr. Basharat Ali, Chemical Engineer from the Ministry of Finance; Mr. Sam A. Martin, Economist from the Ministry of Finance; and Ms. Kamla Bholai, Attorney at Law from the Ministry of Petroleum and Mines.

The accomplishments of the Primus Board were:

- a. the expansion of the natural gas

pipeline network upon which future natural gas projects would be built;

- b. the successful administration of the contract regulating the purchase of natural gas used by T&TEC for power generation;
- c. the development of the Flare Gas Conservation Project which allowed the expansion of NGC's mandate to include Offshore Operations;
- d. the creation of an employee base trained in natural gas technology.

The coming on board of Mr. George Hamel Legall in 1981 as the second NGC Chairman ushered in the start of a new era for the Company. Mr. Legall (now deceased) was the Permanent Secretary in the former Ministry of Petroleum and Mines (now the Ministry of Energy and Energy Industries) who had been appointed to lead an NGC that was growing rapidly as the realities of the industry changed.

In 1981, NGC was still a very small company and quite unknown to those outside the Energy Sector. However, in the early 1980s the Company was quietly moving from strength to strength with the widening base of ammonia and methanol consumers coming on to its distribution network. In fact, total gas sales increased from 150 mmsefd in 1978 to 366 mmsefd by 1986. Working on the achievements of the early years, the newly-instituted Board of Directors' main task was to implement the Company's transition to Offshore Operations.

Between 1981 - 1986, several new persons were brought onto NGC's Board, including: Mr. John A. Charles, Attorney at Law; Mr. Andre Alphonse, Chartered Accountant; Mr. Bob Yorke, Engineer; George Maxwell Richards, Chemical Engineer/University Lecturer. The services of Mr. Basharat Ali, Ms. Kamla Bhofai and Mr. Eldon G. Warner were retained.

Following in the tradition of the founding Board, the new Directors of NGC were drawn from Academia, Government Ministries and from the Professions.

In 1981, Mr. Knollys Alloy had left the Company and a new Chief Executive was appointed in the person of Tahir Ali Mohammed. Mr. Mohammed had worked previously on NGC's Flare Gas Conservation Project

as its Project Manager. His involvement in this very important project continued while he served in the capacity of CEO, a position he held until 1983.

In early 1984, the Company sought the services of Mr. Malcolm A. Jones, a Chemical Engineer who earlier on in his career as Project Manager with the National Energy Corporation (NEC) had been directly involved in the construction of the Tringen ammonia and Trinidad and Tobago methanol plants on the Point Lisas Industrial Estate. Mr. Jones was appointed to lead NGC and it was during his tenure from 1984-1996 that the phenomenal growth in sales of natural gas and profitability occurred.

The accomplishments of the Legall Board were:

- a. The continued expansion of the pipeline network through the establishment of the 30" diameter submarine pipeline from Cassia offshore field to Beachfield and the 30" diameter cross-country pipeline from Beachfield to Phoenix Park via Rio Claro;
- b. Restructuring of the Company to meet the demands of its offshore operations;
- c. The successful commissioning of the Flare Gas Conservation Project.

In February 1987, a new Board of Directors was constituted. During the next five years various



Mr. George Hamel Legall – Chairman of NGC: 1981–1986

THE HUMAN FACTOR



Mr. C. Anthony Beaubrun,
Chairman of NGC: 1986 – 1992

directors including three different chairmen served on the Board of NGC.

The Chairmen for the period 1987 – 1992 were: Mr. Dominic Mahabir, a Petroleum Engineer, who served from early 1987 until January 1988; Mr. Shiraz Rajab who, also a Petroleum Engineer, served for a few months until March 1988; and, lastly, Mr. C. Anthony Beaubrun, Chemical Engineer who was appointed Chairman in March 1988, remained in the position until February 1992.

Mr. Beaubrun's tenure as Chairman of NGC brought many lasting benefits to the Company's revenue and asset base. NGC's involvement in a number of engineering projects, the most important being the construction of a gas processing plant at Phoenix Park, ensured that cleaner gas reached the customers, thereby enhancing their processing capabilities.

The construction of Phoenix Park Gas Processors Limited did two things for the Company, and by extension, the country. Firstly, it provided an additional source of revenue for NGC; and secondly, the removal and export of the heavier components of the gas provided additional foreign exchange earnings for the country.

There were other achievements during this period. The decision to adopt a product related

pricing structure at a time when the ammonia and methanol plants were experiencing difficulties due to depressed world prices, gave the plants some breathing space and enhanced their ability to survive the hard times. In the 1990s, this policy resulted in overwhelming profitability for NGC. In the coming years, this policy, added to other incentives, would act as an attractive investment package to woo foreign business to the country.

The member-Directors of the Beaubrun Board were:

- Mr. Malcolm A. Jones - Managing Director and President ;
- Mr. Knollys Ahloy - Natural Gas Engineer;
- Mr. Frank Look Kin - Government Technocrat & Petroleum Engineer;
- Mr. Kenrick Haynes - Geologist;
- Mr. Phillip Hamel-Smith - Attorney at Law;
- Mr. Jadoonath Bhimull - Engineer;
- Mr. C. A. David Elder - Management Accountant;
- Mr. Vernon Gilbert - Petroleum Engineer;
- Ms. Dhana Maharaj - Attorney at Law
- Mr. Zameer Mohammed - Teacher;
- Mr. Daniel Sankar - Accountant and Workers' Representative;
- Ms. Phyllis Atherton - Accountant and Workers' Representative.



Mr. Malcolm A. Jones, Managing Director and President of NGC: 1984 – 1996

The achievements in this era were:

- a. The acquisition of a 20% shareholding in Trintomar – the first local marine gas producing company:
- b. The joint-venture agreement with Conoco Inc & Pan West Engineers for the construction of Phoenix Park Gas Processors Limited (PPGPL):
- c. The negotiation and conclusion of the 1991 Gas Sales Contract Agreement with Amoco Trinidad which signaled NGC's continuing relationship with that company as the major supplier of gas to NGC:
- d. The development of the Company's first strategic plan which projected NGC's business plan for the future:
- e. The creation of a product-related pricing formula for the establishment of gas prices which ensured NGC's future profitability.



Prof. Kenneth S. Julien
Chairman of NGC: 1992 – 1996

By early 1992, NGC was given a new mandate. Apart from its core business activity of transmitting gas to industrial consumers, NGC was "to become the prime-mover in gas-based development," meaning it would undertake activities such as: the evaluation of investment proposals; the development of gas-based projects; and the promotion of Trinidad and Tobago as a prime location for gas-based manufacture.

In spite of its growth and profitability, the Company had managed for most of its existence to remain a very low-keyed enterprise. With the institution of the new mandate, NGC was now playing a major high-profile role in revitalizing the country's gas-based industrial sector. NGC had come into its own.

During this period, Dr. Kenneth S. Julien, University Professor, had returned to NGC but this time as its Chairman. Having been a member of the founding Board of Directors all those years before, he was no stranger to the Company, or for that matter, to Point Lisas.

Dr. Julien's efforts as international energy ambassador brought new investment into the country. He brought renewed interest in methanol and ammonia production and a zeal for the acquisition of new gas supply sources. By late 1992, the quest for new investment for Trinidad and Tobago bore fruit. An investment

decision was made by the Nucor Corporation for the establishment of the world's first commercial Iron Carbide plant at Point Lisas. This early success provided the catalyst for renewed metal activity at Point Lisas and for the establishment of the country as a centre for new steel-making technologies.

Between 1992 and 1995, Trinidad and Tobago was the hub of energy investment prospects in the English-speaking Caribbean. A number of investments were made including: the establishment of the country's third methanol plant in partnership with the German conglomerate Ferrostaal AG; the investment decision by Farmland Industries Inc and Mississippi Chemical Corporation to establish the world's largest single train-ammonia plant in Trinidad; and the sourcing of new gas supply contractual arrangements with Enron Gas & Oil and British Gas/Texaco.

Of major importance to the continued monetization of the natural gas sector was NGC's facilitation of the US \$950 million dollar Liquefied Natural Gas (LNG) project to the successful completion of the Front End Engineering Design (FEED) Phase. By the end of 1995, the three-year-old negotiating process was close to an investment decision from the consortium of investors which included, along with NGC,

THE HUMAN FACTOR

Amoco Trinidad LNG, Cabot LNG, British Gas Trinidad LNG and Repsol International.

NGC was at the height of prominence in the Energy Sector. Its leadership as a corporate entity was displayed in many areas, including "leadership in integrity, whether it was in the purchase of ITCF of gas at a value of \$US1 Billion or in the award of a petty contract of \$US 1.00," to quote Dr. Julien at NGC's 1995 Employee Awards Ceremony.

The Board of Directors of the period was:

- Prof. Kenneth S. Julien - Chairman and University Professor;
- Mr. Malcolm A. Jones - President and Managing Director and Chemical Engineer;
- Mr. Kenrick Haynes - Geologist and Chief Technical Officer, Ministry of Energy;
- Ms. Sharon Christopher - Attorney at Law;
- Mr. Ramnarine Ramdass - Accountant;
- Mr. Neville Browne - Economist;
- Mr. Frank Look Kin - VP, Business; Development at NGC;
- Mr. Mc Nichols Herbert - VP, Technical Operations at NGC.

The Julien Board was able to accomplish:

- a. The consolidation of NGC's financial asset base through its participation in a number of projects upstream and downstream.
- b. The expansion of the Company's Human Resource Base by over 100%.
- c. The restructuring of NGC to incorporate its merger with NEC for the provision of project management services in keeping with its new mandate.
- d. The expansion and increased reliability of NGC's transmission system.
- e. The creation and promotion of a Community Relations Programme that greatly assisted in the enhancement of the company's investment strategy.

Since February 1996, a new Board was installed. The present Board of Directors is chaired by Mr. Steve Ferguson, a respected and

astute businessman who, as Chief Executive Officer of the Maritime Financial Group (a local insurance conglomerate.) brings a wealth of knowledge of finance matters to the industry.

Mr. Ferguson is supported by a team comprising:

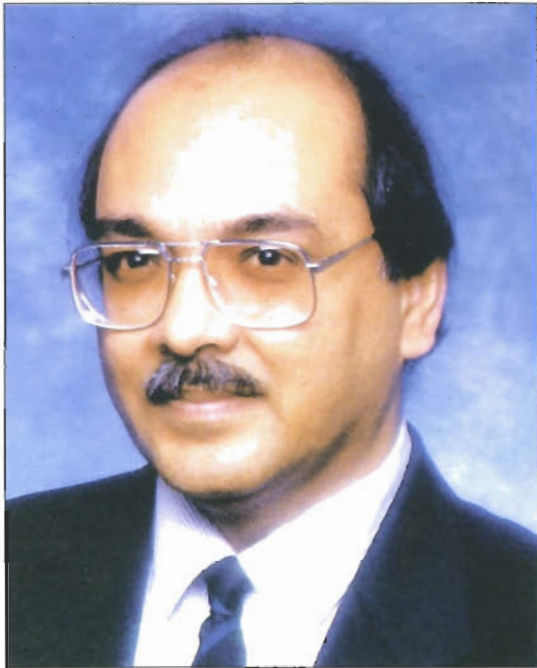
- Mr. Kenneth Birchwood - Petroleum Consultant;
- Mr. Clinton Ramberansingh - Industrialist;
- Ms. Indera Sagewan - Economist and former Parliamentarian;
- Mr. Dave Cowie - Attorney-at-Law;
- Mr. Gerry Hadeed - Businessman;
- Mr. Garvin Akeung - Banker;
- Mr. Ansar Ali - Energy Consultant;
- Mr. Errol McLeod - Trade Unionist.

Given the rapid rate of change in the natural gas industry, the present Board of Directors is aware that there are new challenges to be overcome in the years to come.

The new Board of Directors has brought to fruition several projects that were at different stages of project development. Firstly, NGC played a significant role in the final negotiations for the LNG plant which resulted in a positive investment decision in the first quarter of 1996. Negotiations were completed and positive decisions reached on two ammonia, two methanol and one Direct Reduced Iron (DRI) projects. Negotiations were also carried out with Caribbean Ispat on a gas sales contract with respect to a "Super MegaMod" DRI plant.

So far, the Ferguson Board has achieved:

- a. The successful re-negotiation with Amoco Trinidad Oil Company of the gas supply agreement. The revised terms include: the extension in the terms of the 1991 contract from the year 2011 to 2019; increase in the Daily Contract Quantity (DCQ) from 350 MMscfd to a ceiling volume of 700 MMscfd after May 1, 1998; and, an improved gas pricing structure particularly with respect to quantities in excess of the existing DCQ of 350 MMscfd;
- b. The negotiation of a new pipeline agreement which ensures that NGC will be able to keep step with the increased demand for gas in the future;
- c. A new five-year strategic plan for NGC.



Mr. Steve Ferguson,
Chairman of NGC : 1996 – Present



Mr. Frank Look Kin,
President of NGC : 1996 – Present

In May 1996, Mr. Frank Look Kin, formerly Vice President, Business Development was appointed NGC's new President. Mr. Look Kin, a former Chief Technical Officer from the Ministry of Energy and Energy Industries, had served on the Board of NGC since 1986. No stranger to the Company or to the industry, Mr. Look Kin brings a sense of continuity and envisions his role as managing the Company's continued growth in the years to come. In fact, Mr. Look Kin sees his main task as pursuing the target of one where NGC would be transmitting 1 BCF of natural gas by the year 2000 – a growth of 13% per annum.

It took 21 years to develop a natural gas industry in a country very dependent on the oil industry which had been the mainstay of the country's economic development for the last 100 years. With no new major oil finds in the offing, it took just two decades for the natural gas sector to come into its own and become the engine for future economic growth in the 21st Century. In 1996, Trinidad's natural gas industry was developed to the point that it could stand on its

own in the international arena where, in terms of per capita usage of natural gas, Trinidad ranked second in the world.

Today, NGC has assets of over \$2 billion dollars and is at the centre of the country's continued natural gas development. How far it has come since the early days. Recent strategic planning exercises indicate that NGC will continue to seek to maximize value from natural gas for the benefit of the country. The Company also recognizes the vital role people will continue to play in its development in the coming years and more especially at the turn of the century. The fact that the natural gas business is more difficult and complex now than it was 21 years ago, calls for more humanity and imaginative input which only people can bring. The NGC of the future will not only need financial engineering for its continued success but also people with the wisdom and foresight to make NGC continue to progress for the national interest. Hopefully, we can recognize that there are things we can learn from the past.

A Progression through the years

BY MICHAEL A. CUMBERBATCH



The former Minister of Petroleum and Mines – Mr. Errol Mahabir formally opened the doors of NGC in 1975

Beginnings (1975-1981)

The National Gas Company of Trinidad and Tobago Limited (NGC) was formed in August 1975 as a paper company. One of its early tasks was to administer a gas contract between the Government of Trinidad and Tobago (GOTT) and the AMOCO Trinidad Oil Company (ATOC). The Honourable Minister of Petroleum and Mines, Mr. Errol Mahabir, when speaking at the formal opening six (6) months later, pointed out that, upon discovery of natural gas off the east coast of Trinidad, the Government had decided that maximum economic benefits to the country would be obtained by preserving the following priorities for gas utilization:

- (a) Electricity generation for obtaining low cost energy

for both domestic and industrial users;

- (b) Gas for refinery, fertilizer, petrochemical and small industries;
- (c) Fuel for heavy gas consuming industries; and,
- (d) Other users including Liquefied Natural Gas.

This decision positioned NGC to get into the gas business of the petroleum sector just as the new 'wave' of industrialization was taking shape in the country. This has permitted the nationals of Trinidad and Tobago, through its state-owned company NGC, to be actively involved in the development of its natural gas resources, even as its oil production was declining.

The early structure was rather like the tender shoot and

leaves of a germinating seed. The Chief Executive Officer and his secretary were the hub of activities. These activities were mainly chart collection, volume computation, billing and payments. They were carried out in a family atmosphere in a converted dwelling house on Pembroke Street, Port of Spain. (*The CEO was also chief cook at the regular Friday after-work "cook-up".*)

In this period, the organisation structure kept expanding to match the assignments given to the Company by the shareholder and the "budding" industry's increasing gas demand.

By 1978, all land gas pipelines held by the Trinidad and Tobago Electricity Commission (T&TEC) were vested in NGC. The pipeline maintenance crew was inherited from T&TEC and was sta-

tioned in La Romaine. This crew integrated well with the existing NGC staff.

In 1980, the structure to carry the increasing load had now branched out to incorporate separate legal, commercial and technical services. The Commercial Manager's responsibility included accounting and personnel relations matters. The Technical Services unit was responsible for the pipeline maintenance and had begun its own design of pipelines. The Legal Services unit was necessary to cope with the increasing gas purchase and supply contracts which the company was undertaking. Rights-of-Way for the expanding pipeline network also had to be acquired.

The responsibility given to the company in 1980 to build, install and operate two (2) gas



Teak Platform is located off the south-east coast of Trinidad

compression platforms for the Flare Gas Conservation Project began to have a dramatic impact on the organisation structure in late 1981. During that same year some offices were relocated to an office building at Murray Street, Port of Spain, in order to house the increasing number of staff.

Solid Branches, Early Flowers (1982-1990)

The Flare Gas Conservation Project was designed to capture low pressure associated gas in ATOC's Teak and Poti

fields. Before the introduction of NGC platforms, most of the gas produced with oil was flared. Compression was required to raise the pressure from 20 psig to 1000 psig, prior to its introduction into the 24-inch diameter pipeline emanating from ATOC's offshore fields.

The platforms were built in Louisiana, USA and shipped to the east coast of Trinidad for installation. 'Overnight' they were there and so were the relatively large numbers of people needed to operate and maintain them. The range of

activities of the Company changed considerably. The Company's platforms became an additional source of its gas supply, with an initial average rate of 60 million standard cubic feet per day (MMscfd). Helicopter and boat services were required to provide supplies and move personnel to and from the platforms. It became necessary to hire a catering contractor to serve the needs of the men who lived on the platforms. Warehousing facilities had to be set up at Pembroke Street to house spares for the sophisticated equipment offshore.

Continued growth required more office space and a further move was made to larger offices at Frederick Street, Port of Spain in 1983. The expansion pressured the Commercial Services to be split into a Human Resources division and a Financial and Accounting division. The Human Resources Manager was responsible for Safety, Manpower Planning and Development, Information Resources and Employee Relations. The Finance Manager directed the Financial Accounting and Management Accounting

ORGANIZATIONAL DEVELOPMENT

NGC's Heliport at Camden Field was constructed in 1988



departments. The Technical Services division had grown to the point where it necessitated a separation into two (2) departments - Operations and Maintenance. The Operations Manager got reports from the Superintendents for Offshore Operations, Land Operations, and Materials Management. The Engineering and Maintenance Manager was accountable for the performance of the Superintendents for Engineering and Maintenance. Supervisors reported to the Superintendents. Typically the supervisors were responsible for the performance of technicians of varied skill levels. Internal Audit division was established to review the company's internal control processes and a Corporate Planning division was established to develop business strategy.

An interesting feature post-

1986 was the appointment of a worker nominated representative to the Board of Directors.

At the close of the decade, the Company had deepened its activities in gas development. It joined in strategic partnerships, firstly with Conoco and Pan West, two USA companies, in the formation of Phoenix Park Gas Processors Limited (PPGPL); and, secondly with Trintoepec and Trintoe, two local companies, to form Trintomar. PPGPL was established to extract liquids from the gas before sale to customers. Trintomar was a natural gas production company which sought to provide an additional source of gas. NGC also entered into partnership with GOTT to form the National Helicopter Services Limited. This new company began to provide helicopter services for the offshore petroleum industry.

The tree was making its presence known - flowers were making it stand out from the background. It was doing these things from its modern corporate headquarters in Point Lisas, the move from Port of Spain having been made in 1990.

The family atmosphere of the early years was quickly disappearing amidst the Company's rapid growth. Breaking bread together was now reserved for the Annual Awards Ceremony and Christmas Functions held in very formal circumstances.

First Fruits (1991-1995)

The new mandate given to the Company at the beginning of this period to be 'the prime mover in the gas based industry' in the country heralded its emergence into the international gas industry arena. To more adequately perform this function, NGC was merged

with the National Energy Corporation (NEC). NEC brought with it, business development experience and expertise, a port and other marine assets.

The Company was again restructured to match its new mandate. The President and Managing Director now had as his team, four (4) Vice Presidents, directing the functions of Corporate Services, Financial Services, Technical Operations and Business Development groups, together with the Manager, Human Resources and the Manager, Internal Audit.

The Business Development Group incorporated the previous Corporate Planning function and was structured to consist of Project Planning and Development, Infrastructure Planning and Development divisions, Strategic Planning and

Marketing Department and the LNG Project Coordinator.

It is interesting to note that two of the Vice Presidents were executive board members and the Vice President, Corporate Services was Secretary to the Board of directors from 1992 to 1995. The practice of a worker nominated board member was discontinued in 1991.

The restructured Company was able to facilitate new shifts in the gas industry. Additional sources of gas were opened up. Enron was rapidly introduced as a producer of gas from the South-East Coast Consortium (SECC), when Trintomar's wells in the Pelican field could not deliver contracted quantities. British Gas/Texaco was also contracted to supply gas from their Dolphin field. This has meant not only increased competitiveness in gas supply but improved reliability of supply for the long term demands. On the sales end, NGC was able to woo investors to the country to site their gas demand plants. The end result has been the siting of the first commercial producer of iron carbide in the world at Point Lisas, new

ammonia and methanol plants and, of course, the fastest development worldwide of an LNG project. This latter project will be the first LNG plant to be built in the Western hemisphere in twenty-five years.

An Organization Development Team was appointed in 1993 to assist in maintaining healthy relationships in the dynamic and challenging environment and to help groups initiate and manage change.

Maintaining a family atmosphere in this widespread and increasingly diverse company had now become quite challenging. Annual Award functions, Christmas Dinners, Family Day gatherings, activities of the Sport and Cultural Club and national celebrations began to take on greater significance. The pipeline men's Christmas "wild meat" and "fish broth" party continued to be a favourite gathering for a sense of community.

1996 and Beyond (A Forest?)

Early in 1996, a new Board of Directors was appointed and

the Company restructured to reflect the new direction of the Board.

The Corporate Services Group was reconstituted to include the Safety, Environment and Security Department and the Transportation Services Department. Legal Services became a stand-alone division with the Manager serving as the Company Secretary. A Corporate Communications division was also established which included Public Relations and Community Relations Departments. The Human Resources Division was made responsible for Manpower Planning, Training, Organization Development and Employee Relations.

The evolution of NGC's organization structure has been to divide strategic responsibilities along classic functional lines. The essentially single line of business of buying, transmitting and selling gas, has virtually precluded any other option. The fundamental weakness of a purely functional organisation is its tendency to be myopic when it comes to promoting entrepreneurial creativity, adapting quickly to major customer-market-technological changes,

and pursuing opportunities that go beyond the conventional boundaries of the industry.

However the Company has been successful so far in meeting its challenges utilising the classic organisation structure and it has grown from the paper company of 1975 to a two (2) billion dollar company.

The opportunity is available for NGC to sow seeds in the fields of deeper vertical integration and/or diversification. Present trends suggest that organisations which are smaller, smarter, sharper, and more flexible, can align the energies of their employees more effectively not only to survive but to adapt to current realities, remain healthy and out-perform the competition. One of the options available to bring this about is the creation of strategic business units that contain all the different activities that belong to the same business; and the decentralisation of authority over the unit to the business-level manager. Whatever choice is made, it can be anticipated there will be a metamorphosis of the organisation.

Who knows, it might yet come full circle to small teams as those that engendered the family atmosphere at the beginning.

NGC's Abyssinia Regulator Station was upgraded in 1994



Corporate Profile

BY CHRISTINE PUNNETT

The National Gas Company of Trinidad and Tobago Limited (NGC) is a natural gas company which was established by the Government of the Republic of Trinidad and Tobago in August 1975. The Company has been engaged in the purchase, transportation and sale of natural gas to consumers located mainly on the Point Lisas Industrial Estate and along the East-West Corridor in Trinidad. In 1982, NGC's scope of business

activities was expanded to include the compression of low-pressure associated natural gas from its offshore platforms located in the Teak and Poui fields off the south-east coast of Trinidad. Of the 680 MMscfd of gas sold by NGC in 1996, approximately 106 MMscfd originated from the compression platforms.

Since 1992, NGC's business activities have grown to include a broad range of interests consistent with the specific long-term goal of optimising the use of the country's natural gas resources. This goal necessitated the acquisition of the assets of the

National Energy Corporation (NEC), which included the Pt. Lisas Harbour and specialised pier facilities

In keeping with the Government's mandate to be "the prime mover in gas-based development," NGC is also involved in proactive investment promotion of the country as an ideal location for gas-based investment. NGC is the main conduit through which all projects related to the utilization of natural gas are channelled.

In addition to its transmission and distribution activities, NGC holds a 20% sharehold-

Field Measurement Technicians conduct a calibration exercise to verify the accuracy of readings, which record volume of natural gas utilized.



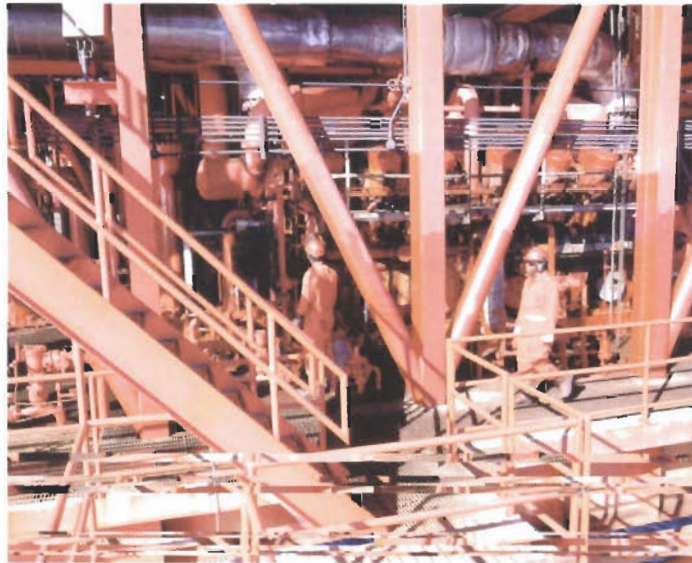
ing in Trintomar, a locally owned marine gas producing company. NGC has a 49% joint-partnership with Conoco Inc. and Pan West Engineers & Constructors of Phoenix Park Gas Processors Limited (PPGPL). This facility, established in 1991, was designed to remove the natural gas liquids from the country's natural gas stream. NGC also holds an 18% equity interest in National Helicopter Services Limited (NHSL) which provides helicopter transportation services for the offshore Petroleum Industry.

With increasing demand for industrial site space, NGC has been developing a new industrial estate at Brighton/La Brea in south Trinidad. In 1997, NGC held 83% of the issued equity capital in Labideo, the company formed to develop the site.

Through its subsidiary, NGC Trinidad and Tobago LNG Limited, NGC has a 10% share in Atlantic LNG Company of Trinidad and Tobago along with Amoco Trinidad LNG, British Gas Trinidad LNG Limited, Repsol International Finance BV and Cabot Trinidad LNG. The consortium will own and operate the 450 MMscfd Liquefied Natural Gas (LNG) plant when it comes on stream in 1999.

NGC's total assets amounted to \$2,196 million in 1996 compared with \$928 million in 1992. In 1996, the Company grossed \$2,107 million in sales and achieved an after-tax profit of \$373 million. Today, NGC ranks second in the top five energy companies operating in Trinidad and Tobago in terms

of revenue generated. With a workforce of over 400 persons, committed to excellence and the financial success of the Company, the achievement of its corporate mission to maximize value from the development of the natural gas industry for the benefit of Trinidad and Tobago is indeed assured.



Offshore Technicians at work on compressors



Engineering Drawings are prepared with the aid of Autocad

NATURAL GAS IN TRINIDAD AND TOBAGO

an historical perspective

BY PATRICK VINCENT



Aerial View - Power Generation plant at Point Lisas.

In The Beginning

Trinidad and Tobago has a long history of oil and gas production. The first oil well was drilled by the Merrimac Company in 1857 in the vicinity of the Pitch Lake. This first well was unsuccessful but this did not discourage others from exploring. In 1865, Walter Darwent founded the Paria Oil Company and, in 1866, the company found success in its oil well drilled on the Aripero estate. While other successes followed shortly thereafter, it

was not until 1908 that oil was commercially produced in Trinidad. As expected, this production came from fields near the Pitch Lake; thus began the petroleum industry in Trinidad and Tobago.

Then Came The Utilization Of Natural Gas

The utilization of natural gas for industrial purposes began some 45 years after the start of commercial oil production. In 1953, the new

Penal electrical power station was commissioned utilising natural gas for power generation. Later, in 1963 a 16 inch (400mm) diameter pipeline was laid from the Clarke Road Valve Station, Penal, to the electrical power station in Port of Spain in the north, where the generating plant had been modified to use natural gas as fuel.

In 1959, Federation Chemicals Ltd, pioneered the use of natural gas as a chemical feedstock in the manufacture of ammonia in Trinidad. The

plant which still exists at Savonetta, was supplied with natural gas produced from Shell Trinidad Limited's gas-condensate field in Penal.

The period 1961 to 1968 saw considerable oil exploration activity off the East Coast of Trinidad. This activity resulted in significant oil and gas discoveries which culminated with commercial production in 1972. Exploration drilling off the North Coast of Trinidad in 1971 also led to the discovery of natural gas reservoirs.

The Dream

The Point Lisas Industrial Port Development Corporation Limited (PIIPDECO) was registered in September 1966. The Corporation evolved from the dreams of the then South Trinidad Chamber of Commerce, which initially wanted a deep-water harbour in San Fernando. However, in view of the fact that the South had great industrial potential because of the oil industry, the government was offering incentives to investors and promoting low-cost fuel in the form of natural gas. The Chamber recognized that investors would have needed



Aerial View of Point Lisas in 1993

an industrial estate supported by an industrial port. This led to the creation of the Point Lisas Industrial Estate and Port Point Lisas.

The Development Of Natural Gas-Based Industry

In January 1975, the Government, having recognised the importance of the natural gas resources to the economy of the country, took the lead in the development of the gas-based industry. The Government held a conference titled the "Best Uses of Our Petroleum Resources." At that conference, various uses of gas were identified, including: (a) the metal industries (steel and aluminium); (b) generation of electricity; (c) nitrogenous fertilizers; (d) fuel source for refinery and petro-

chemical processes; (e) fuel source for food processing; (f) fuel source for pyro-process industries (cement, glass); (g) LNG for export; (h) secondary oil production via gas injection. The recommendations from this conference served as both a guide and an influence on the direction taken in the development of the natural gas-based industry.

Also in 1975, The National Gas Company of Trinidad and Tobago Limited (NGC) was established as the agency with sole responsibility for the sale and distribution of natural gas throughout the country. Thus began 21 years of operation of a company which today plays the significant role in the development of the natural gas industry.

NGC's sister company, The National Energy Corporation

(NEC) was formed in 1979 with the primary objective to develop and promote the country's hydrocarbon resources. NEC was merged with NGC in 1992.

Pipeline Development

Government's determination to develop the gas-based industry required that the necessary infrastructure be provided. In 1977-78, a major 24" diameter gas transmission pipeline with a capacity of 400 million cubic feet per day (MMscfd) was laid from Amoco's offshore producing fields to facilitate a supply of gas to the Pt. Lisas Estate.

A second major pipeline system 30" in diameter starting from Cassia offshore field with an installed capacity of

600 MMscfd was constructed in 1982-83.

Field Development

Amoco's Teak and Poui oil and gas fields were developed during the years 1970 to 1980. First gas for electrical power generation from Amoco's fields came ashore in 1974 via Amoco's subsea pipeline system. Development of Amoco's Cassia field began in 1982 with first gas to shore in 1983 along the newly installed 30 inch diameter pipeline.

The initial endeavour into the production of natural gas by the state occurred in 1989/90 with the development of the Pelican field by Trinidad and Tobago Marine Limited (Trintomar). NGC has a 20% equity investment in this venture.

HISTORICAL DEVELOPMENT

In 1993, Enron Gas and Oil Trinidad Limited (Enron) was assigned the remainder of the South East Coast Consortium Block (S.E.C.C.) excluding the Pelican field, and this company has successfully developed the Kesskidee and Ibis fields.

In 1996, British Gas/Texaco commenced the development of the Dolphin gas field, the most easterly field to be developed to date.

Gas Conservation

Noting that natural gas is a non-renewable resource, the Government, in 1981,

embarked on a conservation programme that led to the capture of gas that was being flared by Amoco. This gas was produced in association with oil. NGC was charged with the responsibility of capturing, compressing and making the gas available for use. The two compression platforms are owned and operated by NGC and are adjacent to Amoco production platforms in the Teak and Poui fields. The platforms were installed in 1981.

Natural Gas Market Development

Table 1 details the year in

which the major gas-based plants began operations; the company which owned and operated the plant; the product manufactured and the capacity of the plant.

Natural gas utilization by gas-based industries in 1978 averaged 148 MMscfd. By 1996 consumption had risen to 680 MMscfd, an increase of 8.5% per year. This exceptional growth rate over the 21 years of existence augurs well for Trinidad and Tobago becoming a major player in the global natural gas business.

Table 1 Gas-Based Plants Operating in Trinidad and Tobago

Year	Company	Product	Plant Capacity
1953	T&TEC, Penal	Electricity	236 MW
1959	Federation Chemicals Ltd. (FEDCHEM). Sold to Hydro Agri (Trinidad) Ltd. in 1991	Ammonia	750 MT/d
1963	T & TEC, Port of Spain	Electricity	308 MW
1974	Trinidad Nitrogen Co. Ltd. (TRINGEN I)	Ammonia	1,000 MT/d
1977	T&TEC, Point Lisas	Electricity	634 MW
1980	Iron and Steel Co. of Trinidad and Tobago Ltd. (ISCOTT). Leased to Caribbean ISPAT in 1991 and sold to ISPAT in 1995.	DRI, Billets	2,300 MT/d
1981	Fertilizers of Trinidad and Tobago Ltd. (FERTRIN). Sold to Arcadian Ammonia Trinidad Ltd. in 1992	Ammonia	2,088 MT/d
1984	Trinidad and Tobago Methanol Co. (TTMC I)	Methanol	1,380 MT/d
1984	Trinidad and Tobago Urea Co. Sold to Arcadian Urea Trinidad Ltd. in 1992	Urea	1,620 MT/d
1988	Trinidad Nitrogen Co. Ltd. (TRINGEN II)	Ammonia	1,100 MT/d
1991	Phoenix Park Gas Processors Ltd.	Propane, Butane, Natural Gasolene	12,000 b/d
1993	Caribbean Methanol Co. Ltd.	Methanol	1,500 MT/d
1994	Nucor Iron Carbide	Reduced Iron	880 MT/d
1996	Arcadian Ammonia Trinidad Ltd. (O3 Plant) Sold to Potash Corp. of Saskatchewan (PCS) in 1997	Ammonia	635 MT/d
1996	Trinidad and Tobago Methanol Co. (TTMC II)	Methanol	1,500 MT/d



THE DEVELOPMENT OF NGC'S PIPELINE INFRASTRUCTURE

BY Mc NICHOLS HERBERT

Owing to the shift in availability of natural gas from the west coast to east coast, the Government of Trinidad and Tobago, through the Ministry of Petroleum and Mines, undertook in 1976 to lay a 37km long 610mm diameter pipeline from Beachfield to Picton. During the same year NGC began construction of 8km of 508mm diameter pipeline "Spurline" from the main 406mm T&TEC pipeline at Phoenix Park, through the industrial estate in Point

Lisas, with its terminal point at the T&TEC Power Station. Both pipelines were completed in 1977, at which time use of Texaco's 305mm cross country pipeline was discontinued. Gas was supplied to the Tringen I Plant off the Spurline in June 1977.

In October 1977, the Natural Gas Contract between Trinidad Tesoro (Tesoro) and Trinidad Cement Limited expired. NGC negotiated a contract with Trinidad Cement Limited; purchased the 8km of 152mm diameter pipeline

from Trinidad Tesoro and therefore continued the supply.

6.5km of 305mm pipeline was also constructed to link Trintoc's Station 6 with T & TEC's Penal Power Station to supply high pressure gas for their gas turbine electricity generators.

During this period the operation and maintenance of the fourteen (14) year old, 70km T&TEC 406mm diameter Penal to POS pipeline together with all their other pipelines were turned over to NGC.

The main pipeline had been constructed in 1963 after T&TEC negotiated a contract with Shell Trinidad Limited for a supply of gas to replace fuel oil in their steam generators at Port of Spain.

In the years 1978 to 1980, in order to become self sufficient, to improve the reliability of the gas supply and in anticipation of the increase in gas demand in the Point Lisas estate, NGC constructed 39km of 610mm diameter submarine line from Amoco's Teak 'B' platform to Pt.

HISTORICAL DEVELOPMENT



Upgrade works at Phoenix Park Valve Station in 1994.

Galeota via Amoco's Poui 'A' platform. NGC also installed 21km of 508mm diameter between Picton and Phoenix Park and 6.5km of 610mm diameter pipeline from Galeota to Beachfield. The offshore pipeline was project-managed by Amoco while the other pipelines were designed in-house and also project-managed in-house.

In 1981, NGC constructed 32km of 152mm diameter pipeline from Trintoc's Mahaica Gas Field to link up with T&TEC's 406mm diameter pipeline in the vicinity of the Caroni River and the Uriah Butler Highway. This pipeline serves as a trunk line from which distribution lines will be connected to supply small industrial consumers along the east-west corridor; particularly in the O'Meara and Macoya Industrial Estates.

The Flare Gas Conservation

project was also initiated in that year. Two (2) Gas Compressor Platforms were installed off the south east coast in Amoco's Teak and Poui fields for recovery of gas that was being flared. A three (3) kilometer flexible pipeline 203mm in diameter was laid between NGC's Teak Platform and Amoco's Teak 'B' platform for transmission of compressed gas into NGC's 610mm diameter pipeline. A flexible pipeline was installed because of the lower overall cost in installing this pipeline compared with the conventional rigid steel pipeline.

In 1982, the continued depletion of reserves in Amoco's

Teak and Poui fields led to the development of the Cassia field. This, coupled with the increasing demand for gas on the west coast, necessitated the construction of 67km of 762mm diameter submarine

pipeline from Amoco's Cassia platform to Beachfield and 56km of 762mm pipeline from Beachfield to Phoenix Park via Rio Claro. A different route was chosen for the new offshore and onshore lines so that the security of the entire pipeline system could be enhanced. The offshore pipeline was project managed inhouse while the onshore pipeline was project managed by Natural Gas Pipeline Co of America. Owing to the hilly terrain and poor ground conditions during the rainy seasons the pipeline took two (2) years to be constructed.

The offshore pipeline from Cassia terminates with a 2,100 barrels slug catcher to take care of any hydrocarbons (condensate) condensed in the pipeline. Included as part of the pipeline is a Pressure Regulating Station and a line break valve onshore. The entire onshore pipeline was



Construction work on the 30" ϕ cross country pipeline in 1983.



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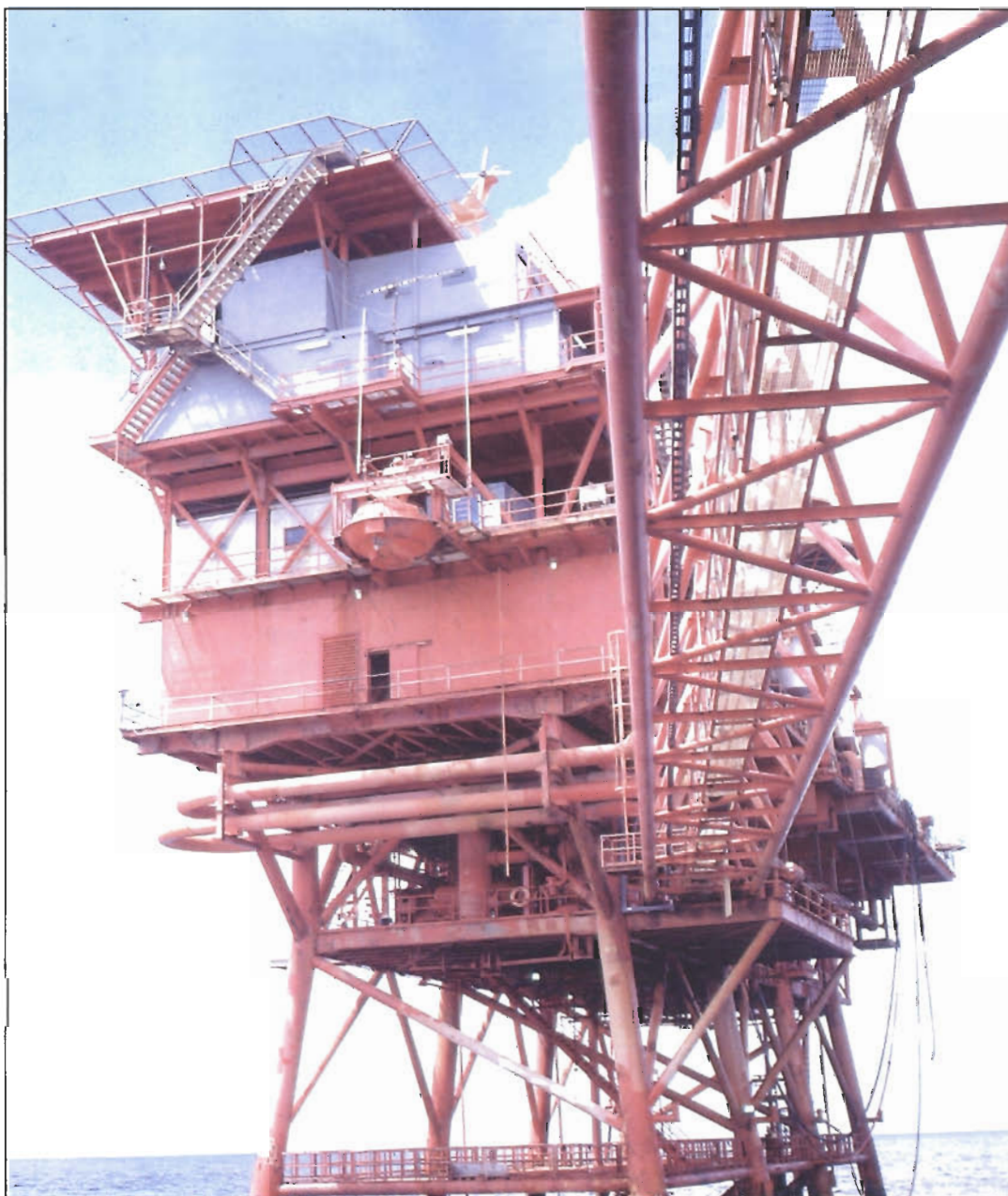
In 1994, in anticipation of increased natural gas usage on the Pt. Lisas Estate and out of a concern for security of supply to our customers, NGC constructed a 6km 508mm /762mm diameter pipeline loop with the 16" "T&TEC" line in the Phoenix Park area. This new pipeline augmented the capacity in Pt. Lisas and also enhanced pipeline reliability. The Beachfield to Phoenix Park line was also designed with 3 automatic line-break valves, installed to enhance the safety of the pipeline system. To meet the additional demands for natural gas on the island for petro-chemical development and Liquefied Natural Gas to the year 2000, the NGC will be

expanding its pipeline system.

In 1996, NGC signed an agreement with Amoco to purchase 450 MMscfd of capacity from Amoco's 1016 mm diameter offshore pipeline which originates from its Mahogany field. Also, NGC has purchased 150 MMscfd of capacity from the 914 mm diameter pipeline to Atlantic LNG from Beachfield to Picton Valve Station. This on-shore arrangement will remain in effect until 1999 when NGC will construct its own 914 mm diameter pipeline between Beachfield and the Point Lisas Industrial Estate. At that time the capacity of the entire transmission system will be 1.5 billion cubic feet per day (1,500 MMscfd).

Flare Gas Conservation by NGC

BY Mc NICHOLS HERBERT



In the 1970s, Amoco began to produce crude oil in the Poui and Teak fields off the south-east coast of Trinidad. The Poui field is approximately ten (10) miles east-south-east of Galeota Point while the Teak field is approximately twenty five (25) miles east-north-east of Galeota Point. The production of crude oil is always accompanied by the production of associated natural gas. The majority of this associated gas was being flared as the Exploration and Production Licence granted by the Government to the producer did not stipulate that all produced gas must be utilized or conserved.

In early 1979 with a view to gas conservation, NGC requested a consultant—Natural Gas Trinidad and Tobago Engineering Company to determine the feasibility of conserving gas by compressing the low pressure associated gas to the offshore pipeline pressure. The results of the preliminary study indicated that two (2) “six-pile” compressor platforms with three (3) compressors on each platform needed to be installed in the offshore fields and that the

project was technically feasible.

In August 1979, having determined that the project was also economically feasible, NGC through its tendering process, contracted the services of an engineering consultant – Lawrence Allison & Associates – to design the required facilities, and to Project Manage the fabrication, construction and installation of the platforms and related facilities.

The design calculations carried out by Lawrence Allison & Associates called for the construction of two (2) eight inch in diameter pile “steel template” jacket structures in 190 feet of water and within 250 feet of the Amoco production platforms, on which were to be installed a cellar deck, a main deck, an upper deck, a utility deck, a two-storey living quarters and a helideck. Required to compress the associated natural gas were four (4) reciprocating compressors on the Teak platform and five (5) similar compressors on the Pouli platform. In order to capitalize on standardization both platforms were to be designed for five (5) compressors and to withstand instantaneous winds (gusts) of 120 miles per hour.

The gas which was being flared was projected to last approximately ten (10) years on a declining basis and was at the time sufficient to support compression capacity of 60 MMscfd on the Pouli platform and 48 MMscfd on the Teak platform.

The eight (8) piles needed were to be 42 inches in diameter made of 1.5 inch thick steel requiring a penetration into the sea bed of 210 feet.

The platforms were to be designed with sacrificial zinc anodes to protect the steel structures from corrosion for a minimum platform life of fifteen (15) years. A bridge, containing a walkway, to interconnect the Amoco and NGC platforms was part of the design.

To support the compression process on each platform, one diesel and two natural gas driven generators, two diesel driven fire water pumps, one crane, a potable water maker, instrumentation systems, gas and fire detection systems, escape capsules and communication equipment were installed.

Based on reservoir studies in the Teak and Pouli fields it was

established that the production of associated gas could sustain over a period of ten (10) years, platforms compressing 60 million cubic feet per day (MMscfd) and 48 MMscfd of gas in the Pouli and Teak fields respectively.

The preliminary designs and costings proved up the feasibility, and approval for the continuation of the project was given. While the consultant Lawrence Allison & Associates was completing the detailed design, the main equipment including the compressors were ordered: Ingersoll-Rand model B412 KVSR reciprocating natural gas-driven integral compressors were chosen for the service. Each machine delivering 2600 brake horse power (bhp)

View of bridge/walkway connecting NGC's platform with Amoco's gas producing platform.



HISTORICAL DEVELOPMENT



Jacket for platforms being off-loaded by barge - south-east coast of Trinidad.

was designed to compress the inlet gas from approximately 20 psig to 1000 psig, a compression ratio of approximately 30:1. The design was for compression to be carried out in three (3) stages with the compressors furnished with controls which could trim the machine capacities individually or collectively. Owing to the uncertainty of gas quality and fluctuating pressures of Amoco's associated gas, the more rugged low speed reciprocating machines were chosen above the high speed centrifugal compressors.

Work began immediately as the compressor package with design, manufacture, and testing taking place in Houston, Texas, and Painted Post, New York. Work also began on the detailed design of the structure. At this time an NGC Project Manager was hired and NGC's engineering personnel became involved in the project. The fabrication of the jacket and the packaging of the compressors were carried out in Louisiana, USA. The completed structures compressor packages and ancillary modules were transported by

barges to the Teak and Poui fields.

While the jackets were being fabricated and work was proceeding at a pace on the compressor package, an Installation Contractor was hired by NGC to carry out the installation of the jacket onto the seabed and the compressor modules onto the installed jacket.

In 1981, after a 2,400 mile journey from Louisiana, the fleet of tugs and barges were positioned in the Poui field. The Poui jacket was allowed to slide off the barge which was positioned with precision to allow the jacket to be launched within 250 feet of Amoco's Poui A platform which was in operation at the time. Air was allowed out of the jacket causing it to sink slowly to the seabed in a vertical position and in the correct configuration. Hollow 42 inch diameter steel piles were then driven through the leg 210 feet into the seabed in order to stabilize the structure.

The eight (8) leg deck was then lifted in two pieces and

welded in place onto the jacket. Subsequently the bridge, the vent boom, the utility module containing the generators and air compressors, the living quarters with helideck attached and five (5) compressor modules were set in place. A similar installation took place in the Teak field.

In the meantime, a Superintendent - Offshore Operations, Supervisors and Technicians were hired for the commissioning, operation and maintenance of the platforms. A group of technicians were trained at Ingersoll Rand's training facility in Painted Post, New York. The next phase of installation was for the 'hook-up' works where all utilities and safety systems were connected to the central control room and to the individual control panels. The new offshore employees were involved in the 'hook-up' works in preparedness for the platform operations.

In March 1982, the Poui platform was commissioned as some of the installation works were not completed in Louisiana. The Teak platform was commissioned three (3) months later. The initial production from the Poui Platform averaged 33 MMscfd while production from the Teak platform averaged 27 MMscfd. While the combined volume currently being conserved stands at 115 MMscfd. However in 1986, contrary to projections in 1979, in excess of 50 MMscfd of associated gas was still being flared in the Teak field. NGC considered the usability of the extra space on the Teak platform and considered the installation of a fifth IR compressor to capture another 12 MMscfd of gas. The Company also considered

the feasibility of installing centrifugal compressors which have a higher throughput per equivalent size of reciprocating machine. Centrifugal compressors operate at around 15,000 RPM and are very sensitive to suction pressures, particularly space occupied. It was finally decided since the process conditions were very well established in comparison to the pre-feasibility design of 1979, and that adequate surge control could be designed into the equipment, that the sensitive centrifugal machines should be utilized. In late 1986, Petro Marine Inc., was contracted by NGC to carry out engineering designs and project manage the installation of compression equipment on the empty space in the Teak platforms.

Three (3) solar turbine driven compressor trains with a production capacity of 33 MMscfd were selected for the service. These machines provided an extra capacity of 21 MMscfd more than if an IR

compressor was installed. Engineering designs followed by compressor packaging and testing were carried out in 1987. In March 1988, the package was shipped to Trinidad and later installed with the use of a crane barge. After 'hook-up' works were completed, the new units were commissioned in April 1988.

The investment of approximately TT\$270 million in the Flare Gas Conservation project was an extremely successful one. It brought about the conservation of 100 MMscfd of gas which would normally have been flared and at the same time provided NGC and the country with considerable economic benefit. The production of associated gas in sufficient quantities to support the platform capacities was only anticipated to last for ten (10) years. However, as continuous efforts have been made to prolong the life of the producing fields, associated gas in both fields has remained at levels

that can adequately support the compressors and this is likely to continue for some time.

Natural gas compressed from the platforms has been NGC's cheapest source of natural gas and the platforms have contributed approximately 18% of the natural gas acquired for sale in 1996. The highest throughput from the compressors also occurred in 1995 with net volumes of 106 MMscfd. Continuous improvements are being made to maximize the conservation of gas in the Teak and Poui fields.

The maintenance of compressors and auxiliary equipment is carried out by NGC personnel who have gained considerable experience in the maintenance of such equipment. Only the solar turbines are overhauled abroad under an exchange programme. The installation of the refurbished turbines are completed by the offshore personnel.



Solar Compressors were brought by barge

TRINIDAD AND TOBAGO AT THE ENERGY CROSSROADS

BY WADE HAMILTON

The Government of Trinidad and Tobago and the National Energy Corporation in the late seventies and early eighties undertook a comprehensive study with regards to the development of a Liquefied Natural Gas (LNG) plant in Trinidad. The proposal was for the establishment of a base-load liquefaction terminal to process gas from the country's proven reserves. The project involved the establishment of an LNG Terminal Complex and the procurement of two LNG tankers to transport products to markets in Europe and North America. However the eighties were classified as the period of turmoil in the petroleum industry where markets crashed and worldwide energy prices plummeted. The economic outlook for the development of the LNG project was quickly

eroded and the project was subsequently shelved.

In the late seventies and early eighties, the Government was the primary catalyst for the development of heavy based industries as a result of the windfall revenues from the oil boom. In the early nineties there was a major shift in the State's role to that of facilitator, with more active participation by private enterprise.

A proposal for the establishment of a small LNG terminal in Trinidad to supply a niche market in Boston, United States, was submitted by Cabot LNG for consideration in 1992. The outcome from this proposal led to the amalgamation of a larger working group comprising representatives from The National Gas Company of Trinidad and Tobago Limited, Amoco,

British Gas PLC Cabot LNG of Boston and Repsol of Spain who became an active project participant in the Atlantic LNG Company in December 1995. Enagas, like Cabot LNG, is another major LNG product offtaker.

A project team along with MW Kellogg Company in Houston, Texas, was established in October 1993 to undertake a pre-feasibility study. The study looked at the feasibility of establishing a single train LNG plant based on the APCI (Air Products Process). The study examined the option for the construction of a single train plant utilizing 4 frame, 5 turbine driven compressors with a throughput capacity of 350 MMscfd and that of 5 frame, 5 turbine driven compressor with a capacity of 413 MMscfd. The initial economics of the process indicated that both options were feasible, however for small injection of additional capital the 5 frame, 5 option offered the best returns on the investment. A decision was made to progress the engineering design to a more defined scope by undertaking a Front End Engineering Design study (FEED).

Tenders for FEED were issued for competitive bidding in July 1994 to the major engineering contractors such as Bechtel, Chiyoda, JGC and the MW Kellogg Company. The FEED engineering contract was awarded to a combined Joint Venture of Chiyoda/Hudson Engineering in October 1994. Bechtel declined to bid on the APCI process but however offered an option to present a competitive bid on an alternate technology offered by Phillips. The participants undertook to evaluate the Bechtel option

and a limited FEED engineering contract was entered into.

A number of intercompany working committees was established to further develop and examine the commercial, marketing and shipping aspects of the project. The FEED Engineering exercise was completed in June 1995 and a further refined construction capital cost estimate was prepared. The cost indicated that the single train plant was economically feasible. A decision was taken to invite competitive tenders for Engineering Procurement and Construction (EPC) services. Tenders were issued to the joint ventures of Chiyoda/Hudson Kellogg/JGC on the APCI process and similarly to Bechtel on the alternative Phillips Technology process.

Bids were received, evaluated and a recommendation was made to award the contract, based on the lowest bid price received, to Bechtel/Phillips. Following the completion of the negotiations with the Government of Trinidad and Tobago, a formal contract was entered into with Bechtel and Phillips on June 30th 1996 for the construction of the single train LNG plant in Point Fortin based on the Phillips process.

The plant is a single train cascade refrigeration cycle, based on the proven Phillips process, with a nominal production capacity of 450 mmscfd. The complex is being built upon a 27 hectare reclaimed site next to the former Point Fortin Petrotrin Refinery. The terminal will consist of a single LNG train powered by 6 frame 5 turbine driven compressors, two (2) 100,000 cubic meter storage



tanks and LNG loading terminal dock. The facility will be fully self-contained. Construction is expected to be completed in early 1999 for commercial deliveries by the winter of 1999.

It is anticipated that at peak construction, a workforce of 1900 – 2000 people will be directly and indirectly employed in the Point Fortin area. Approximately 100 people will be permanently

employed by the Atlantic LNG Company to manage the overall operation. The project will inject approximately US\$100 million into the local economy in the short term through the placement of direct contracts for the supply of labour, materials and services.

Aerial View: Clearing in the forest – Right of Way for pipeline to LNG plant.



DOWNSTREAM OPPORTUNITIES

BY CHARLES BAISDEN

INTRODUCTION

Over the period 1978 to 1995, Trinidad and Tobago produced cumulatively 26 million tonnes of ammonia, 7 million tonnes of methanol and 1.5 trillion cubic feet of natural gas consumed in the production of this ammonia and methanol. The export value of these gas-based petrochemicals is estimated at US \$4 billion. Based on the new plants that are already approved for implementation by the turn of the century, this country will be producing annually 3.8 million tonnes of ammonia and 2.9 million tonnes of methanol, representing increases of 53% and 92% respectively, over their current annual production capacities. These two petrochemicals will

together increase their gas usage from the current level of 420 MMscfd (60% of total gas demand) to a level of 685 MMscfd (59% of expected total gas demand) by the year 2000.

Additionally, this country will be exporting the equivalent of 400 MMscfd of natural gas in the form of LNG to the United States. Furthermore, Trinidad and Tobago has, since 1991, exported cumulatively 14 million barrels of gas extractives (propane, butane and natural gasoline) derived from the local natural gas stream. Currently, 10 thousand barrels of these gas liquids are exported per day and by the year 2000, 25 - 27 thousand barrels of these liquids could be extracted from local natural gas production. These represent the continued export of a natural resource in raw or close-to raw form. The

range of final consumer products that could be derived from these chemicals have sales values as much as ten times the current base chemical values.

POTENTIAL DOWNSTREAM BENEFITS

In this context, serious considerations must be given to retaining as much as possible of this export value locally, by processing the chemicals as far downstream as is feasible. The chart at the end of this article indicates some of the downstream conversion options that could be derived from our existing slate of gas-based petrochemical feedstocks and base chemicals. Among the benefits that could accrue from downstream diversification of our existing chemical base are:

(i) Increased Value-Added Potential

More processing closer to the final consumer product, will derive higher sales values and generate further conversion revenue within the local economy.

(ii) Diversification of Existing Petrochemical Base

Downstream production will create captive domestic demand which will diversify market risks, stabilize the base production and buffer against drastic pricing fluctuations.

(iii) Fostering of Closer Links with Final Customer

This could reduce or eliminate middle-man discounts, as well as stimulate more long term commitments from customers and thus buffer customer and producer from the full vagaries of the market-place.

(iv) Enhancement of this Country's Position

As an important Petrochemical Supplier the wider slate of chemicals produced will enable the country to establish links with a broader range of customers within the industry, and provide an opportunity to enhance Trinidad and Tobago's importance as a reliable petrochemical supplier.

(v) Multiplier Effects

The more labour intensive downstream industry would stimulate the formation of new ancillary industries.

(vi) Local Participation

The downstream plants being inherently of smaller scale, will encourage participation by locals in the industry. The

major benefits that could be derived from downstreaming of the industry are obviously highly desirable, and the need to move in this direction has been recognised from the very start of the industry. However, except for some urea and urea formaldehyde production implemented in the eighties by the State, all attempts to date to implement an effective downstream programme have not yet borne fruit. The multinational companies with some presence or interest in this country have not given much priority to local downstream prospects.

CONSTRAINTS

There are certain underlying local constraints or barriers to achieving such a highly desirable national goal as downstream diversification of our petrochemical industry. These may well be a combination of the following:

(i) Natural Gas Composition

The high methane content of local natural gas makes it most suitable for use either as a fuel, or for direct conversion to first level methane-intensive base chemicals like methanol and ammonia.

(ii) Feedstock Availability

Given the methane-rich composition of local natural gas, this creates a shortfall of higher hydrocarbon feedstock which is needed for implementation of economic size facilities to produce base chemicals like ethylene, propylene, butylenes or their higher valued downstream derivatives. Accordingly, at the current gas demand levels, and the attendant insufficiency of feedstock, not to men-

tion other obstacles such as market access, market potential, technology status/access or capital access, it has been difficult to date to structure viable projects in areas such as MTBE, propylene, butadiene etc. The big gas demand increment that LNG would create is expected to considerably enhance the viability prospects.

(iii) Small Domestic Market Base

Our small population size locally and in the wider Caribbean, coupled with the relatively undeveloped state of most of the regional economies, mitigate against a basic downstream competitive strategy of locating intermediates close to end use products and consumer products close to market, or, alternatively, having a strong domestic market to prop up a competitive export thrust.

(iv) Lack Of Distribution Channels

Given the economy-related nature of the downstream products and the well-developed channels established by long-standing pioneer chemical firms, a new player on the block would find extreme difficulty in building up credibility and confidence in the marketplace. Furthermore, the keen competition for market share requires that sales be customized, and aggressive R&D and market research be pursued to support effective product promotion, product development and process development programmes. Inadequate distribution channels will also lead to high transportation costs given the multiple client customized base that downstream products will require, compared

with the base chemicals which are generally targeted to a few large end-users or to aggressive traders.

(v) Capital Risk

There is hesitancy on the part of multi-nationals to concentrate capital resources outside of their home bases unless they perceive irresistible competitive advantages such as cheap abundant feedstock, or substantial domestic market base existing or projected.

(vi) Feedstock Pricing

Downstream products, given their wider distribution requirements, their higher profit potential and more intense and constant competition for market shares, need stable, secure, cheap access to feedstock. Accordingly, it would be more attractive to locate close to market unless there are major overriding competitive advantages related to feedstock pricing and availability.

What then are the chances of successfully downstreaming its industry and thereby enhancing the economic and social benefits to be derived from its natural resources?

LOCAL INDUSTRY STRENGTHS

In arriving at strategies to address the country's weaknesses and to circumvent its constraints, we must consolidate our strong points. Accordingly, any development strategies must be related to building on the foundations already laid through the country's experience with oil and petrochemicals. These include:

- Good feedstock base

including oil based feedstock:

- Good record in dealing with multinationals;
- Good business climate;
- Strategic, ocean-accessible country location;
- Good record in construction and operations of large chemical plants;
- Highly literate, English-speaking population;
- Well-developed industrial infrastructure;
- Supportive and pro-active State involvement.

DOWNSTREAM STRATEGIES

In our continued pro-active quest to captivate the higher values associated with downstream products, the following strategies are worth considering:

(i) Strategic Partnering

Key long-standing industry players having captive demand or access to markets through well developed distribution networks should be targeted. Such partners may also have direct access to capital or technology and may not meet as much resistance from competitors as will apply with completely new industry players.

(ii) State Promotion

It is a fact that multi-national firms are hesitant to concentrate investments outside their home bases in the absence of significant benefits. The local business community is definitely not ready to face up to the industry risks and are not capable of addressing the other barriers to entry of high capital requirements, high technology know-how, sophisticated export marketing capabilities and the high up-

front project development costs. The State must therefore continue to lead in the major initiatives, either as promoter, facilitator, active sponsor/equity participant or a combination of these. In a subsequent period probably through a divestment programme or by public stock exchange selling, the State can then achieve the national goal of wider local ownership.

(iii) Raw Material Accessibility

The lean composition of local natural gas will always pose considerable limitations to basic raw material availability. The capital requirements, market access and unfavourable aspects associated with an over-concentration of State ownership will necessitate considerable involvement of foreign investors. However, in the process, it must be ensured that regardless of ownership structure now or in the future, the country must have ready access, subject to reasonable commercial arrangements, to all gas-based products produced locally that are capable of downstreaming.

(iv) Innovative Raw Material Pricing

This country has been able within the last seven years or so to achieve success as a centre for ammonia and methanol manufacture, not simply on the basis of matching the cheapest gas pricing arrangements in the world. Its success has hinged more on the innovativeness of its flexible gas pricing strategy. It has been predicated on the willingness of the feedstock supplier, in this case, the State, to participate in the downside risks of its customers, with the tacit

expectation of reaping higher than usual upside rewards when its customers' markets are buoyant. The business risks for the gas supplier as expected then become more challenging, since they involve having a balanced portfolio of customers whose industries would hopefully not all be in decline simultaneously and more crucially, exercising caution in the setting of the guaranteed floor gas prices. Clearly, a similar feed-stock pricing strategy would

be needed for the promotion of the local downstream gas-based industries. Given the considerable business risks involved, such initiatives must necessarily be led by the State. In the context of a small, open, developing economy they would not be supportable by strict market economics and non-interventionist policies.

CONCLUSION

Trinidad and Tobago, with its

abundant natural gas reserves has been quite successful to date in commercializing these reserves. The level of conversion has been reflected in export of mainly first stage or basic petrochemicals. It is recognised that the downstream possibilities could be very broad, from a chemical standpoint and could create products as much as ten times current export values. However, the barriers associated with gaining entry into some of these downstream

businesses make the efforts ten times more difficult. It will require formulation of deliberate strategies given the value added benefits to be gained and the undesirable situation of an overexposure in concentrating on export of large quantities of a few first level products. Such strategies may include strategic partnering, state promotion, overcoming raw material accessibility problems and through innovative raw material pricing.

MAJOR DOWNSTREAM APPLICATIONS

ETHYLENE DOWNSTREAM APPLICATIONS

ETHYL-DICHLORIDE	PVC, SOLVENT
POLY-ETHYLENE	RESIN, FILM (SHEET)
ETHYL-BENZENE	STYRENE, RESINS, SBR, ABS, RUBBER
ETHYLENE OXIDE (EO)	DETERGENT, CEMENT, ADHESIVE, COSMETICS, CORROSION INHIBITOR, NON-IONIC SURFACE FUMIGANT
ETHYLENE CHLOROHYDRIDE	ANTI-FREEZE, POLYESTER, DETERGENTS, SOLVENTS, PLASTERCISERS
VINYL ACETATE	PLASTICS, ADHESIVES
ETHYLCHLORIDE	ANTI-KNOCK
ETHANOL	SOLVENT INTERMEDIATE
BUTYL ALCOHOL	PAINT COATINGS, ADHESIVES
ACETIC ACID	INTERMEDIATE TO RESINS, RAYONS

PROPANE/PROPYLENE/POLYPROPYLENE - DOWNSTREAM APPLICATIONS

Film	Snackfood packaging, Overlap for boxes
Fibers & Filaments	Carpet backing, Furniture backing, Carpet face yarns, Cordage & twine
Injection Molding	Automotive interior trim, Air ducts, Signal lamp housing, Bumpers and body parts, Battery cases, Caps & closures, Toilet containers, Prescription vials, Videotape cassette boxes, Medical products (syringes, beakers, trays, tubing), Major home appliances (washing machines, clothes dryer, dishwasher).

METHANOL DOWNSTREAM APPLICATIONS

Chemical Applications	Formaldehyde: Resins, Adhesives, Plastics, Arborite, Plywood. Paints, Dyes, Toys, Nylon, Coatings, Pharmaceuticals, Insecticides, Audio & Video Cassettes, Stereo & Telephone Components, Thinners, Fiberglass, Acetic Acid.
Fuel Applications	Direct use as Automotive Fuel Blended with Fuel MIBE (Octane Booster) Turbine & Boiler Oil, Converted to Gasoline.
Other Applications	Single Cell Protein, Reducing Agent (Steel Mill), Fuel Cells, Batteries, Olefins, Sewage Sludge Treatment.

AMMONIA DOWNSTREAM APPLICATIONS

Direct Application Fertilizers	ammonium sulphate, ammonium nitrate - UAN, CAN ammonia gas pumped directly into the soil by special equipment
Ammonia in Solution	ammoniates (agricultural fertilizers) used in chemical and pharmaceutical industries petroleum industry (to neutralize acids, H ₂ S buffer)
Nitric Acid	explosives, resins, dyes
Soda Ash Manufacture	manufacture of soda ash (industrial chemical)
Textile Manufacture	
Urea	Resins, Melamine Kitchenware, Fertilizers
Miscellaneous	synthetic ice, synthesis of medicinal drugs, plastics, fuels, manufacture of paint removers, polishes and cleaning agents ammoniated dental products

ENVIRONMENT AND SAFETY PROCESS

BY JAMES TRIM

Introduction

The 1996 Draft Revised Corporate Environmental and Safety Policy of The National Gas Company of Trinidad and Tobago Limited (NGC) is a declaration of its commitment to and a recognition of environmental and safety performance as a value mutually reinforcing efficiency in the corporation's business activities. Indeed at NGC there is the belief that a focus on Environment and Safety leads to the continuous improvement in the quality of management.

In order to fulfill our environmental and safety purpose, a strategy has been devised to provide structure on a day-to-day basis. Our Environment and Safety Improvement Process (E&SIP) presents our employees with a vision, concept, strategy and focus for the alignment and ownership of our collective performance and improvements in our business activities. It is driven by the force of value and our commitment to the highest standard of technical efficiency.

Environment and Safety Vision

The Environment and Safety vision of NGC is to be an industry leader in safety and environmental stewardship enabled by an overriding culture in which safety and environmental issues are balanced, merged with all business

activities and driven by an affective commitment to the performance of real work.

Environment and Safety Purpose and Goals

Our purpose and goals are to continually enable the environment management skills and safety competence of our staff; develop and facilitate processes and systems of work to continuously minimize exposures; and reduce waste and emissions to the environment in the pursuit of our ultimate goals of:

- Zero Accident Performance
- Zero Pollution/and negative environmental impact
- Optimum use/conservation of resources

Employee's Responsibility

Each employee at every level is a potential source of new ideas and is expected to contribute to the value chain and, by extension, the bottom-line. His/her responsibility is not simply compliance, but taking charge of his/her employability conscious of the duty to acquire job intelligence, anticipate, identify, analyze



Offshore Technician in full safety gear is a must.





Fire Fighting Exercises are undertaken as part of NGC's Safety Training

and solve problems from a position of personal ethic.

Environment and Safety Improvement Opportunities

Our E&SIP is not so much about inspections, "end of pipe controls" or "fix-as-fail," but it is with a shareholder focus on five integrated performance factors which are the links between strategy and action. These links include the flow of ideas, real-time information, and resources as well as the policies, systems, procedures and norms of behaviour.

Our defined integrated performance factors are:

- (i) Capacity (competence) – our resource advantage, business intelligence, skill in the domain of endeavour, creativity, relevant thinking, talent and accomplishments of our personnel.
- (ii) Job Design – the engagement of best methods of practice, creating process measurements and a system of reward that supports desired behaviours.
- (iii) Coaching - the ongoing committed partnership that facilitates the work process through the sharing of safety principles and values.
- (iv) Resource Allocation - the means to achieve better performance through the

availability of quality components, tools and equipment, documented procedures and specialist advice.

- (v) Organizational Climate – that which informs the behaviour of our people and defines principle-based values. These values establish the framework through which collective energy and ownership are created, leadership is assumed and achievement is realised.

Summary

Our ability to meet our objectives and to approach our vision is contingent upon our mastering our purpose and processes.

Indeed, over the last few years, we have experienced a cultural shift, and continuous improvement of our mean safety performance which is now superior to the gas industry average. NGC values and takes great pride in its safety and environmental stewardship.



Below left

Walking the pipeline's 'Right of Way' to ensure the integrity of the pipelines.

Below right

Safety at Sea Exercises



NGC AND THE ENVIRONMENTAL MANAGEMENT AUTHORITY

BY HAYDEN BLAIZE



Removal of old infrastructure from industrial site

The Government of Trinidad and Tobago, in furtherance of its commitment to develop a comprehensive programme to promote environmentally sound and sustainable development in Trinidad and Tobago, established an Environmental Management Authority (EMA). This authority is responsible for the management of the environment within Trinidad and Tobago. It carries out its functions by facilitating the formulation and execution of national environmental management policies and practices, the promotion of public awareness of environmental concerns, and the establishment of an effective regulatory regime which will improve, protect and conserve the country's environment.

The regulation of the petroleum industry by the EMA is of critical importance, as this industry, while contributing over seventy five percent (75%) of foreign earnings and in excess of thirty percent (30%) of Gross Domestic Product (GDP), has the potential to create adverse impacts on the environment.

In this regard, the EMA has convened a multi-sectorial committee to treat with environmental issues related to the petroleum industry, and NGC has two (2) designated representatives on

this committee.

The advent of regulatory bodies is often viewed with some degree of suspicion by industry, as they are perceived as obstacles to the development process. NGC however, because of its proactive approach to environment issues, welcomes the EMA and sees the EMA as a partner in realizing sustainable economic development for Trinidad and Tobago.

NGC's environmental responsibility pervades the entire organization, stretching from development through Operations to Maintenance.

It is now standard for all expansion plans for the natural gas transmission system to be influenced by the results and mitigation recommendations emanating from the conduct of Environmental Impact Assessments (EIA's).

In developing infrastructure for investors, appropriate site remediation programmes are implemented so as to identify, treat and safely dispose of any pre-existing contamination. In this way industrial sites managed by NGC are deemed as "environmentally clean." NGC then has the authority to enforce, through appropriate contractual agreements, that

investors operate and maintain their facilities such that baseline environmental conditions are maintained.

Natural gas poses few environmental risks during the process of operating and maintaining natural gas facilities. The material is a low molecular weight hydrocarbon which demonstrates low reactivity with respect to photochemical oxidation. Notwithstanding this, NGC's Operations and Maintenance personnel adhere to strict environmental guidelines in all of their activities.

There are guidelines for handling liquid waste disposal such as liquid hydrocarbons. The quality of gas compressed and transported by NGC contains only traces of sulphur compounds and this facilitates adherence to the regulations. Gas venting on platforms is also subject to environmental control. Also, included in Operations and Maintenance policies are guidelines for ocean dumping, condensate systems and drain systems.

A number of preventative and reactive procedures are in place to cover marine loading and off-loading. The National Energy Corporation, a wholly owned subsidiary of the NGC, is the owner of the Pt. Lisas harbour and Savonetta Pier. NGC controls these assets and holds chairmanship of the Savonetta Pier Coordinating Committee. Through this medium it ensures that all environmental matters are treated in accordance with internationally accepted guidelines. One of the measures which has been introduced is the loading systems designed to eliminate venting directly into the environment by the installation of appropriate return vapour lines.

NGC therefore, has always demonstrated environmental responsibility in all aspects of its business. The Company, like the EMA, shares the common goal of environmentally sound and sustainable development for Trinidad and Tobago.



Shore Protection works at new industrial site at La Brea

TRINIDAD AND TOBAGO

the centre for

gas-based

manufacture in

the Caribbean

BY CHARLES BAISDEN

Trinidad and Tobago (T&T), occupying a land mass of 5,100 square kilometers, with a population of 1.3 million people, and a Gross Domestic Product (GDP) per capita of roughly U.S. \$5,000 is the second largest and southernmost English speaking twin-island country in the Caribbean.

The country is unique among the Caribbean island nations in that it is the only one whose economy is not heavily dependent on tourism or agriculture, but is primarily petroleum (oil and natural gas) based. In fact, the oil, petrochemical and steel industries, account for over eighty percent (80%) of the country's foreign earnings, and contribute over thirty percent (30%) to the country's GDP.

While the country has been

involved in the oil industry since 1908, its natural gas industry has emerged with increasing importance during the late 1970. The emergence corresponded with the discovery and development of substantial natural gas reserves, off the south-east coast of Trinidad. This period, fortunately enough, corresponded with the peaking of the country's oil production at 230,000 barrels per day, which has since been in unabated decline, with current production of 130,000 barrels per day. Indeed, the country's oil refining throughput, which once made Trinidad the most important Caribbean refining centre, peaked at 450,000 barrels per day in the 1970s but had declined to 80,000 barrels per day by the mid 1980s. Petrotrin's refinery upgrade modernization completed in 1996, has brought the throughput capacity to around

160,000 barrels per day.

In contrast, natural gas utilization has increased in the country from 135 million cubic feet per day, in 1974, to its current level of 720 million cubic feet per day. The declining oil production locally was accompanied by an upsurge and eventual peaking of world oil prices, which fuelled the economy with a petrodollar boom and, in effect, enabled acceleration of the development of the gas industry. During this period the Government actively and deliberately promoted and monetized the new found natural gas resources, by utilising the increased oil revenues.

Among the earliest industries to benefit from this upsurge in natural gas utilization, was the country's power generation facilities. Post WW II Electricity had been generated



Advertising in International publications assisted in promoting Trinidad and Tobago as the investment location in the Caribbean

at the Penal power plant site utilising natural gas, derived from nearby land wells. However, with the coming on-stream of the offshore gas, the Port of Spain power station converted most of its units to operate on natural gas turbines. This was also quickly followed by the completion of another new, fully gas-turbine power plant at the Point Lisas Estate. This development, fueled by the relatively low-cost natural gas, doubled the power generating capacity in the country, thereby enhancing the country's capability to deliver a reliable power supply to new large industrial plants.

The completion of a cross-country pipeline, from off the

south-east coast to Point Lisas, provided a major link in the infrastructure which facilitated the development of the Point Lisas Industrial Estate. This, coupled with the increased electricity generating capacity and other positive factors, propelled the development of a series of worldscale gas-intensive industrial plants.

Currently, T&T is the second single, largest ammonia exporter in the world, a position that is led by Russia. The country's position has been maintained over the last ten (10) years. The oldest gas-intensive plant is the Hydro Agri Ammonia Plant, formerly owned by W.R. Grace and which began production in

1959. Outside the oil refinery, this had been Trinidad's only venture into gas-based petrochemicals and prior to the discovery of gas off the south-east coast of Trinidad.

With regards to methanol, as in ammonia, Trinidad and Tobago was the site of the first methanol plant in Latin America. The country now has 5% of the world's methanol capacity and ranks second among world exporters. By 1999, Trinidad will rank as the world's largest exporter of both methanol and ammonia.

Trinidad's ammonia is currently derived from six (6) ammonia plants having overall capacity of 2.28 million



Port Pt. Lisas – Iscott Dock where product for the steel industry is loaded and unloaded

tonnes per annum (6,830 tonnes per day). Three additional plants, now under construction, will bring the country's ammonia capacity to 3.8 million tonnes per annum (11,430 tonnes per day), by 1999.

The country's methanol capacity is derived from three (3) world-scale plants having combined capacity of 1.5 million tonnes per annum (4,530 tonnes per day). With the proposed construction of at least one and possibly two new plants, local methanol capacity is expected to reach 2.1 or possibly 2.9 million tonnes per annum (8,680 tonnes per day) by 1999. The petrochemical plants utilize almost sixty percent (60%) of the country's gas demand, methanol alone being responsible for roughly twenty percent (20%) which equates the level of gas utilization for power generation.

In addition, the country is establishing a vibrant iron ore reduction industry, based on imported ore from Brazil. A gas-based reduction process is employed to produce reduced iron which is in high demand as feedstock for mini-mills. The first local Direct Reduced Iron (DRI) plant forms part of an integrated mini-mill located at the Pt. Lisas Estate. This first Caribbean plant, now owned by ISPAT Ltd (formerly ISCOTT) was the first industrial plant and the second major occupant of the Point Lisas Industrial Estate. It is comprised of two (2) Midrex units, each with a production capacity of four hundred and fifty thousand (450,000) tonnes DRI per year. In fact, the current operation regularly produces at a combined level of over one (1) million tonnes DRI per annum. There is also an associated melt shop and rod-mill

which convert a portion of the DRI output into steel billets, wire rods and coils.

Approximately ten (10) years after the start-up of the first iron ore reduction plant, the country attracted its second such plant, but one which employs new emerging (iron carbide) iron ore reduction technology. Given the pioneering role of this project, some start-up problems were experienced; however, the plant eventually produced successfully up to seventy percent (70%) of nameplate capacity within two (2) years of start-up. This plant owned by NUCOR, has a production capability of three hundred thousand (300,000) tonnes of iron carbide per annum. In addition, the investors plan to install at least three additional modules which will bring overall capacity to at least one and a half (1.5) million

tonnes per annum by 1999. Trinidad and Tobago is expected to become the iron carbide capital of the world, given that NUCOR, a technology and plant operations trail blazer in the industry, will have gained considerable ground ahead of the competition and would wish to expand rapidly at the current site.

Added to this, one of NUCOR's most ardent competitors recently turned sod for the construction of another iron ore reduction facility in the country, employing the relatively new 'circored' technology. A plant with a capacity of five hundred thousand (500,000) tonnes per year of DRI is planned, and this will utilize seven hundred and fifty thousand (750,000) tonnes per year of Brazilian iron ore. This new investor group, led by Cleveland Cliffs Incorporated, will start-up its plant in early 1998, and within a two (2) year period, should install additional capacity amounting to one and a half (1.5) million tonnes of DRI per annum.

Furthermore, Caribbean ISPAT will soon be starting construction of a new hot briquetted iron reduction plant (HBI Megamodule) employing the same Midrex technology as their existing plant. The plant will contain a briquetting facility to produce the output as hot briquetted iron (HBI), rather than as direct reduced iron (DRI). The proposed capacity of this new plant is 1.2 million tonnes HBI per annum, and it is expected to be on stream by the end of 1998. ISPAT has further indicated a desire, subject to favourable market conditions, within a two (2) year

period of start-up of this plant, to diversify into downstream products including slabs, hot rolled coils and cold rolled coils.

The net result of these developments is that this country, at the turn of the century, will be producing almost six (6) million tonnes per annum of reduced iron, derived from roughly nine (9) million tonnes of Brazilian iron ore. This would also move gas utilization by the metals industry from seven percent (7%) of total gas demand to around seventeen percent (17%).

Other than power generation, petrochemicals and metals, the rest of the country's gas demand is utilized mainly as fuel by the oil refinery and several smaller industrial and commercial users, most of them located outside of the Point Lisas Industrial Estate. These currently account for fifteen percent (15%) of total gas demand.

Among the major factors which have contributed to making Trinidad and Tobago such an important centre for gas based development are:

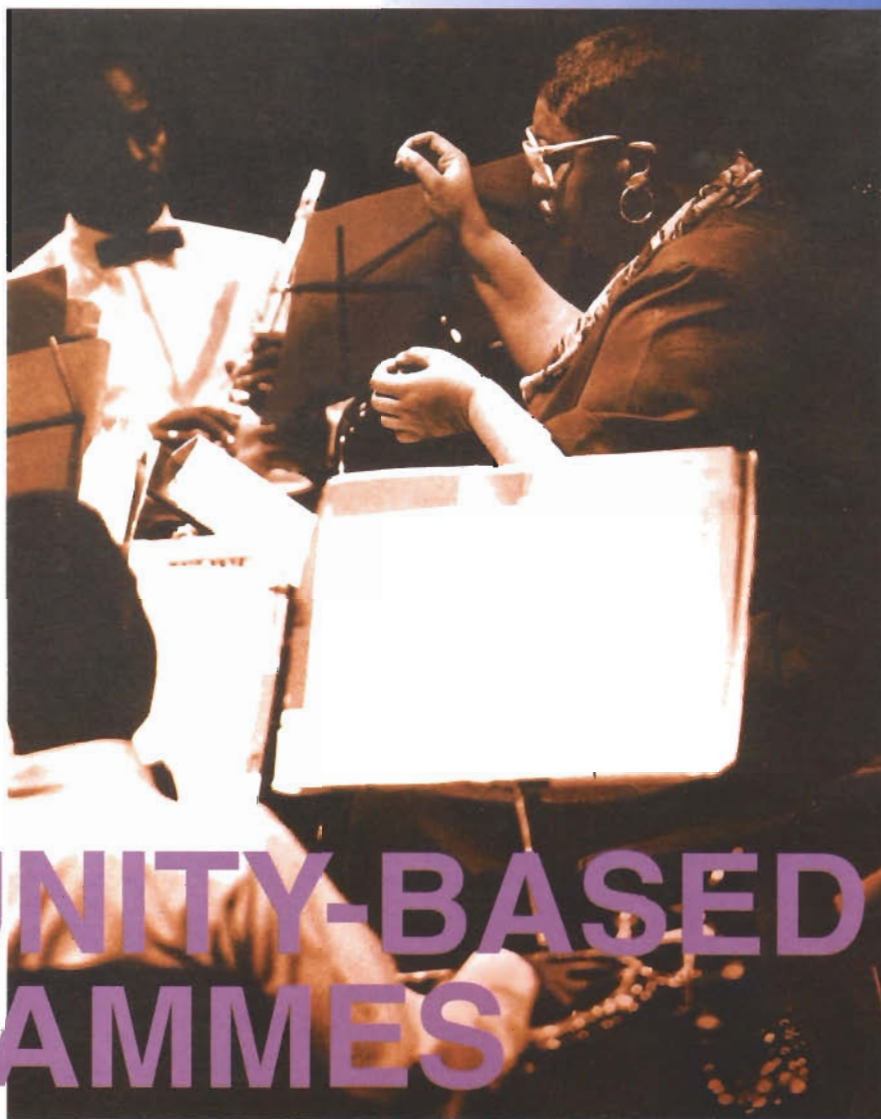
- ***A readily available and reliable utility supply.***
- ***A well-developed infrastructure.***
- ***A well-trained pool of competent construction workers and process operators.***
- ***Available, competitively priced natural gas.***
- ***A leadership and supportive role by the state.***
- ***An investor-friendly, legal, business, socio-economic and politically stable environment***

The current and potential contribution of these gas-based industries to the local economy could be assessed in several spheres: Export value of output, Gross Gas Revenue, Permanent employment, Investment intensity.

The above treatise clearly demonstrates the significance of the gas-based sector to the local economy and its impact on the international arena.

Given the level of returns in relation to other local economy alternatives such as agriculture, tourism, services, food processing and non-petroleum manufacturing, the gas industry is likely to continue on a strong growth path. It is imperative that the way forward should be tempered by caution in the choice of new investments including pricing of the precious, depleting natural gas resource and by a need to strengthen the existing base by downstream diversification. In this regard, it is important that we do not merely extravagantly enjoy the spoils of our natural resource 'covenant', but that we efficiently utilize it towards the achievement of more lasting benefits that would reach our future generations. Furthermore, the global village in which we live and the telecommunications revolution, continually make competition more and more intense which will create continuous challenges for us to even maintain our current significant role as a center for gas based manufacture. The solution must lie in the efficient pooling of all our local resources, to ensure that lessons of the past have been learned and that our successes are properly channelled.

The NGC sponsored Lydian Singers is headed by Ms. Pat Bishop, Trinity Cross Holder



NGC'S COMMUNITY-BASED PROGRAMMES

BY ROSLYN CARRINGTON

The National Gas Company (NGC) is entrusted with the responsibility of maximising value from the nation's natural gas resources for the benefit of Trinidad and Tobago. NGC returns substantial sums of money to the Government (Corporation Sole) through the payment of taxes and dividends. However, as a major corporate entity, and as a State Enterprise with a national mission, NGC takes its social responsibility further.

Through a process of direct

and pro-active community involvement, NGC seeks to assist communities in developing their own capacity in key areas such as education and training, sport, culture and employment, with particular emphasis on youth. The goal is the creation of strong, stable and empowered communities. While NGC's involvement is motivated by a strong sense of community responsibility, it also makes good business sense. A stable social climate is a prerequisite for investment which in turn allows NGC to promote the kind of

gas-based projects which will create value for Trinidad and Tobago.

The National Skills Development Programme – providing high-tech training for a high-tech world

NGC has played an essential role in the recently implemented National Skills Development Programme (NSDP) from its very inception. NGC, while providing much-needed financial support, has also been deeply

involved in the design and structure of the Programme. The Company was appointed by the Government to propose a solution to the declining levels of skilled labour in the country, particularly in view of the promising growth within the gas-based and heavy industrial sectors.

The result of extended research by NGC into training systems world-wide was the NSDP, a partnership between the Government and the Industrial Sector designed to provide local youths with

PROMOTIONAL

advanced technological training in order to provide the advanced technical skills demanded by the industrial sector with a view to stimulating industrial growth. The Programme is based on the German Dual Apprenticeship System which allows for trainees to learn within a working or factory environment. Qualifications received through this Programme are recognised and accepted world-wide.

Sowing seeds now for a bountiful future for Trinidad and Tobago

NGC has always been an exemplary tenant of the Point Lisas Industrial Estate, and is aware of the benefits to be reaped by all, through its involvement in various projects which, strictly speaking, are not within its area of responsibility.

Rivulet Road

A decision was taken to undertake and underwrite the extensive upgrading in 1994 of the heavily trafficked Rivulet Road. This road is approximately 6.5 kilometres long and links the Solomon Hochoy Highway with the Point Lisas Industrial Estate. The much improved thoroughfare has benefited the occupants of the Industrial Estate and the travelling public. NGC's commitment to improve the physical infrastructure where possible, contributes to the enhanced infrastructure package for investors and customers and improving the country's international image.

Brian Lara Promenade

NGC was also a major contributor to the building of the



NGC was involved in upgrading and beautifying Port of Spain – The Brian Lara Promenade in 1994.

popular Brian Lara Promenade in Port of Spain. This pleasant meeting ground and tourist spot has become an oasis in the heart of the busy city.

NGC's Community Relations Programme - Youth Development through Education, Sport and Community

This Programme was established in 1992. It is structured to allow the Company to work in conjunction with organisations at national, regional and community levels with the focus being on youth development as well as the stimulation of innovative business ideas which allow for increased self-employment among the youth. NGC is guided by its belief that through its infusion of technical expertise and financial resources, the Company can make it possible for young entrepreneurs, other organizations, community-based groups and schools to achieve their goals and objectives. The Programme includes,

among other activities, some special projects: the Marine Environmental Awareness Programme (MEAP); the development of sporting facilities and activities; and sponsorship of the Lydian Singers.

Marine Environmental Awareness Programme - transforming our vision of the sea.

The Coastal Villages Education Project is the backbone of NGC's Marine Environmental Awareness Programme (MEAP). It is administered in collaboration with the Trinidad and Tobago Coast Guard with the support of institutions such as the Caribbean Industrial Research Institute (CARIRI), the Caribbean Research and Development Institute (CARDI), Caribbean Fisheries Training and Development Institute (CFTDI) and Bowen Marine Limited. The Programme has shown a rapid rate of growth throughout the years since its inception. The Programme, which began in 1993, is aimed at trans-

forming the vision of coastal residents to see their marine resources as both a source of livelihood and as their heritage to be valued and preserved. It exposes unemployed young people aged 14 – 25 to skills such as Survival at Sea, Safety at Sea, Life Guard Training, Boat Building and Maintenance, Outboard Engine Repairs, Fish Technology, Fruit Processing, Fabrication of Fish Processing Equipment, Meat Curing and Taxidermy. Another goal of this programme is to have the graduates conduct regular patrols on all the beaches in the North Coast to minimise the incidence of drowning and other difficulties experienced by bathers.

In the last three years, MEAP has embraced many of the coastal areas which span the western peninsula, north, north-east, east, central and south coasts of Trinidad. In Tobago, the programme was extended to areas such as Charlotteville, Speyside,

Roxborough, Caanan, Bon Accord and Plymouth. Over 1000 unemployed youths have benefited from this training programme.

Currently in its fourth year, MEAP has been expanded, and is intended to take participants to a higher level. Graduates have been evaluated to identify those showing entrepreneurial potential. They will be offered training in basic business management skills such as bookkeeping, marketing, product packaging, costing and basic management techniques. This training will be provided by the Small Business Development Corporation (SBDC).

These advanced participants will work in conjunction with the SBDC to produce a business plan for presentation to commercial banks for business development loans. The National Gas Company will act as guarantors. This programme will be co-ordinated on behalf of NGC by the SBDC.

The goal of the programme is to help these participants to become self-sufficient, successful entrepreneurs by har-

nessing the resources of the marine environment.

Youth Sail – a call to the youth to join in nation building

In 1993, NGC launched its Youth Sail programme in conjunction with our own world renowned navigators, the La Borde family. This programme exposes young people to the joy and discipline of life at sea. Between 1993 and 1995, eighty-seven (87) children of NGC employees and thirty-seven (37) from children's homes, aged 13 – 14 participated for one week in learning navigation techniques, chart work, geography, astronomy, dinghy handling and oceanography. With Coast Guard involvement, the dimension of self-esteem was introduced.

In 1996, the Programme evolved into two projects – Youth Sail and Youth Sail Caravan. The Caravan is an offshoot of the successful Youth Sail Programme and aims to offer the many benefits derived by participants of the programme to children in coastal communities. In

1996, some 350 young coastal residents participated in the project. The overriding aim of Youth Sail is the development of the virtues, ideals, values and skills that would contribute to personal growth and nation-building. It is hoped that these children will become aware of the need for discipline that would extend into their personal and academic lives.

Fanning the flames of community spirit through NGC's Community Basketball Project

This Project, which entails the refurbishment and construction of basketball courts in communities throughout the country and the sponsorship of a Community Basketball

Time Out for action on one of the Basketball Courts constructed by NGC



League, is in its third year of existence. It has developed within participants throughout Trinidad and Tobago a sense of community, of hope, and of achievement. It has provided the less privileged youth in the country with much-needed facilities while deepening and widening interest in the sport. It therefore encourages community spirit and camaraderie among participating teams. The League is administered in conjunction with the National Basketball Federation of Trinidad and Tobago (NBFTT). Over 1600 young persons from 27 communities have been able to come together to develop sportsmanship at a local level.

Through the efforts of NGC's Community Relations Department, the nation's youths have been provided with the opportunity to expend their energies in the wholesome and rewarding arena that is sport, and have



Caroní Zonal Games: Primary school children are encouraged by NGC's Head of Community Relations, Hasely Crawford – the 1976 Olympic Gold Medalist

PROMOTIONAL

discovered an avenue for team-building, recreation and community bonding in a spirit of good fun and friendly competition.

To date, NGC has constructed or refurbished 29 basketball courts, and an additional 11 are planned for 1997.

Promoting the Arts and Sport

The National Gas Company also holds an appreciation for the richness of this country's culture. It has sponsored the nationally acclaimed Lydian Singers led by Trinity Cross Holder, Ms Pat Bishop, since 1991. This partnership has proven to be of mutual benefit in that it allows NGC to make culture more easily accessible to the people while providing the Lydians with the support needed to give their frequent benefits for charitable organisations throughout the

country.

NGC's support for the Arts has also helped to make investor visits far more pleasant through cultural evenings such as May Magic, Veni Patagé and A Little Night Music. These cultural events have set a trend for many other organisations within the country, and have become quite a popular means of introducing others to the cultural riches which Trinidad and Tobago has to offer. NGC assists unsponsored steelbands annually at the Carnival Panorama competition as a means of helping smaller bands to grow and to compete with the larger ones.

Caroni Zonal Primary School Games

For five years, NGC was the sponsor of the Charlierville/Carapichaima Zonal Primary School Sports. Since 1995,

however, in keeping with the company's commitment to the development of sport and of the young people in the country, NGC has sponsored the Caroni Primary Schools Divisional Track and Field Games.

NGC believes that in order to develop sport in Trinidad and Tobago one must begin at the primary school level, as it is at this level that one can identify true talent which can then be nurtured until it reaches its true potential. Young competitors are also exposed to clean, healthy, fun sporting activity in the true spirit of sportsmanship.

Other activities of the Department include the management of government/LOME IV projects such as the recent refurbishment of the Arima cycle track, the construction of the Tacarigua outdoor Synthetic Hockey

Field, and the construction of three indoor sporting halls.

Donations

In addition to these major projects, NGC is also committed to several charitable bodies through Deeds of Covenant while still assisting hundreds of organisations throughout the country each month through its donations programme.

Pledging support well into the future

Although NGC's Community Relations Programme has only formally been in existence for four of its twenty-one year history, the impact on the communities which it has assisted is tangible and evident. In keeping with its philosophy of ensuring that each citizen of the country benefits from its activities, NGC pledges to continue its support to the national community.

Coastal villagers benefit from NGC's MAEP Programme





*Earth our upkeep
gives her best and
yet keeps more
in store, not less.*

*Return A thought
if not the resource.*

Replenish her womb!

Michael Coryat (1996)

One
Moment
Please...

