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PREFACE

This Report of the Energy Sub-Committee for Vision 2020 is presented as a discussion document on how the national community can define its perspectives, expectations and aspirations for Trinidad and Tobago, against a background of informed analysis of the energy sector, long acknowledged as the key driver of the economic, political and social life of Trinidad and Tobago.

In setting the report in a context – both global and

domestic – the Energy Sub-Committee offers it, not as a route map, but as a landscape map through which may be glimpsed emerging opportunities and challenges as the country progresses towards 2020.

The Energy Sub-Committee recognises the significant gap between the energy sector and the rest of the economy and is keenly aware that it could widen over the next decade. Our task is to bridge the divide and to find the solutions that offer maximum

benefit to the people of Trinidad and Tobago. This report is the joint product of several industry professionals, all of whom have expertise and experience at the highest levels. The report, however, has not been as all-inclusive as could be and in trying to build consensus towards a shared vision, we have deliberately avoided too many specific and short-term solutions while ensuring that most of the significant issues were included and analysed.

VISION STATEMENT

To be an integrated and fully developed energy sector that is a key driver of a sustainable and flourishing local and regional economy while attaining global competitiveness in all of its sub-sectors by 2020.

- The energy industry will be sustainable, operating transparently with the full support of the government (through effective governance) and

the people of Trinidad and Tobago. It will include locally owned and managed energy-based companies that participate throughout the complete value chain in projects and operations that are both local and global in scope and scale.

- Based on the successes of this industry, Trinidad and Tobago is the regional financial and

energy trading centre, supported by a strong and vibrant capital market, world-renowned educational institutions producing highly skilled and competent personnel, and a technology hub that stimulates innovation and entrepreneurship, supported by a strong public-private sector partnership.

MISSION STATEMENT

To create partnerships and innovations that foster self-reliance and a resilient energy sector, through an ethical, efficient and evolving regulatory framework by:

- Expanding and fusing all aspects of energy and their support services.
- Promoting the development of new industries.
- Meeting international standards.
- Enhancing the social elements geared towards the achievement of a proud and prosperous nation.

VALUES TO 2020

- | | | |
|---|---|---|
| <ul style="list-style-type: none">▪ Integrity▪ People and community▪ Equity | <ul style="list-style-type: none">▪ Integration and collaboration▪ Environmentally compliant and focused | <ul style="list-style-type: none">▪ Receptivity to ideas and innovativeness |
|---|---|---|

T&T ON GLOBAL ENERGY STAGE

- Global leader in methanol, ammonia and LNG exports.
- Largest exporter of LNG into the United States.
- Attractive investment location for global industry leaders.
- Technology advances boost prospects for growth in hydrocarbon resources.

PREAMBLE

A major goal of this visioning exercise should be to determine those viable pathways by which the benefits of expansion in energy sector activity could be made to flow into the rest of the economy, whether directly or indirectly. Unfortunately, the data used

to measure the sector and its impact on the economy have traditionally not been collated or interpreted in ways that would facilitate detailed analysis.

The sector has always been competitive and is indisputably the engine of growth in the national economy. The need to infuse the overall environment with energy sector best practices and thinking and to increase the pace of economic diversification has now become even more critical, given the changing structure of the domestic economy and international markets.

Many services used in the energy sector could be transferred to the wider economy and used as a basis for expansion into overseas markets. Trained nationals are ready for the challenge. Many of whom have

developed the technical expertise and are leading exponents in best practices in energy and global management, both in Trinidad and Tobago and abroad. Ultimately, the fundamental challenge is to create the conditions for sustainable long-term growth and development of the energy sector, the wider economy and the people of Trinidad and Tobago, even with the inevitable decline of energy revenue and of sector maturation.

RECENT HISTORY

Trinidad and Tobago contains less than one per cent of known global reserves of natural gas. Despite its tiny share of gas reserves, the country has been successful in establishing one of the leading gas-based export centres in the world. These

OVERVIEW

exports are principally ammonia, methanol, steel products and, more recently, liquefied natural gas (LNG). In the case of ammonia and methanol, Trinidad and Tobago is the world's leading exporter. Now that Trains I, II and III of Atlantic LNG are on stream, this country is placed among the world's top five LNG-exporting countries, and is already the largest exporter of LNG into the United States.

The country has therefore been uniquely successful in the global marketplace in creating an environment in which gas-based export industries flourish. Given its small size and reserve base relative to that of larger countries with gas-based industries, Trinidad and Tobago's success is testimony to the unique combination of institutional, commercial and regulatory

arrangements that were employed in a highly competitive business. The development of the majority of these gas-based industries (excluding LNG at Point Fortin) was based on an original plan for an industrial estate at Point Lisas. This was, however, modified and adapted as the scale and size of the plants and industries increased. From the modest first efforts of W.R. Grace with a 150-tonnes-per-day ammonia plant in 1958, the sector has recorded steady growth.

Today, more than twenty-five world-scale units are producing a variety of products and utilising cutting-edge technologies in benefiting from larger economies of scale. Trinidad and Tobago has now become an extremely attractive location for investment in energy and energy-related

activities, especially with its proven hydrocarbon resources and infrastructure.

How did this happen?

Limitations imposed by size, including reduced capital accumulation and the small domestic capital market, have created opportunity for the foreign private sector to maintain a continuous presence in the domestic petroleum industry from the earliest years of the last century.

A reassessment of energy policies in the context of contemporary trends in global energy after the first Gulf War in 1991 noted the domestic economy's dependence on petroleum and called attention to the rising foreign portion of the national debt. This had been growing steadily during the mid-1980s, rescheduled in 1988, and by 1992 required

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the first of several large annual repayments. The need for efficient use of capital, as well as for new capital, dictated different strategies.

Strategic Intent

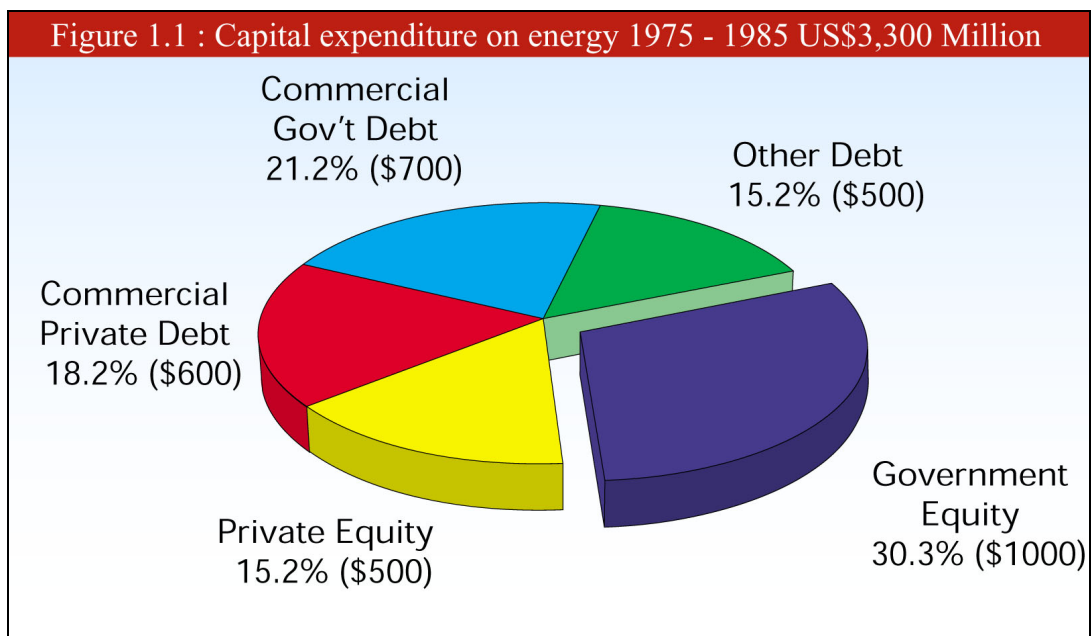
Optimal utilisation of our energy resources to generate long-term sustainable growth and development of the economy and a better quality of life for its citizens.

The Government amended the Petroleum Taxes Act in 1992 to allow a sliding-scale

Supplemental Petroleum Tax rate applicable for a range of prices. This facilitated greater certainty in the planning process in respect of future applicable tax rates. Private capital became critical to expansion of the energy sector, since financing public expenditure for State enterprises, including the utilities, came from the sale of State assets.

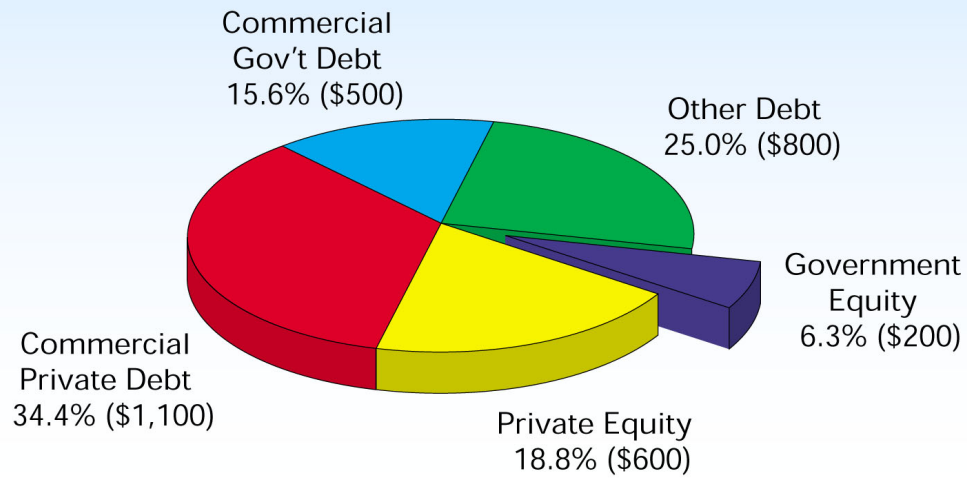
Figure 1.1 shows the pattern of capital expenditure during the decade 1975–1985,

inclusive. Over that period, the Government assumed the role of lead investor in spending US\$3,300 million on developing gas-based industries at Point Lisas. Figure 1.2 illustrates the reduction in Government equity during the decade from 1986 to 1996, inclusive. It is noteworthy that much of the supplemental funding was not sourced directly from the private sector, but through private sector-backed debt.



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Figure 1.2 : Capital expenditure on energy 1986 - 1996 US\$3,200 Million



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A comparison between the two decades shows the changes in the sources of funding for the Trinidad and Tobago energy sector between the periods 1975-1985 and 1986-1996. The details of expenditure (as listed in “The Management of Energy Resources”, APETT Engineering Conference, 1995) indicate that most of the expenditure in the sector between 1986 and 1996 was incurred in the last five years of that 10-year period.

The multi-million dollar LNG project, developed from 1992 and formally established as Atlantic LNG in July 1995, is not included in Figure 1.2. Included in the data for the second period, however, is the Farmland/MissChem ammonia plant (now Point Lisas Nitrogen Limited). Energy projects of the size

being described have long gestation periods and may span seven to eight years between initial negotiations and completion. Even after a positive investment decision, the plants may take another four to five years from investment decision to project completion, first production and commissioning. A new government came to office in December 1995 but new gas-based project development continued apace.

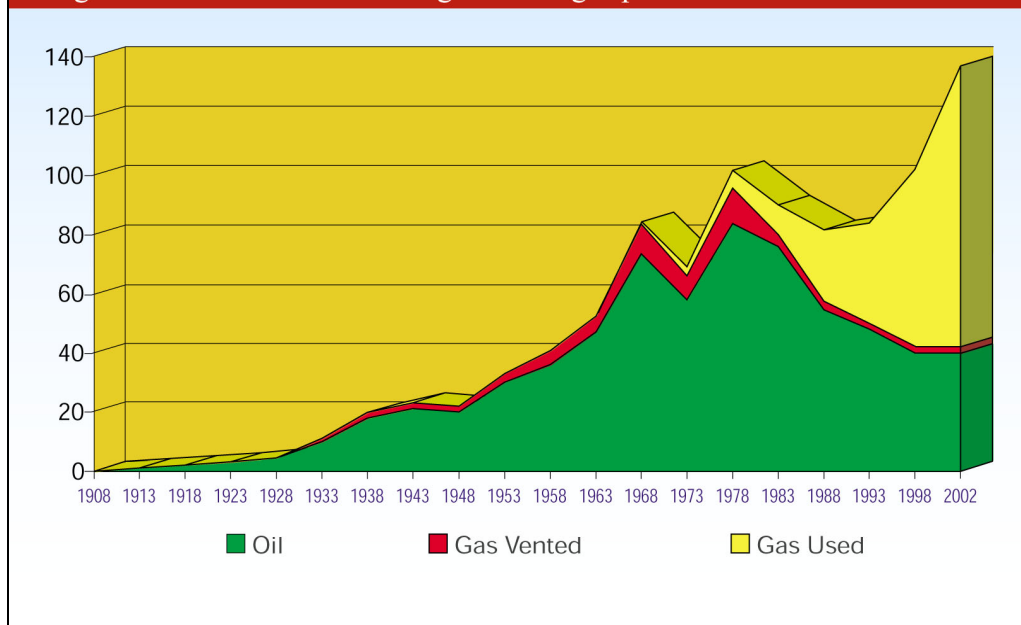
The pattern of expenditure set in the 1992–1995 period persists to this day. Except for gas transmission, almost all the expenditure in this period was financed through the international capital market using foreign private equity. Private domestic capital (the C L Financial Group) is now more involved. The local

conglomerate CL Financial owns the majority share in four of the methanol plants as well as the CNC ammonia plant. Titan Methanol, the other methanol producer, was funded directly by the international capital market. Its fellow plant, Atlas Methanol, will follow this pattern and is expected to come on stream in the last quarter of 2004. Trains II and III of the Atlantic LNG project (also excluded from the expenditure listed for the 1986- 1996 period) came on stream in mid-2002 and early 2003, respectively.

Total capital expenditure for these latter projects amounted to approximately US\$5,000 million, if expenditures related to offshore exploration and production and gas transmission are included.

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Figure 1.3 : Trinidad and Tobago oil and gas production: 1908 - 2002



Another significant development in the energy sector in the 1990s was the award of new acreage for exploration and development, much of which yielded successful hydrocarbon discoveries. Of even greater significance was the discovery of a large oil deposit off the north-east coast of Trinidad. A consortium comprising BHP Billiton as the operator, Talisman and Total, is

actively developing the field, with first oil expected in late 2004.

With the divestment of much of the State equity interests in the nineties, and with foreign direct investment dominating the second round of expansion in ammonia, methanol, LNG and electricity, there is urgent need for policy review and strategic intervention by Government and active

involvement of the domestic energy sector.

CURRENT STATUS

The timing of this visioning exercise is appropriate for the following reasons:

- The level of reserves and contractual obligations guarantee a longtime span of 30 to 50 years for

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energy sector activities in Trinidad and Tobago.

- The experience gained by the State in exercising control over much of Trinidad and Tobago's energy sector activities (particularly after 1974) in the context of close to one hundred years of experience in oil and gas in Trinidad and Tobago.

This is illustrated in Figure 1.3.

- The emergence of nationals operating at the highest levels in all areas of the energy sector, both at home and abroad.
- The forces of globalisation and the global energy industry facilitating the movement of commodities, capital, technology, personnel and global standards, without concern for national boundaries.

Factors Fuelling Growth

- Long-term commercial contracts.
- Substantial reserves of natural gas.
- Substantial oil find in the oligocene structures.
- New technology for deep-sea exploration enhances prospects for unexplored areas.

Traditionally, the hydrocarbon sector in Trinidad and Tobago has been viewed as an enclave, dominated by external interests and requiring continuous support from external systems. The tendency was to refer to Trinidad and Tobago as an open petroleum economy, with the inevitable connotations of the term. The advent of LNG subsequent to the development of the domestic natural gas-based industry has now provided a more clearly defined long-

term picture. The industry's potential long-term viability has been enhanced by its close proximity to large Venezuelan gas reserves (with crossborder exploitation opportunities), and by Trinidad and Tobago's industry experiences and political and economic maturity. While requirements to link into external systems, standards and practices remain relevant, opportunities for economic integration and diversification on the basis of proven strengths of the energy sector are now ripe for exploitation.

Three critical factors, other than those listed above, now combine to promote development of the next phase of industrial development at previously unanticipated levels. First, as noted earlier, gas reserve development advanced

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significantly over the last decade as markets for natural gas in Trinidad and Tobago grew, especially as the Atlantic LNG project got under way. Gas reserves in Trinidad and Tobago are now approximately 32 trillion cubic feet (tcf) — more than twice the level of a decade ago, and the forecast is for continued reserve appreciation at similar rates for the next 10 years, at minimum.

Secondly, the oil discoveries off the north-east coast are geologically important and can be expected to promote further seismic work to identify possible commercial hydrocarbon reserves in oligocene rocks. This trend is expected to continue for the foreseeable future. Finally, new technological developments in deep-water petroleum resource exploitation strongly support

the view that acreage not yet under exploration (approximately 62% of total available acreage) will yield additional hydrocarbon discoveries.

FUTURE DEVELOPMENTS

Trinidad and Tobago has therefore now become a very important hub for the global natural gas industry, capable of serving markets from Brazil to Spain. Industry analysts predict that Trinidad and Tobago may become one of the critical gas nodes for the Western Hemisphere.

This is due to:

- The country's success at establishing a large, flourishing natural gas industry.
- An increasing natural gas reserve base.

- Its strategic location off South America and close proximity to the US Gulf.
- Proximity to the substantial gas reserves off east Venezuela.

Plans for future industrial development must recognize the likelihood of continued expansion of the country's gas-based industrial sector, with the attendant issues arising from increased plant size, greater breadth, depth, diversity and complexity.

Chapter 2 of the Energy Subcommittee's report identifies trends in global industry and in selected energy-based products, and attempts to position future developments in Trinidad and Tobago within that context. This will include the following factors:

- Electricity as an industrial input and the potential spin-off industrial and commercial activities,

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including e-commerce and the information and communications technology (ICT) sector in general.

- Value-added oil and gas-based activities such as possibly expanded refining activities and more complex petrochemical synthesizing processes, such as ethylene, gas-to-liquids (gtls) and methanol-to-olefins (mtos).
- The possibility of additional commercial hydrocarbon discoveries.
- Port and harbour facilities, trading and shipping services on a larger scale.
- Supply services and logistics support for expanded offshore oil and gas operations and increased exports.

- New approaches to downstream value-added activities.
- Replacement of obsolete plant and equipment to maintain competitiveness.
- Global technological change and its impact on exploration and production, refining, and gas-based industrial development.
- Scaleable support services such as financial services, environmental services and human resource development to match the projected level of activity.

There are currently four gas suppliers, with the dominant supplier controlling more than 70% of the market while holding the largest single share of the gas-prone acreage offshore. Based on current trends, the number of suppliers is expected to

increase to 10 over the next two decades.

Nine gas consumers currently account for just over 95% of consumption and this could expand to 20 between 2004 and 2024. The midstream sector (gas transmission) comprises two providers, one of which is the State-owned National Gas Company of Trinidad and Tobago (NGC). It should be noted that important elements of the de facto regulatory framework for gas transmission remain informal and not codified into regulations. Both the consultants who developed the Gas Master Plan and the downstream gas consumers have suggested the need for changes to this framework.

The advent of LNG may have generated the critical mass necessary to sustain a domestic capability in a whole new range of activity

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linked to the upstream sub-sector. As a result, the energy industry has now crossed a new threshold, into a future upheld by four essential pillars — apart from expansion and replacement for future development:

- Deepening the reach of industries into new, more complex and different areas, such as upstream offshore services, upstream fabrication, and design engineering — both upstream and downstream;
- Mitigating economic risk;
- Increasing the overall benefits that accrue to the nation through enhancing the role of domestic capital in the sector, labour (including management by Trinidad and Tobago nationals), the application of appropriate technology and local institutional and

business development, including enterprise development and increasing institutional capacity. For example, strategic injections of Government equity, or for facilitating the entry of domestic private capital (to ensure that benefits of the natural gas endowment accrue to national stakeholders) will be critical to furthering national development. There are very real possibilities for expanding domestic private sector participation in the Trinidad and Tobago energy sector, and for expanding the operations of domestic energy companies abroad. These initiatives should be actively explored and encouraged. Many of these issues are addressed

in Chapters Four, Five, and Six; and

- Finally, the need to create sustainable economic life beyond the era of oil and natural gas is clearly a critical requirement. Chapter Seven seeks to articulate the challenges in this regard.

CRITICAL NEW REALITIES

The energy sector has always attracted the best and brightest of the country's technical and managerial talent, largely because it offers the highest levels of compensation and is willing to be resourceful in attracting local talent. However, its increasing complexity over the past 20 years has rendered it difficult to comprehend by much of the general public and by professionals and business

OVERVIEW

persons who operate outside the sector's scope. Given the scale of current operations and the potential for future expansion, two critical realities present themselves:

- The cream of skilled expertise will continue to be attracted to the energy sector.
- The skills gap between the energy sector and the rest of the country will continue to widen.

Managing these realities while making the best use of emerging opportunities will pose significant challenges for Trinidad and Tobago. This report identifies possible responses.

Several issues demand immediate attention:

- Interpretation and classification of economic data through which economic evaluation and strategy are conducted.

- Concerted efforts at public education and wider understanding of the energy sector among key national institutions, both within the central government and in key non-government agencies.
- The need to develop new and expanded institutional capacity in both the State sector and private sector, with greater emphasis on institutional enterprise and enhanced entrepreneurial capacity outside the State sector.

Further, the impact of the continued development of the natural gas industry on the environment, health, and safety of neighbouring communities will become more critical. In particular there is need to pay greater attention to the impact of future development on the

surrounding communities, especially the **human impact**. As such, the opportunity now exists to develop a comprehensive long-term industrial development plan based on a minimum of 20 more years of energy-related industrial and commercial development.

One starting point will be the identification of potential industrial sites suitable for such activity and with potential for future expansion. The domestic energy sector's ability to enhance development in Trinidad and Tobago is now evident, particularly as the country becomes an international player with global operations. Such improvements can encompass skills enhancement through training, employment and business development in allied services. Improvements can also be made through

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deliberate policy decisions designed to disperse sector activity as required for the development of Trinidad and Tobago. Given the likely size and scale of the new activity, security, shipping congestion and maritime safety issues will assume a much larger role in planning and development.

ENERGY SUB-COMMITTEE FUNCTIONING

The Vision 2020 Energy Sub-Committee was established by the Government of Trinidad and Tobago and met for the first time on April 4, 2003. At the initial meeting, the Sub-Committee reviewed the Draft Terms of Reference for the Sub-Committee and amended it. Appendix I to the report is the Final Draft of the Terms of Reference, as agreed by the Energy Sub-

Committee. The convener of the Sub-Committee added several persons and organisations to the Sub-Committee, including the Association of Professional Engineers of Trinidad and Tobago (APETT), the Society of Petroleum Engineers (TT Section), the Geological Society of Trinidad and Tobago, the National Energy Business Alliance (NEBA), the Trinidad and Tobago Electricity Commission (T&TEC), National Petroleum Marketing Company, and a representative of the banking sector, among others.

A one-day workshop held at Petrotrin on April 10, 2003 was attended by 30 people. The session was facilitated by Dr. Kermit Walrond, Distinguished Member, SPE Int., and a retired former Vice President of BP Amoco,

Azerbaijan. Chapter Three is the Executive Summary of this Workshop's proceedings. It has been used as a guide to the conduct of meetings of the Sub-Committee since then.

Appendix 3 is the minutes of the Workshop.

While the Energy Sub-Committee had available to it the Executive Summary of the Gas Master Plan (2002), as prepared for the Ministry of Energy by Gaffney, Cline and Associates, it was unaware of the Government's views of the plan and its desired future hydrocarbon sector policy.

The Sub-Committee was also aware of the award of a consultancy contract by the Government of Trinidad and Tobago for a review of the fiscal regime surrounding the hydrocarbon sector, as well as a review of institutional

OVERVIEW

capabilities. The likely effects of these initiatives would have to be factored in and would necessarily have

an impact on some aspects of this exercise. Finally, the Committee sought and obtained the views of

companies and institutions that participate in, or are affected by, the energy sector in Trinidad and Tobago.

TRINIDAD AND TOBAGO IN THE GLOBAL ENERGY ENVIRONMENT — THE LONG VIEW

GAZE INTO THE FUTURE

- Oil demand to grow by 1.6% annually to 2030.
- Gas share of global energy market will increase from 23% to 28%.
- Strong economic growth in China will push global demand for energy-based commodities.
- US gas imports will rise from 10% of needs in 2010 to 30% of needs by 2030.

INTRODUCTION

For most of its history, the petroleum industry has been truly global and is dominated

by a few mega corporations that actively participate in all aspects of the business, from exploration and production of reserves to the production and marketing of an extensive variety of finished products.

In Trinidad and Tobago, the industry has enjoyed a long and proud history as a significant contributor to economic growth and development.

Oil was first discovered in Trinidad in 1866. By 1908 crude oil was being produced, followed by refining in 1912. Over the course of World War I and World War II, Trinidad was to play a very important role as a refuelling stop for American and British aircraft, ships and even submarines. By late 1960, this country was home to the largest refinery of the American oil giant Texaco.

Located just off the coast of Venezuela, Trinidad and Tobago shares its rich hydrocarbon-bearing geology that has yielded substantial reserves. It also enjoys additional benefits of a location that facilitates international and inter-hemispheric trade.

This chapter explores the nature of the global energy environment, with special focus on oil, natural gas and natural gas derivatives and selected downstream industries. It also examines the extent to which Trinidad and Tobago is, and expects to be, a participant in the global energy industry.

Most of the information on the global trends was sourced from two main documents, viz., World Energy Outlook 2002 (International Energy Agency) and International Energy Outlook 2002 (US

Department of Energy —
Energy Information
Administration).

The chapter incorporates a set of explicit assumptions about underlying macroeconomic and demographic conditions, technological developments and government policies and presents a baseline vision of how energy markets might evolve if governments individually or collectively do nothing more than they

have already committed themselves to doing.

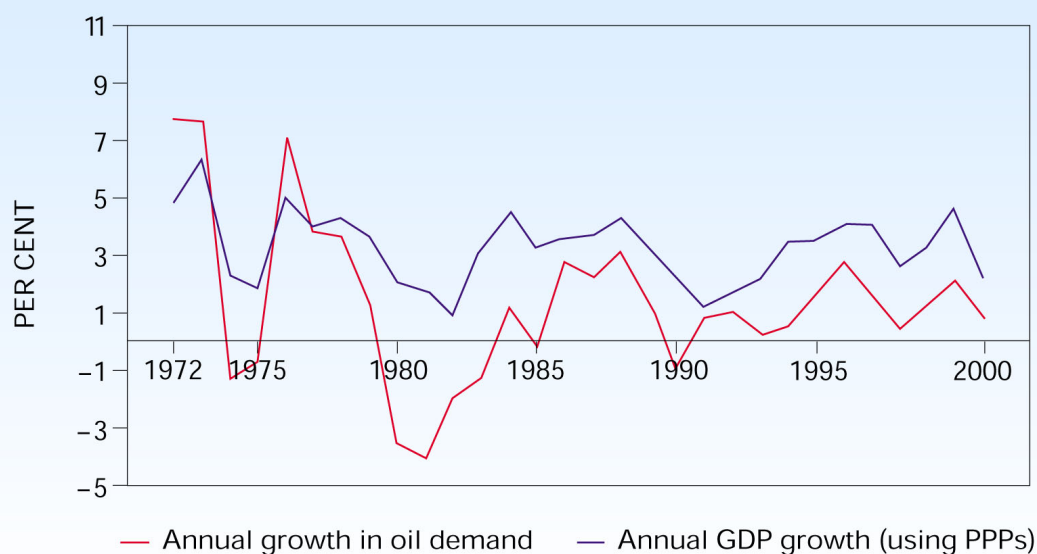
ECONOMIC GROWTH ASSUMPTIONS

The single most important driver of primary energy demand is economic growth. In developing economies, economic growth is tied to the level of mechanisation, urbanisation and industrialisation, all of which are strong drivers of energy

demand. In developed economies, while the link to gross domestic product is still significant, it is weaker than in developing economies because of the increasing importance of their service sectors.

Since 1971, each 1% increase in GDP has yielded a 0.64% increase in primary energy consumption except for the oil price shocks of 1973–1974 and 1979–1980 and the very warm weather of 1990.

Chart 2.1 : Global economic and oil demand growth



THE GLOBAL ENERGY ENVIRONMENT

Factors that account for the pessimistic economic projections in the short term include the Iraq war, declines in the stock markets in several of the G8 countries, global surplus capacity in many industries and hefty

debt burdens on companies and individuals who have become reluctant spenders and investors.

Indeed, the usually optimistic International Monetary Fund (IMF) predicted that the U.S.

economy would grow by 2.2% in 2003, which is slightly less than in 2002, while the economies of the European Union and Japan would do worse — only 1.3% and 0.8% respectively.

Table 2.1 : Comparison of oil demand projections 2002 - 2020

	GDP (average annual growth, %)	International oil price in 2020 (2000 \$)	Oil demand (average annual growth, %)
Shell*	3.5	n.a.	1.1
PEL*	3.0	22	1.6
OPEC*	3.3	20	1.7
WEO 2002	3.1	25	1.7
WEO 2000	3.1	27	1.9
US DOE 2002	3.2	25	2.2
DRI/WEFA***	3.2	23	2.2

*Dynamics as usual scenario, 2000-2025. ** 2000-2015. ***1999-2020

Note: The definition of the international oil price differs among studies.

Sources: Shell International (2001); Petroleum Economics Ltd (2002); OPEC Review (2001);

US Department of Energy/EIA (2002); DRI/Wharton Econometric Forecasting Associates (2001).

Nonetheless, early 2002 marked the beginning of the economic recovery of the US and other OECD countries. It

is now expected that the OECD countries and most other regions will experience greater levels of growth from

2004. Asia, especially China, will continue to experience significantly stronger than world average growth.

**OTHER
DETERMINANTS OF
ENERGY DEMAND AND
SUPPLY****Technological Innovation**

The pace of technological innovation and the rate at which new technology is adopted not only influence demand and supply trends, but also present a major source of uncertainty. Consequently, specific assumptions have been made to make projections more specific.

Demand-side Technologies

It is assumed that much of the current very heavy energy-using capital stock

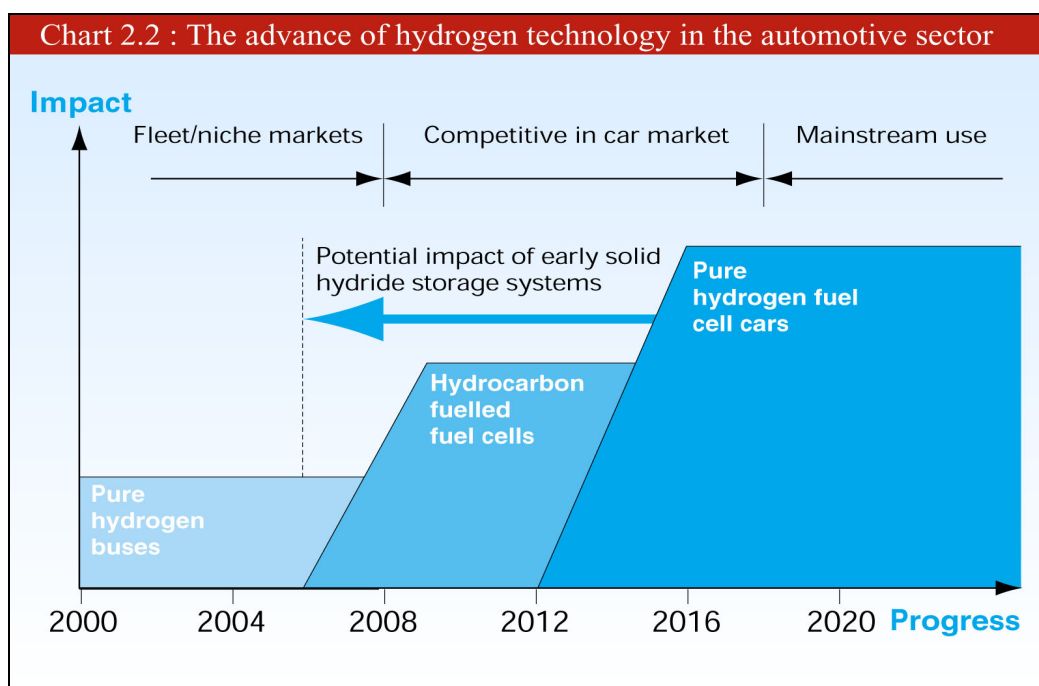
(refineries, heavy industries, power plants) still have long useful lives and will be replaced toward the end of the projection period.

Energy-efficiency technological developments will therefore not have significant negative impacts on demand in the short to medium term. In general, it is assumed that current technologies will become more efficient, but no new breakthrough technologies beyond those known today will be used.

It is expected that the fuel efficiency of new passenger vehicles will improve by 30% between the present time and

2030 in the European Union and 20% in Japan, Australia and New Zealand. However, the energy saved will be partially offset by an increase in mileage. No improvement is expected in the United States and Canada because technical advances in vehicle fuel efficiency will be offset by an increase in car size, weight and the number of appliances in each car.

Fuel-cell vehicles are not expected to penetrate the fleet market to any significant degree before 2030. Shell, however, has a more aggressive view of its adoption, as seen in the following illustration.



Supply-side Technologies

Efforts will continue to reduce oil and gas exploration and production costs. Key new technologies in this area, such as advanced seismic techniques, will improve the identification of reservoir characteristics. Better drilling and production engineering can also be expected. Further advances will be made in seismic interpretation, deep-water technologies and enhanced

oil recovery techniques. Major advances are also expected in high-pressure gas pipelines, LNG processing and gas-to-liquids production technology. It is also expected that continuing progress will be made in improving the fuel conversion efficiency of existing power generation technologies. The average efficiency of new combined-cycle gas turbine plants is assumed to rise from 55% in

2000 to 62% by 2030 in OECD countries. There will also be reductions in the capital costs of emerging fossil fuel and renewables-based power technologies.

Energy and Environmental Policies as a Factor Affecting Energy Markets

Changes in government policies and new measures on energy security and environmental protection, especially climate change,

could have profound consequences for energy markets. There are many sources of uncertainty, including the production and pricing policies of oil-producing countries, the impact of energy market reforms, taxation and subsidy policies. Regulations governing energy-related greenhouse gas emissions, the possible introduction of carbon permit schemes, and the role of nuclear power also affect the energy future. The type and degree of direct government involvement in setting energy and environment policies have a varying and strong effect on energy demand and demand mix. The assumption for this forecast period is that they do no more than they have already committed to doing — which is already proving to be a challenge.

Demographics as a Determinant of Energy Demand

Based on UN Population Division data (2001), growth will decelerate progressively over the projection period, from 1.2% per year in 2000-2010 to 1.0% per year in 2010-2020. Global population will expand by more than a third, from 6 billion in 2000 to 8.2 billion in 2030. Population will continue to grow at a faster rate in the developing countries, though more slowly than in the past, as birth rates drop. The developing countries' share of world population will grow from 76% in 2000 to 81% in 2030 and most of the increase in global population will occur in urban areas. In most developed countries, an increasing proportion of the population will be older while most developing countries will experience a

rapid rise in segment of prime working age. These trends suggest strong energy demand growth in developing regions and slower growth in developed countries.

GLOBAL ENERGY TRENDS

Global Primary Energy Demand

IEA projections are for global primary energy demand to increase by 1.7% per year from 2000 to 2030, reaching 15.3 billion tonnes of oil equivalent. More than 60% of the increase will come from developing countries (30% to 43%) as a result of rapid economic and population growth, especially in Asia, Central and South America. The OECD share of world demand will decline from 58% to 47%.

**Global Primary Energy
Demand Mix**

The World Energy Outlook 2002 predicts that fossil fuels will account for just over 90% of the projected increase in world primary demand to 2030. Oil will remain the single largest fuel in the primary energy mix, even though its share will fall slightly, from 38% to 37%. Oil demand is projected to grow by 1.6% per year, from 75 mb/d in 2000 to 89 mb/d in 2010 and 120 mb/d in 2030. The bulk of the increase will come from the transport sector. No other fuel will seriously challenge oil in road, sea and air transportation during the projection period, although

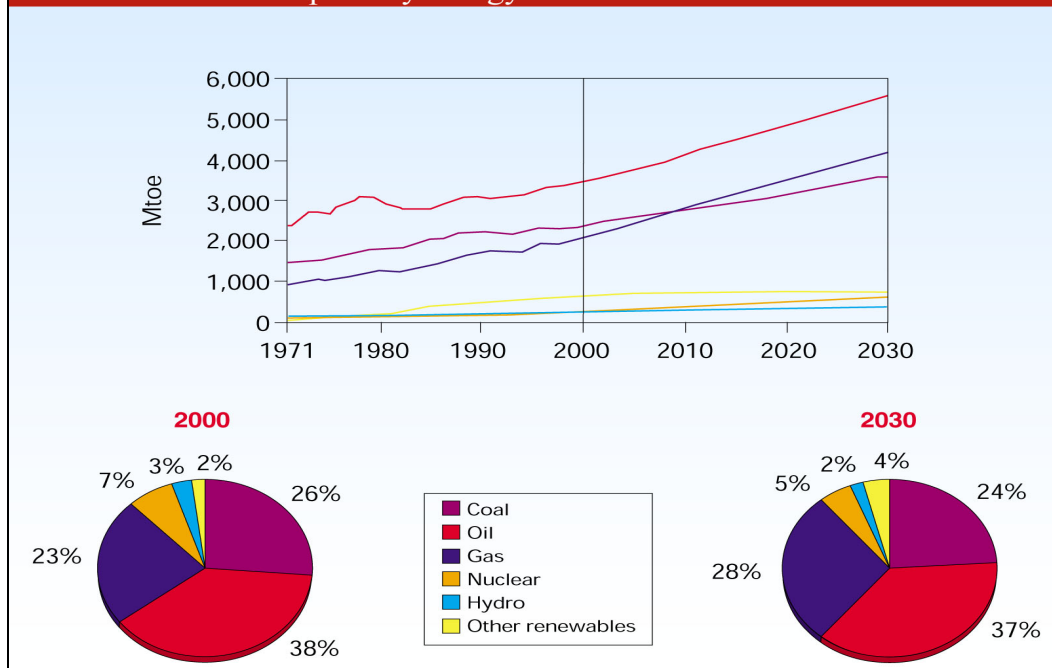
oil will remain a marginal fuel in power generation with a decline in the OECD area being offset by a small increase in developing countries. Moderate increases are projected in industrial, residential and commercial oil consumption. Most of these increases will occur in developing countries, where competition from natural gas for space and water heating and for industrial processes will be limited.

Demand for natural gas as an energy source and as feedstock for downstream industry will grow faster than for any other primary fuel, except for non-hydro-renewable energy sources.

With annual growth of 2.4% per year, gas will overtake coal just before 2010 as the world's second-largest energy source. Gas consumption will double between 2000 and 2030, and the share of gas in world demand will increase from 23% in 2000 to 28% in 2030, mostly at the expense of coal and nuclear energy.

This growth is driven by general economic expansion and the environmental premium placed on natural gas which is far less polluting than its main fossil fuel rivals. New power stations will account for over 60% of the increase in gas demand over the next three decades.

Chart 2.3 : World primary energy demand



Global Final-Use Energy Demand

Sectors

Transport demand will grow the most rapidly, at 2.1% per annum, overtaking industry in the 2020s as the largest final-use sector. Transport demand will increase everywhere, most rapidly in the developing countries, at 3.6% per year. OECD transport demand will grow

at a more leisurely 1.4%, because of saturation effects. The Residential and Services sectors' consumption will grow at an average annual rate of 1.7%, slightly faster than industrial demand, which will rise by 1.5% per year, while the Information and Communication Technology sector introduces a major uncertainty into the prospects for final energy use.

Sources

Among all end-use sources of energy, electricity is projected to grow most rapidly worldwide, by 2.4% per year from 2000 to 2030. Electricity consumption will double over that period, while its share in total final energy consumption will rise from 18% to 22%. Electricity use will expand most rapidly in developing countries, by 4.1% per year, as the number

of people with access to electricity and per capita consumption increase. Demand will increase by 2% in the transition economies and by 1.5% in the OECD. By 2030, electricity as a percentage of total energy consumption in developing countries will equate that of OECD countries.

Global Energy Supply

The world's energy resources are adequate to meet the projected growth in energy demand. Global oil supplies will be ample at least until 2030, although additional probable and possible reserves will need to be proved up in order to meet rising demand.

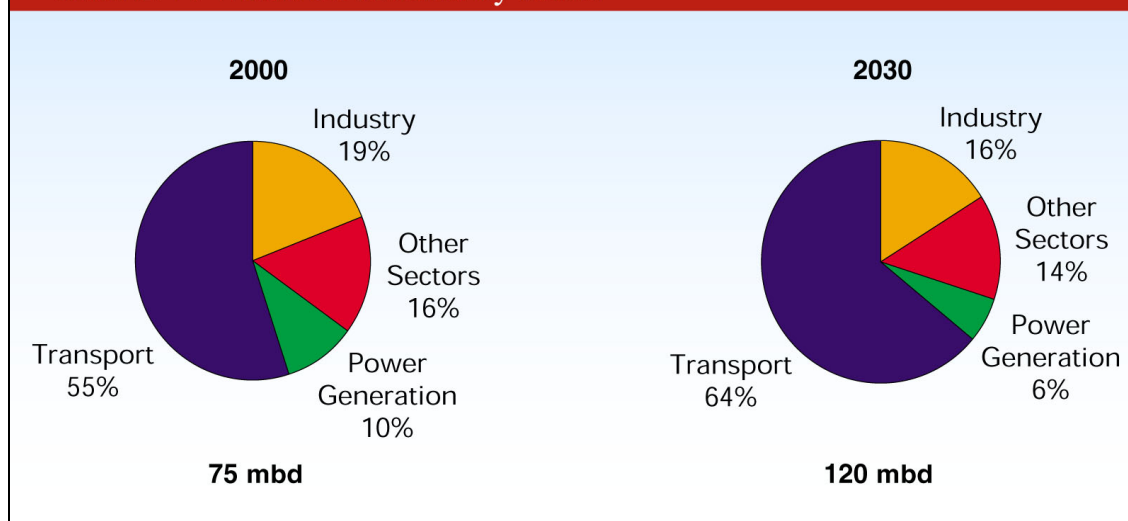
Unconventional oil will probably carve out a larger share of global oil supplies. Reserves of natural gas and coal are particularly abundant. Renewable energy sources are also plentiful. However, there will be a pronounced shift in the geographical sources of incremental energy supplies over the next three decades, in response to a combination of geological, technical and cost factors. The aggregate effect will be that almost all the increase in energy production will occur in non-OECD countries, compared to just 60% from 1971 to 2000.

OIL TRENDS

Global Crude Oil Demand

The fastest growth will occur in the rapidly expanding Asian economies, particularly China and India, while the largest increase in absolute terms will be in China and Organisation for Economic Cooperation and Development (OECD) North America. Almost two thirds of the total growth in oil demand will occur in non-OECD countries. The OECD share of world demand will drop from 62% in 2000 to only 50% in 2030. Transportation is projected to absorb 55% of total oil consumption by 2030, up from the current 47%.

Chart 2.4 : World oil demand by sector



Global Crude Oil Supply

At around \$4 per barrel, the total cost of developing new supplies in the Middle East is the lowest in the world and will ensure that region's continued dominance during the forecast period.

Production prospects for OPEC and non-OPEC countries alike are subject to uncertainty about the impact of short-term price volatility on potential investors and spending on upstream research and development. In many non-OPEC countries,

the production outlook will depend critically on new technologies that improve exploration-drilling success rates, lower engineering costs and permit production in such extreme environments as ultra-deep water and the Arctic.

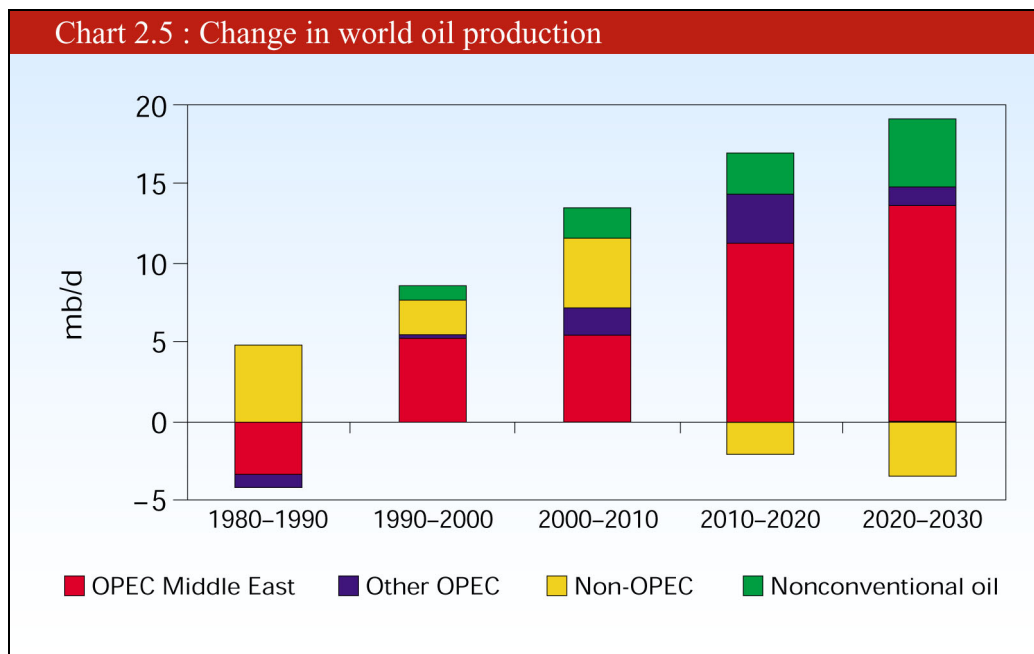
Oil production in the U.S., Canada, and Mexico is expected to rise in the near term. North Sea production is already in decline and this is unlikely to change. The only other non-OPEC producing

countries that will see a significant increase in crude oil production in the medium term are Russia, Kazakhstan, Azerbaijan, Brazil and Angola. Large projected increases from major offshore finds in Brazil and Angola will depend on the successful deployment of advanced deep-water technologies and on the existence of stable regulatory and tax regimes in both countries.

Nonconventional oil is expected to contribute just over 8% to total world oil supplies by 2030. The greater part of future nonconventional oil will come from Canadian oil sands and Venezuelan extra-heavy bituminous crude. These two regions contain an

estimated 580 billion barrels of recoverable reserves — more than the entire reserves of conventional crude oil in the Middle East. The proximity of Canada and Venezuela to the U.S. market will help these sources compete against lower-cost producers further afield. They

will also provide the United States and other countries with an opportunity to reduce their dependence on Middle-East crude oil, as OECD conventional oil production declines. The following chart shows the projected change in world oil production from 1980 to 2030.



The main factors that will influence the volume of nonconventional oil production during the forecast period are

international oil prices, capital investment and environmental policies. Recent technological improvements have

drastically reduced the cost and energy intensity of exploiting nonconventional oil resources. But their costs remain higher than those of

conventional oil, and significant investment will be required to make them fully competitive.

International Oil Trade

Oil trade is set to grow considerably as the gap between indigenous

production and demand widens in all regions. The increase is most dramatic for Asia, where imports jump from 4.9 mb/d (42% of demand) in 2000 to 24 mb/d (83%) in 2030. Among the three OECD regions, Europe's dependence grows

most rapidly, from 52% to 85%, while the Pacific remains the most import-dependent at almost 94%. Rising production in Canada, especially from oil sands, and in Mexico will help to temper the increase in North America's imports.

Oil Markets Outlook To 2030

- Oil demand projected to increase by 1.5% per year to 2030.
- Largest increase occurs in non-OECD countries. OECD share of global demand falls to 45% from 51% in 2000.
- 75% of increase comes from the transportation sector, which by 2030 will absorb 67% of total oil consumption compared with 55% in 2000.
- Middle east OPEC will continue to be the dominant supply source and the world's swing producer.
- Nonconventional oil will grow to 8% of supply with important contributions from Canada and Venezuela.
- Global oil trade will grow considerably as the gap between production and demand widens.
- Light and middle distillates will represent 82% of refined products, up from 78% in 2000.
- Gtl plants will play an important role in meeting incremental demand for middle distillates.

Trinidad and Tobago's Oil Sector

Trinidad and Tobago is the Caribbean's leading producer of oil and gas, with around 25% of the country's Gross Domestic Product coming from the energy sector. However, at the current production rate of 130,000 bopd, projections indicate that crude oil reserves that have previously been consistently between 600 and 800 million barrels for several decades will now increase significantly as a result of the recent offshore oil discoveries by BHP Billiton off the north-east coast of Trinidad.

The land-based fields are very mature and have been in decline over the last 20 years. Many industry professionals are of the view that, with the application of state-of-the-art technologies (e.g. deep-water and seismic interpretation

technologies) and appropriate government policies and incentives, significant finds may yet be made both onshore and offshore, and oil production will continue well beyond 2020.

Approximately 80% of the crude oil produced is exported, primarily to be processed in the North American facilities of the multinationals who own the leases. The rest is refined locally at the country's sole facility. Indigenous crude accounts for about 40% of the local refinery's crude diet; the remainder is imported mainly from neighbouring Venezuela.

Global Trends in Crude Refining

Global demand for refined petroleum products is expected to increase by 1.5% per year, from 71 mb/d in 2000 to 114 mb/d in 2030.

Almost three quarters of this increase will come from the transport sector. As a result, there will be a shift in all regions towards light and middle distillate products and away from heavier oil products, used mainly in industry. By 2030, light and middle distillates will represent 82% of global refined product demand, up from 78% in 2000.

To meet demand for refined products of 114 mb/d, global refining capacity is projected to increase by an average of 1.3% a year, reaching 121 mb/d in 2030. Over 80% of this additional capacity will be built in non-OECD countries. GTL plants also account for a growing share of refined product supply.

The largest expansion in supply will occur in Asia but the highest rate of refining capacity growth is projected

to occur in the Middle East. The additional capacity will outstrip new local demand and the region is expected to become an increasingly important exporter of refined products. In the OECD regions, sluggish increases in demand for refined products will be met by a capacity creep at existing refineries and by an increased reliance on imports, which supplied just over 2% of total product demand in OECD countries during 2000 but are expected to increase to 11% by 2030.

This change will be due largely to the increased imports of OECD North America, which are projected to reach one fifth of the region's product demand by 2030. Environmental concerns about refinery operations are a factor in this trend.

Throughout the forecast period, refinery complexity

will have to be increased in order to raise yields of light and middle distillate products so that refinery output continues to match the changing profile in market demand. The fastest growth in demand for light and middle distillates is expected to occur in Asia. However, in general, Asian refineries have low complexity, reflecting the region's large market for heavier oil products.

The most complex refineries are found in North America and, to a lesser extent, in OECD Europe, which have high proportions of light products in their product mix.

Only minor improvements in conversion capacity will be required in these markets.

Any such investment in Europe is likely to be in the form of additional hydrocracking capacity in order to maximise yields of middle distillates, which are

in short supply. The biggest investments will go to reducing sulphur in diesel and gasoline and reducing the aromatic, benzene and olefin content of gasoline whilst maintaining existing octane levels.

Trinidad and Tobago Refining

Petrotrin owns and operates the country's only functioning refinery, located at Pointe-à-Pierre, which manufactures petroleum products for local consumption and for export to regional and international markets. In its heyday in the 1960s and early '70s, the refinery held the distinction of being Texaco's largest refinery with a capacity of 355,000 bopd. Due to changing economics, Texaco scaled back its operations and eventually sold the business to the State. Throughput having declined all the way

to 100,000 bopd, the refinery was upgraded to its current capacity of 160,000 bopd.

Approximately 20% of output is consumed domestically while the rest is exported. A total of 50,000 bopd is exported to the Eastern Caribbean where it commands a 70% share of the market, 30,000 to Central America and 60,000, mainly fuel oil, to the U.S.

In keeping with the global trend to higher octane levels with reduced threat to the environment, Trinidad and Tobago has committed to investment in new isomerisation and alkylation

plants. With Petrotrin's refinery configuration having been designed to produce what is now an unacceptably high percentage of fuel oil (39%), options for "bottom of the barrel" upgrades designed to yield a larger proportion of the lighter and middle distillates are being vigorously investigated. However, only incremental capacity growth is contemplated at this time.

NATURAL GAS TRENDS

Global Natural Gas Demand

Gas consumption is projected to rise strongly in most

regions over the next three decades, driven chiefly by demand from power generators. Demand grows most rapidly in the fledgling markets of developing Asia, notably China, and in Latin America. Nonetheless, North America, Russia and Europe remain by far the largest markets in 2030. The share of gas in the global primary energy mix will increase from 23% in 2000 to 28% in 2030. The following table illustrates projected growth in primary demand for natural gas at 10-year intervals from 2000 to 2030.

Gas Markets Outlook To 2030

- World natural gas demand will grow at an average of 2.4% per year, increasing its share of global energy mix to 28% from 23% in 2000.
- China (5.6%), Asia (4.7%) and Latin America (5.2%) will lead growth.
- The import dependence of OECD countries in Europe and North America will rise.
- The U.S. will import 10% of its needs in 2010 and 30% by 2030.
- Global trade in LNG will increase sixfold between 2002 and 2030.
- Electric demand will be the major determinant of gas demand to 2030.

**TABLE 2.2 : WORLD PRIMARY
NATURAL GAS DEMAND (BCM)**

	2000	2010	2020	2030	Average annual growth 2000–2030 (%)
OECD North America	788	992	1161	1,305	1.7
OECD Europe	482	640	799	901	2.1
OECD Pacific	122	168	201	243	2.3
Transition economies	609	748	876	945	1.5
China	32	61	109	162	5.5
East Asia	83	139	200	248	3.7
South Asia	51	96	153	205	4.7
Latin America	105	167	251	373	4.3
Middle East	201	272	349	427	2.5
Africa	53	95	155	239	5.2
World	2,527	3,377	4,254	5,047	2.4

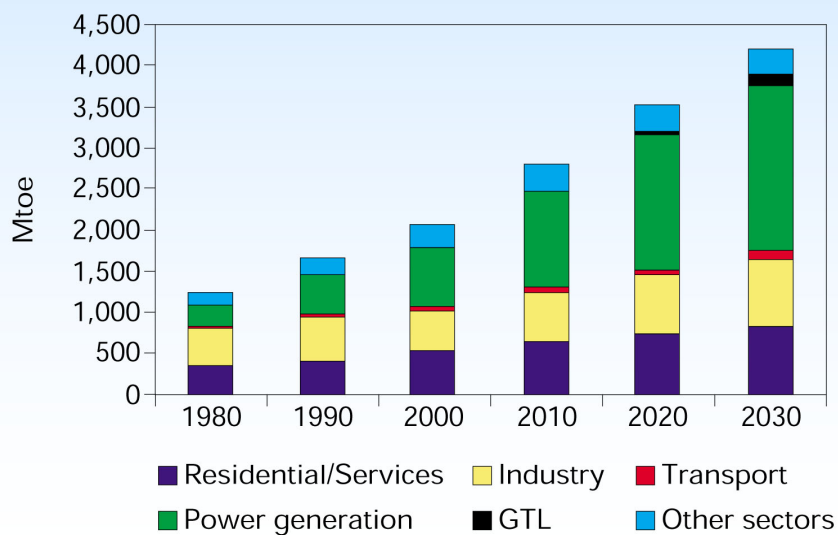
GTLs

A key feature of the primary gas consumption projections is the emergence of gas-to-liquids (GTL) plants as a new market. GTL production costs have fallen sharply in recent years, largely due to improved yields and thermal efficiency. The latest GTL

technologies being developed by Shell and Sasol are projected to cost \$20,000/bbl of capacity. GTL can yield a better return on investment than can oil refining if the cost of the natural gas feedstock remains significantly lower than that of crude oil. Shell claims that

its Middle Distillate Synthesis technology is profitable at a crude oil price of \$14 per barrel and plans four 75,000-b/d plants, possibly in Egypt, Indonesia, Iran and Trinidad and Tobago.

Chart 2.6 : World natural gas demand by sector



Global Natural Gas Supply

Half of the world's gas reserves are found in two countries, Russia and Iran. The ratio of global reserves

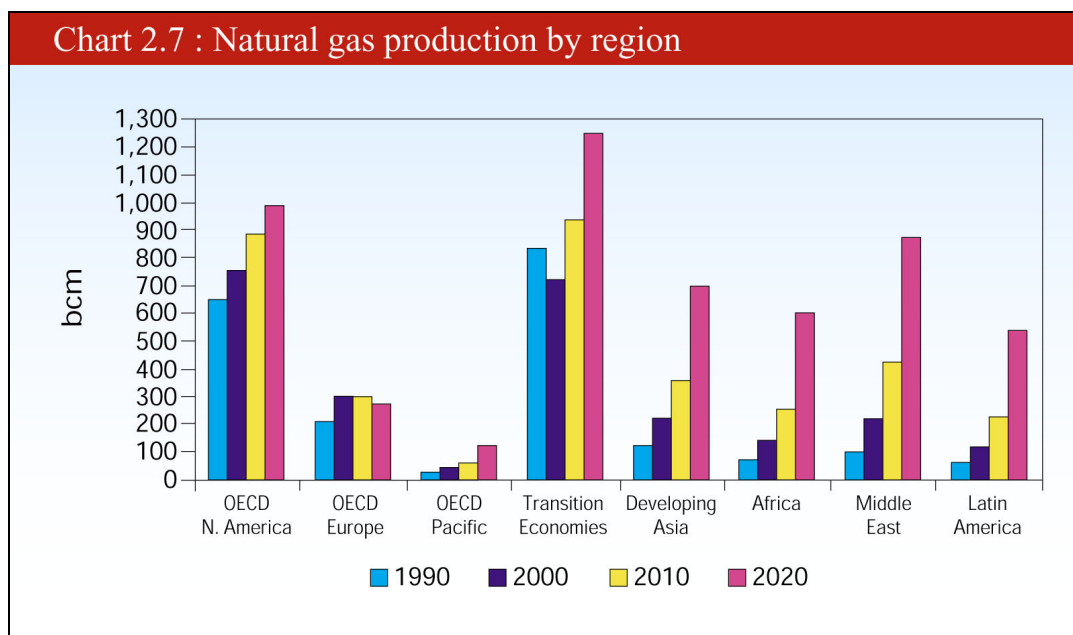
to production is around 60 years at present rates, compared to less than 44 years for oil. Strong growth in gas reserves has occurred in the former

Soviet Union, the Middle East and the Asia-Pacific region. However, as much as a third of the world's gas reserves are currently "stranded". Most of the

incremental output will be exported to Europe and

North America. Output will also increase quickly

in Africa and Latin America



Gas Hydrates

In the regions just outside the continental shelf surrounding all the continents of the world, immense volumes of methane gas are trapped as hydrates under the ocean floor. Some reliable sources estimate that these volumes of methane, which far exceed conventional gas resources, will be technologically feasible to extract by 2030.

The importance of the hydrates to future technological trends lies in their ability to provide a source of hydrogen for fuel cells very far into the century.

Global Natural Gas Trade

The geographical mismatch between resource endowment and demand means that the main growth markets for gas are going to become much

more dependent on imports. This has major implications for developing cost-effective long-distance transportation technologies and delivery systems (pipeline, LNG, CNG, methanol) as well as the possible location or relocation of downstream industries closer to reserves. Europe's import dependence will continue to rise, from

36% in 2000 to 69% in 2030. The Middle East will emerge as a major new supplier of gas to Europe, while Latin America (Trinidad and Tobago and Venezuela) will greatly increase exports to Europe. Russia, together with other former Soviet Union republics, will remain the largest single supplier to Europe. OECD North America, which is more or less self-sufficient in gas at present, is expected to have to import 10% of its needs by 2010 and 26% by 2030.

All of these imports will be in the form of LNG, from Latin America, Africa, the Middle East and Asia. There are few physical connections now between the main regional markets of North America, Europe, Asia-Pacific and Latin America. But these are expected to increase considerably, with a rapid expansion in LNG trade and

the construction of new long-distance and undersea pipelines. Indeed, Trinidad and Tobago is actively considering all methods by which it can supply gas to the rest of the Caribbean (pipelines, LNG and possible CNG and gas hydrates). LNG shipping capacity will increase by at least 40% just between 2002 and 2005.

Trinidad and Tobago's Natural Gas Sector

Trinidad and Tobago Natural Gas Demand

Trinidad and Tobago has become one of the major natural gas development centres in the world. Trinidad now has eight ammonia complexes, five methanol units, a urea plant and an iron and steel facility and enjoys the distinction of being the world's leading exporter of ammonia and methanol.

In 2003, LNG accounted for approximately 53% of natural gas sold in the country. Of the remaining gas volumes sold, petrochemicals accounted for 64%, power generation for 19%, iron and steel manufacture for 7% and gas processing for 2%. Since then, demand has continued to increase rapidly as additional LNG trains come on stream and capacity increases in ammonia and especially in methanol. Another factor influencing the increase in demand for natural gas locally is the increased demand for electricity for both domestic and commercial use. Also, should the proposal before the Government for an aluminium smelter come to fruition, significant additional amounts of gas-based energy would be required. The global downturn, exacerbated somewhat by the events of September 11,

THE GLOBAL ENERGY ENVIRONMENT

2001, has had little impact on Trinidad and Tobago's natural gas industry. The more recent rapid development of the energy industry has taken place mainly in LNG. Cambridge Energy Research Associates has stated that "North

American gas production is heading for a long-term decline and other countries will be called upon to make up the difference. LNG volumes, which only a few years ago were seen as an effective but tiny piece of the U.S. supply puzzle, will

ultimately have to soar to 9 bncfd to match demand growth". Trinidad and Tobago is well placed and ready to increase production for this market, justifying a fourth LNG train.

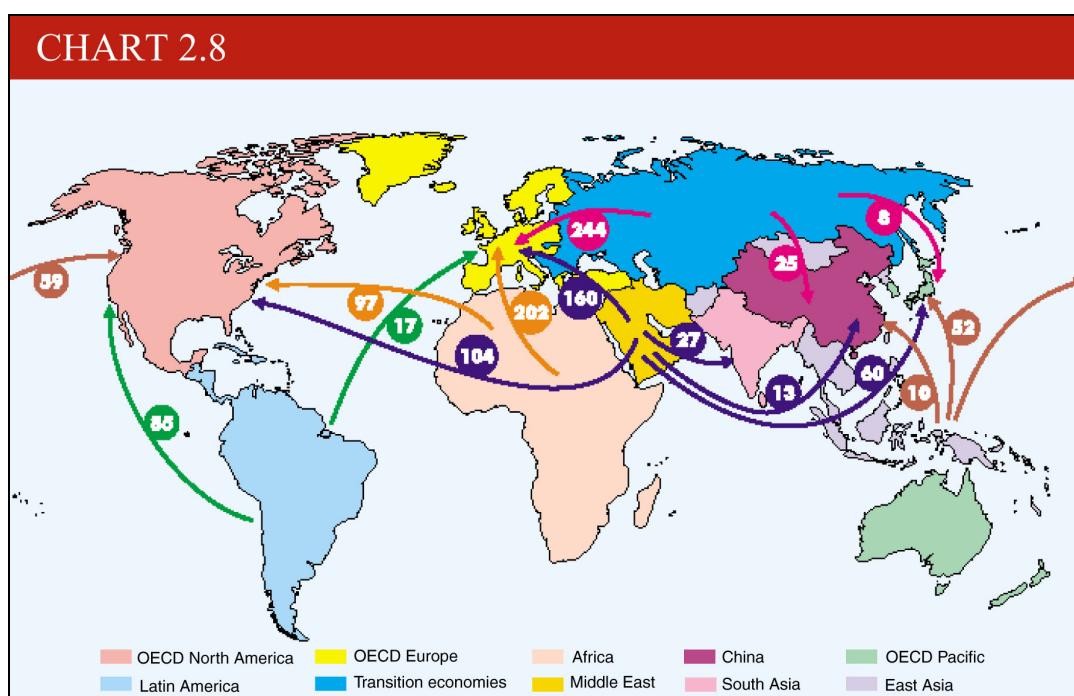
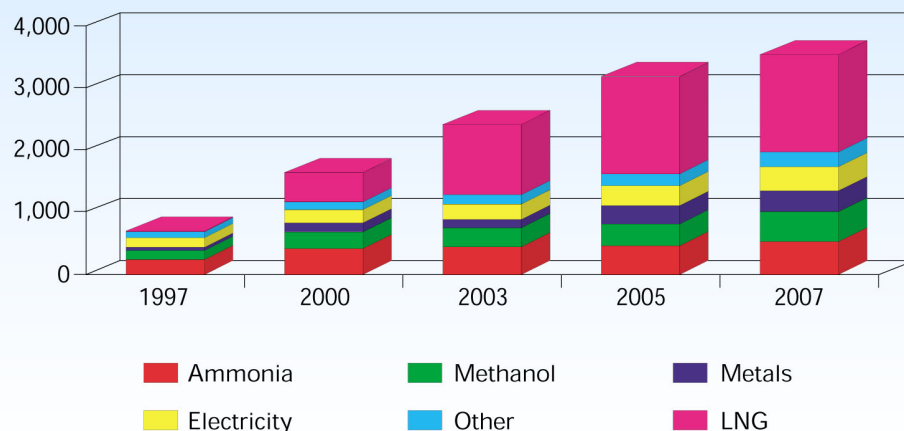


Chart 2.9 : T&T natural gas demand (MMSCFD)



The rise in gas production, stimulated by the expansion of LNG and the petrochemicals sector, has opened up the possibility of a whole new downstream industry — ethylene. Trinidad and Tobago has explored the idea of building a US\$1 billion ethylene petrochemicals complex but, for a variety of reasons, including insufficient quantities of ethane that could be extracted from the natural gas currently

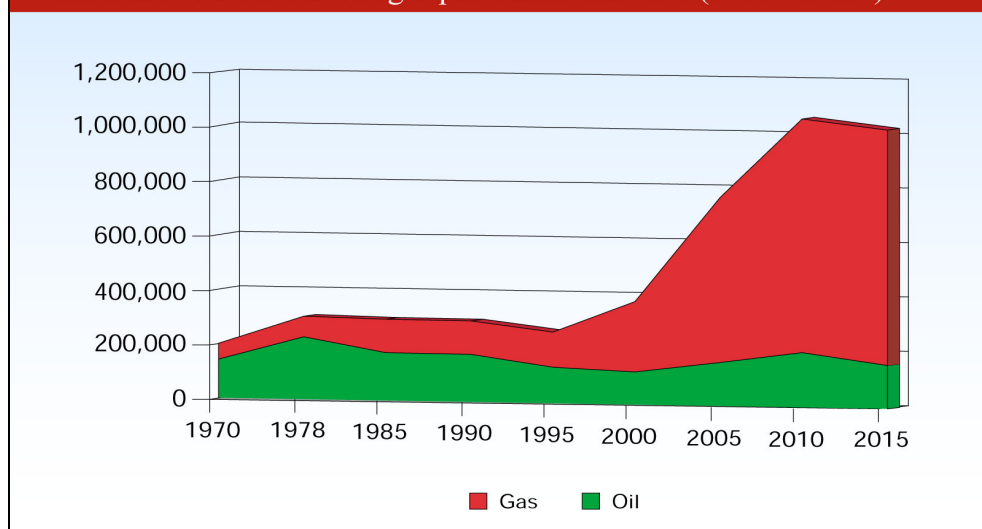
produced locally, it was deemed unjustifiable.

Trinidad and Tobago Natural Gas Supply

The major gas finds have been offshore in acreages leased by the large multinationals — BP Trinidad and Tobago LLC, British Gas and EOG Resources Trinidad Limited. Minor foreign players include Agip and EOG. Local producers include Petrotrin, Trintomar and Venture.

Unlike a decade ago, the sharp global increase in demand for gas and the broadening of gas applications have provided Trinidad and Tobago with a guarantee of a ready market leading to great expectations of a “tsunami” effect on the local economy fuelled by gas sales. Chart 2.10 depicts gas production in relation to oil, the traditional driver of the economy.

Chart 2.10 : T&T Oil and gas production forecast (1970 - 2015)



Petrochemical Market Outlook

- World methanol demand will grow at 1.6% per year for the next decade and increase by 3% beyond 2010.
- Increases in formaldehyde and acetic acid demand and the introduction of fuel cells will partly offset the sharp decline in use as methyl tertiary butyl ether.
- World capacity growth will keep pace with demand and capacity reductions in the OECD.
- Volatile natural gas prices in the U.S. will force U.S. ammonia producers to expand offshore production to hedge against gas price risks.
- The emerging countries with abundant low-cost gas reserves will receive the bulk of the new capacity in both methanol and ammonia.
- Global ammonia demand will grow at the general pace of world economic growth.
- Global exports are expected to increase by 2.9% per year to 2008.
- The major end uses of ethylene are forecast to grow by 3–4% per year to 2008.
- The middle east will continue to supply over 70% of global ethylene production.

GLOBAL PETROCHEMICAL TRENDS

Methanol

Global Methanol Demand

Demand for methanol is driven by demand for its derivatives. Its major derivatives are discussed below but its use as a fuel is increasing in importance. Global demand for methanol is expected to grow by 1.6% by 2010 with new applications playing a major role.

Traditional Markets

Formaldehyde

Formaldehyde is, and continues to be, the single largest consumer of methanol in the world. Accounting for about 33% of estimated methanol demand in 2001, it is widely used as a raw material in the building and automotive industries.

Historically, its growth has closely paralleled world economic growth and this pattern is expected to continue over the study period. With no competing feedstock technology to replace methanol, demand growth at world GDP rates is assumed for this derivative.

Methyl Tertiary Butyl Ether (MTBE)

MTBE is methanol's largest derivative in the U.S. and its second largest derivative globally. The market for this important derivative is at risk in the U.S., with State and Federal authorities clamouring for its phaseout in the short to medium term. Although there are a number of uncertainties surrounding the phase-out of MTBE in the U.S., for forecasting purposes a worst case scenario is adopted and it is assumed that MTBE will be eliminated in California over the period

2003 to 2004 and in the rest of the U.S. by 2006.

On the other hand, the E.U. expects to manage the risk of ground-water contamination more assiduously, thereby avoiding the phase-out of MTBE. The projection is for increased demand in non-U.S. regions, for example in Europe as countries there move to tighter gasoline specifications, and Asia and other countries as lead is phased out, leading to increased requirements for clean octane. Accordingly, a rapid elimination of MTBE will not be likely and the market should continue to be robust. This has positive implications for the French Caribbean islands and Trinidad's gasoline supply to that sub-region.

Acetic Acid

Acetic acid is the third largest consumer of methanol, representing about 9% of total demand. Vinyl acetate (VAM), used in the manufacture of paints, adhesives, film, paper and textiles, is the largest and fastest growing consumer of acetic acid. Accordingly, in the short term, methanol demand growth into this derivative is expected to grow at above-average GDP rates, at about 6% annually up to 2006 and thereafter track world GDP rates.

Other Derivatives

Formaldehyde, MTBE and acetic acid together represent just over 70% of total demand worldwide. Markets for the remaining derivatives,

including methanol-to-olefins (MTOs), are individually small but, when combined, represent the remaining 30% of global methanol consumption. In general, methanol demand into these derivatives is projected to increase with global economic growth.

Emerging Uses

Fuel Cells

The forecast continues to assume that, in the medium to long term, methanol may become a source of hydrogen for fuel cells used in stationary power generation and portable power applications to be followed by use in transportation. The estimates are conservative, however, as alternate sources for hydrogen generation in

fuel cells are gaining strength.

Global Methanol Supply Forecast

World capacity will continue to expand as countries with low-priced natural gas continue to construct methanol plants as a vehicle for monetising their natural gas resources. However, based on historical data, it appears that the start-up of low-cost facilities will force production rationalisation of U.S. facilities and, to some extent, those in Europe which are at the top of the production cost curve.

Table 2.3 : Methanol demand by end use (2001 - 2010)

World Methanol Demand ('000 MT) — (2001 – 2010)										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Formaldehyde	10,053	10,203	10,510	10,825	10,654	10,974	11,303	11,642	11,992	12,351
MTBE	8,246	8,369	7,380	6,408	4,371	3,388	2,764	2,844	2,925	3,009
Acetic Acid	2,766	2,807	2,976	3,154	3,160	3,255	3,352	3,453	3,557	3,663
MMT	824	837	862	888	935	963	992	1,022	1,052	1,084
DMT	455	462	476	490	366	377	388	400	412	424
Fuels	606	616	634	653	244	251	259	267	275	283
Fuel Cells					299	405	561	780	1,184	1,459
Methanol to Olefins							2,000	2,000	2,000	2,000
Solvents	1,235	1,254	1,291	1,330	1,370	1,411	1,453	1,497	1,542	1,588
Others	5,243	5,321	5,481	5,645	6,209	5,815	6,396	5,989	6,588	6,169
MTHL TOTAL DEMAND	29,427	29,869	29,608	29,393	27,609	26,839	29,469	29,893	31,526	32,031

Beyond 2010, demand is projected to grow by 3% per annum.

Trinidad and Tobago — Methanol

There are five existing plants with an overall capacity of approximately 2.9 million tonnes per annum. This sub-sector has enjoyed by far the largest local private sector participation in the energy industry. Local insurance giant Colonial Life Insurance Company (CLICO) has invested in four of the five plants. Atlas, a sixth plant,

with a name plate capacity of 5,000 mtpd, is expected to be commissioned by the first quarter of 2004. This plant will be the largest in the world and will consolidate Trinidad's position as the world's largest exporter of methanol. M5000, another mega plant, is now also under construction. Mega plants such as these help to reduce unit costs and will make Trinidad and Tobago more

competitive. Trinidad and Tobago's major markets are the U.S. (60% of total production) and Western Europe (36%).

Global and Local Ammonia Trends

Trinidad and Tobago ammonia producers have a combined annual production capacity of 5.2 million tonnes per annum, making this country the largest exporter

of ammonia in the world. Four companies with nine plants produce ammonia locally.

The major export markets for ammonia from Trinidad are, like methanol, the U.S. and Western Europe. World exports are expected to increase by 2.9% from 2004-2008.

Ammonia is used in the fertilizer industry in direct application or in downstream products such as urea, ammonium nitrate and nitrogen solutions. Ammonia also has industrial uses such as the manufacture of pharmaceuticals, plastics, resins, adhesives, dyes, explosives and tyres.

Despite having an installed capacity of 17.5 million tonnes annually, ammonia imports for consumption into the U.S. have increased from 3.5 million tonnes in 1998 to

4.6 million tonnes in 2002, while production declined in the U.S. from 13.8 million tonnes to 9.5 million tonnes over the same period. Of the imports, 59% came from Trinidad, ahead of Canada (24%) and the Ukraine (5%). The increase in gas prices forced ammonia producers to reduce their operating rates and increase imports from lower-cost production sites.

The trend is for U.S. fertilizer companies to seek to invest in production facilities “offshore” or out of the U.S. Five of the top eight U.S. ammonia producers (Agrium, PotashCorp, Farmland, MissChem and Koch) have “offshore” production to hedge against the high cost of production related to gas prices.

The fertilizer industry, of which ammonia and other downstream nitrogen fertilizer products are a part,

consumes a mere 3% of U.S. natural gas and therefore has little influence over the market. Natural gas accounts for a significant majority of the cost in the production of ammonia. As natural gas prices escalate in the U.S., ammonia production costs have exceeded market price of the product, resulting in shutdowns.

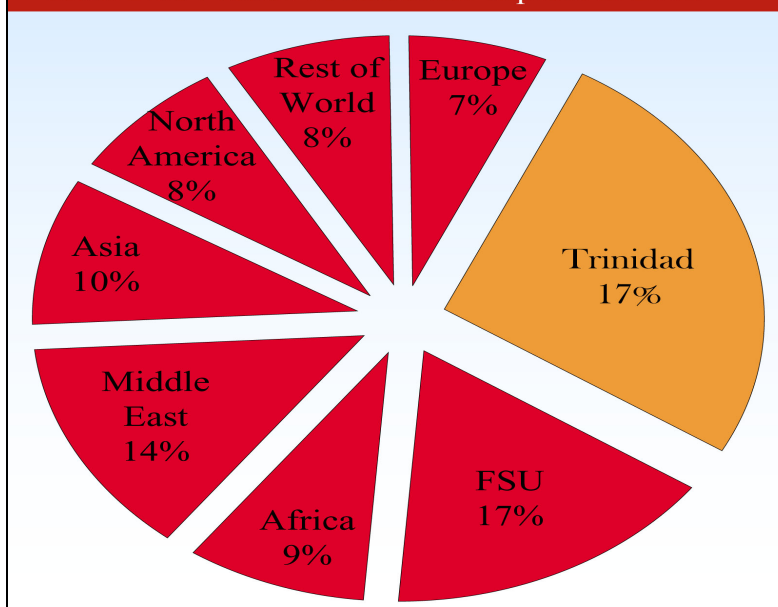
In March 2003, gas prices spiked at just over \$10 per mmBtu, resulting in the shutdown of 66% of the U.S. ammonia production capacity. The availability of low-cost ammonia from countries with low-cost natural gas such as Trinidad and Tobago, Venezuela and Argentina has the effect of preventing the ammonia price from keeping pace with the cost of production, hence the need to shut down plants in the face of high natural gas costs.

In addition to low gas prices, ammonia producers in Trinidad and Tobago enjoy a

competitive advantage due to their convenient location (and other factors such as political and economic stability and

other incentives) relative to the United States Gulf Coast.

Chart 2.11 : Share of ammonia exports in 2008



Ethylene

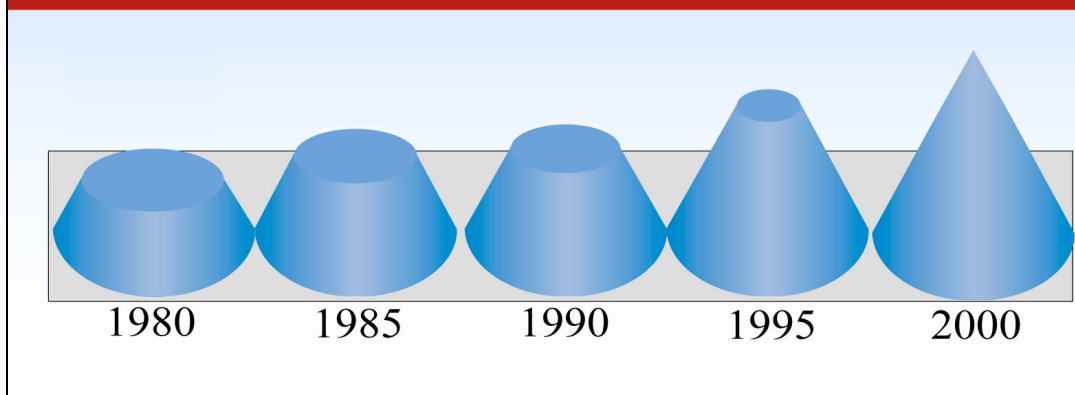
Global Ethylene Trends

Ethylene is one of the largest-volume commodity chemicals produced worldwide and is used as a raw material in the production of plastics, fibres and other organic chemicals

that are ultimately consumed in the packaging, transportation and construction industries and in a multitude of industrial and consumer markets. Its demand is sensitive to economic cycles. In 2001, global ethylene production

amounted to 90.4 million metric tonnes, with an estimated value of \$60 billion. This level of production represents an average annual growth of 3.9% from the 1997 level.

Chart 2.12 : World ethylene production



The scale of ethylene production is enormous. The typical size of a world-scale ethylene unit ranges from 454,000 to 680,000 metric tonnes per year. The largest single-unit ethylene plants in operation have capacities of 970,000–1,134,000 metric tonnes per year. These are exemplified by ExxonMobil's Baytown, Texas unit and SADAF's unit at Al Jubail, Saudi Arabia. The largest single-unit ethylene plant is a joint venture between NOVA and Union Carbide (now Dow) with an annual capacity of

1.3 million metric tonnes and a reported cost of \$750 million. The incentive to build these larger plants is the economic advantage of scale resulting from the reduction in capital requirements and production costs per pound of ethylene.

By far the largest world market for ethylene is the production of polymers, principally polyethylenes. From 2001 to 2006, polyethylenes will continue to be the largest consumer of ethylene, and consumption is expected to grow by 4% per year. Ethylene requirements

for ethylene dichloride (primarily for vinyl chloride/polyvinyl chloride) will grow at 3–4% per year. Ethylene consumption for ethylbenzene (for styrenic polymers) and for ethylene oxide (primarily for terephthalate polyester resins) will grow at annual rates of 4–6%. Other fast-growing end uses, albeit from smaller bases, include linear alpha-olefins, ethylenepropylene elastomers and vinyl acetate. In contrast, some major ethylene derivatives, such as ethyl alcohol and acetaldehyde, will continue to

lose volume as a result of competing technologies.

As of January 2002, world ethylene capacity amounted to 110 million metric tonnes per year. The fastest growing region will be the Middle East at 10-12% per year, followed by Asia (outside of Japan) and South America, each growing at roughly 6-8% per year. The growth in world ethylene capacity translates to an average annual increase of 4-5% during the 2001-2006 period. World ethylene demand is expected to grow at a similar pace of 4.3% during this period.

In the Middle East, over 70% of the ethylene produced in 2000 was ethane-based. Maximum annual ethane requirements for ethylene production in the region are about 108 million barrels. The Middle East might well

become the world's next major source of petrochemical products, with Saudi Arabia and Iran leading the way. The region's vast oil and gas reserves, availability and cost advantage of ethane-based ethylene production have prompted major investment in petrochemicals production. The region is expected to add an additional 9 million metric tonnes (180 million barrels) per year of ethane-based ethylene capacity by 2010. This additional capacity will account for 22% of the total additional ethylene capacity expected to be constructed worldwide by 2010.

Trinidad and Tobago Ethylene

Current local consumption of ethylene is approximately 30 to 40 metric tonnes per year and the feasibility of the construction of an ethylene plant with a capacity of

800,000 metric tonnes per year is under continuing review. This plant would utilize 45,000 to 50,000 barrels per day of ethane feedstock.

The production of ethylene can now be considered a more attractive downstream industry for Trinidad and Tobago for the following reasons:

- The production of ethylene-based products is labour intensive and therefore involves low levels of capital expenditure.
- Technical skills required for downstream products are low-level to moderate.
- The construction of an ethylene plant may trigger the creation of a set of downstream industries that could spawn significant

economic benefits for the country.

The very high level of capital as well as the logistics and marketing issues, however, make the feasibility subject to further review.

ALUMINIUM

Aluminium Supply

Aluminium ore, or bauxite, is plentiful and occurs mainly in tropical and sub-tropical

areas such as Africa, the West Indies, South America and Australia. There are also some deposits in Europe. Primary aluminium production facilities are located all over the world, often in areas where there are abundant supplies of inexpensive energy.

The known reserves of high-quality bauxite are sufficient to provide over 300 years' supply. The world's primary aluminium industry produces

over 24 million tonnes of aluminium metal per year. Most of this production comes from approximately 120 aluminium smelters around the world. These smelters account for over 90% of world production but exclude China, which produces between two and three million tonnes per year. There are over a hundred primary smelters in China, but many are very small.

Table 2.4

Energy Sources Of Electrical Power used in Primary Aluminium Production in 2001

Energy Source	Electrical Power Used (Gigawatt hours)							Percentage of Grand Total
	Africa	North America	Latin America	Asia	Europe	Oceania	World Total	
Hydro	6,955	47,105	27,735	3,621	28,755	7,202	121,373	48.9
Coal	13,325	23,198	1,177	9,877	16,932	24,199	88,708	35.8
Oil	0	149	471	405	1,120	0	2,145	0.9
Natural Gas	35	315	1,047	16,060	5,719	0	23,176	9.3
Nuclear	186	715	90	0	11,720	0	12,711	5.1
Total	20,501	71,482	29,963	29,963	64,246	31,401	248,113	100

Aluminium is a sustainable material, an “energy bank” whose original significant energy input can be recovered each time the product is recycled.

Aluminium can be recycled profitably and repeatedly without loss in quality. While the primary production process is energy-intensive, recycling aluminium requires only 5% of the energy and produces only 5% of the CO₂ emissions in comparison to primary production. There are still 400 million tonnes of the metal in use which will eventually be available for recycling, satisfying around a third of world demand for aluminium, and it is an ever-growing proportion of total aluminium production. Thus, the production of aluminium today is an

investment for future generations.

Aluminium Demand

Current Demand

The most important markets for aluminium products are the transport, building and packaging sectors. However, aluminium also finds application in electrical and mechanical engineering, office equipment, domestic appliances, lighting, chemistry and pharmaceuticals.

The challenges facing the global aluminium industry have changed significantly since attacks on the United States on September 11, 2001. Though some challenges were evident on the supply side before 9/11, they have since manifested themselves in the form of a sharp

deceleration in demand.

The year 2001 turned out to be one of the worst, with aluminium demand in the Western world declining by 6% and the U.S. registering a 12% drop in demand, its biggest decline in the past 20 years.

Following this sharp slump in demand, international prices of aluminium, soaring at over \$1,600 per tonne in late January 2001, collapsed to a low of around \$1,250 in the first week of November, before recovering marginally to around \$1,325 at the end of December 2001. The next year, 2002, turned out to be as challenging.

Effective August 1, 2002, the global leader, Alcoa, decided to curtail nearly 120,000 tonnes of primary metal capacity in an effort to remain competitive.

Nonetheless, the metal's fundamentals remain fairly strong, but the near-term downturn in key economic variables in the U.S. and Europe is cause for concern.

Demand Projections

Global demand for primary aluminium fell away by 4% in 2001, the first appreciable decline since 1993. Economic recovery is now in the air, but there is widespread uncertainty as to whether it will be slow or stuttering. World aluminium consumption is expected to grow to over 30 million tonnes by 2006. The implication for consumption is slower annual growth than the 4% average seen between 1995 and 2000, but well ahead of global economic growth. This is due to aluminium's strong performance in the

transportation end-use sector, which now consumes almost one third of all output.

Forty per cent of the six-year consumption increase will take place in China, which will be consuming almost 20% of the world's primary aluminium by 2006. Over the same period, world refining capacity is projected to increase by just under 10 mtpy, with much of this expansion taking place in Australia, India and Brazil. However, an additional 3.1 mtpy of Western world capacity is needed over the next four years.

The Government of Trinidad and Tobago is currently considering a proposal for the establishment of a 125,000 mtpy smelter with

associated downstream industries.

IRON & STEEL

Global Production Today

Latest figures released by the International Iron and Steel Institute (IISI) indicate that world crude steel production in 2002 exceeded 900 million tonnes — a record figure which demonstrates the increasing demand for steel worldwide. In a year that had seen significant changes in the industry, including the imposition of tariffs, negotiations focused on eliminating inefficient excess capacity, dramatic price fluctuations and significant increases in demand in developing economies. Global demand for steel remains strong. Statistics released by the IISI in Brussels for the 65

countries normally included in the monthly statistics total 886.8 million tonnes for 2002, an increase of 6.4% from the 833.8 million tonnes produced by these same 65 countries in 2001. Asia increased production by 11.6% (39.6 million

tonnes) in 2002. China's production surged by 20.3% and accounted for 30.7 million tonnes, nearly 58% of the 53 million tonnes global production increase. Between 2000 and 2001, Trinidad and Tobago actually decreased production by 10% from

741,000 tonnes to 668,000 tonnes. However, there was a 25.8% production increase in the first five months of 2003 (394,000 tonnes), over the comparable period of 2002 (313,000 tonnes).

Metals Outlook

- Global supply and demand is returning to balance as rising demand absorbs the supply overhang in the markets since 2001.
- World aluminium demand is expected to grow by 3-4% per year, driven mainly by strong performance in the transportation end-use sector.
- China is the fastest growing region in the world and will account for 20% of world demand.
- An additional three million tonnes of capacity is needed in the western world over the next five years.
- The steel market is showing signs of recovery led by robust growth in demand in china.
- Supply shortfalls due to shutdown of bankrupt mills in the U.S. will push prices up in the short run.
- Long-term demand for steel is likely to be flat.

Chart 2.13 : Distribution of worldwide steel production

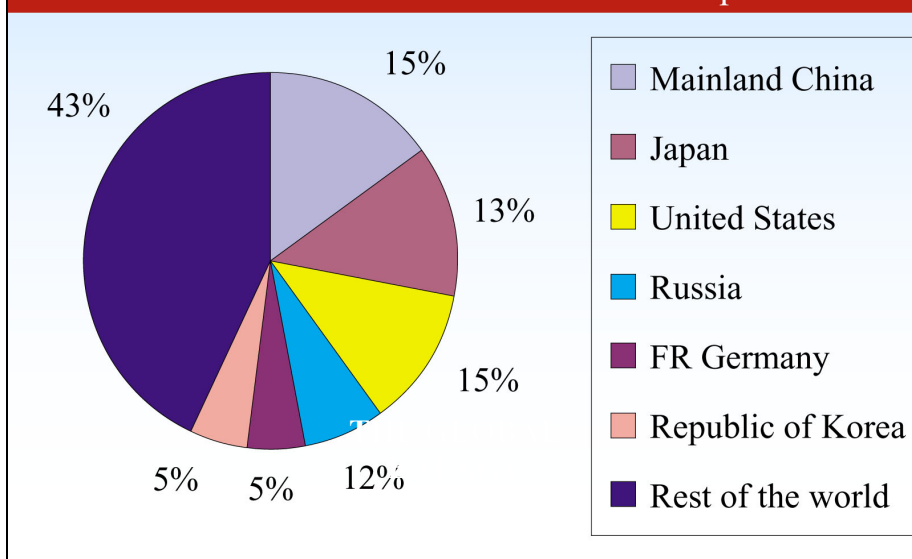
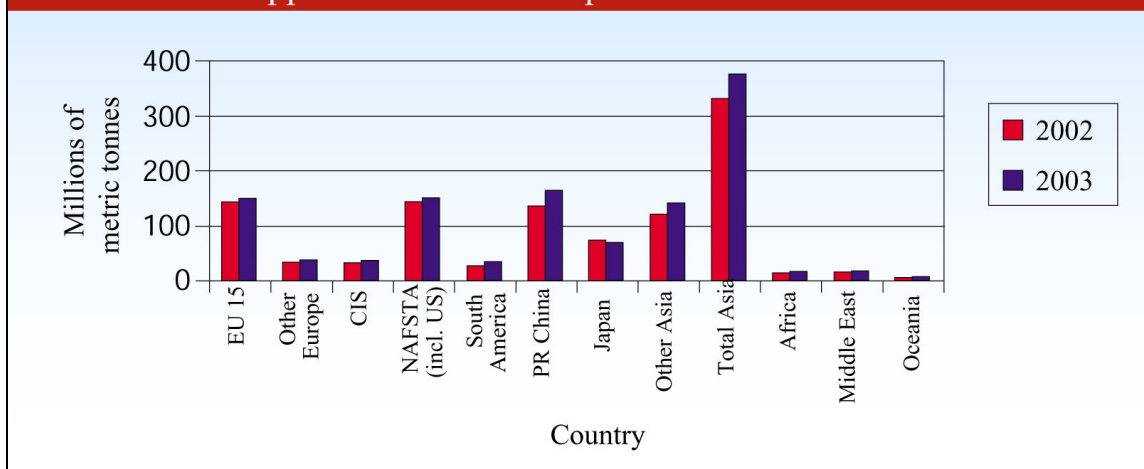


Chart 2.14 : Apparent steel consumption worldwide



World Steel Consumption

While mainland China is the world's largest producer of steel, it is also the world's largest consumer with an estimated consumption of 141.2 million tonnes. The top

10 nations accounted for almost 69% of steel consumption in 2000 while the top 20 nations accounted for 83% of world steel consumption. Looking at consumption trends,

mainland China showed the greatest increase from 1990 to 2000 with an increase of almost 10%. Trinidad and Tobago consumed 250,000 tonnes in 2001, an increase of

2.4% over the 244,000 tonnes consumed in 2000.

Global Steel Prices Today

The United States is still at the high end of the world's steel prices because of protectionist policies.

However, world steel prices

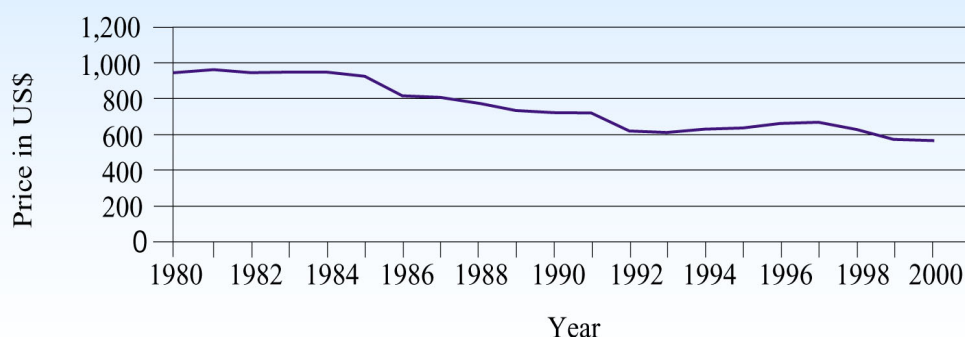
have been in steady decline since 1980. Yet, for many traditional producers, costs have increased to the point where their viability is under threat. During the first quarter of 2003, the cost of production at Ispat

International N.V. rose due to

increases in the prices of key inputs such as metalics, energy and freight.

Conversely, at Caribbean Ispat, the cost of steel has decreased, primarily due to improved production and higher efficiencies.

Chart 2.15 : Steel prices 1980 - 2000



Energy Use in the Steel Industry

The steel industry uses energy both to supply heat and power for plant operations and as raw material for the production of blast furnace coke. According to the most recent

Manufacturing Energy Consumption Survey (MECS), the U.S. steel industry consumed about 2.0 quads of energy in 1994 (including electricity losses incurred during the distribution, generation, and transmission of electricity).

According to data compiled by the American Iron and Steel Institute, total energy consumption in 1997 was about 1.8 quads with electricity losses included. This represents about 2.5% of domestic energy use and

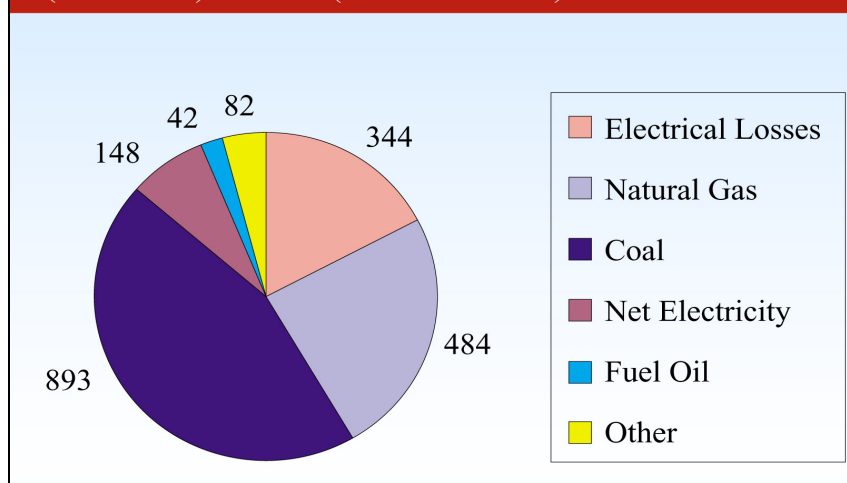
about 8% of all U.S. manufacturing energy use.

The steel industry used close to 2.0 quads of energy in 1994. Nearly half of the industry's energy is derived

from coal, most of which is used to produce coke for use in the blast furnace. Natural gas and electricity combined account for most of the remainder. Two major by-product fuels — coke oven

gas and blast furnace gas — are recovered and used to generate steam, preheat blast furnace air, or supply heat to other plant processes.

Chart 2.16 : Energy use by fuel
(SIC 3312) - 1994 (Trillion BTU)



In Trinidad and Tobago, Caribbean Ispat benefits from reasonably priced, locally available natural gas as an energy source and has a modern, captive marine terminal that handles cargo on a 24-hour basis. The most recent figures state that in February 2003 Caribbean

Ispat One and Two used 44 mmcf/d a day, while Ispat Three used 38 mmcf/d of natural gas in its steel-making activities. In terms of electricity usage, Caribbean Ispat had a consumption of 220 megawatts, and a peak of 236 megawatts.

Steel Industry Position and Outlook

- Record production still exceeds demand, while inventories are high and growing.
- Steel prices are at record lows.
- Prices for many steel-makers are below cost.

- Many steel companies are posting losses.
- Production cutbacks have started.
- Consolidation/alliances are slowly accelerating but still fragmented.
- There is significant uncertainty post-September 11, 2001.

In order to return to profitability the following fundamental issues should be addressed:

- Over-capacity — permanent closure of high-cost capacity (especially the U.S.).
- Production flexibility to respond to market supply/demand.
- Rationalisation and consolidation.
- Removal of trade barriers.

Iron Industry

About 98% of iron ore is used to make

steel. Worldwide, 50 countries produce iron ore, but 96% of this ore is produced by only 15 of those countries. In 2001, Trinidad and Tobago produced 2,197,000 metric tonnes of direct reduced iron (DRI), which is further refined in electric furnaces. This figure represents an increase of 44.6% over the 2000 value of 1,519,000 metric tonnes. Caribbean Ispat's metallic usage for steel production currently comprises about 90% DRI, (all of which is internally produced) and 10% scrap.

In 1999 Caribbean Ispat completed construction of a 1.4 million tonne DRI Midrex™ Megamod, the largest of its kind in the world. As a result, Caribbean Ispat's total DRI production capacity is now 2.7 million metric tonnes, enabling the company to supply DRI internally to other Ispat

subsidiaries and to focus also on supplying the growing world DRI demand for higher quality metallic input for producing value-added products. In 2000, a total of 677,200 tonnes (44.4%) of the DRI produced in Trinidad and Tobago was exported, while 777,900 tonnes were consumed locally.

ELECTRICITY

Global Trends

The Energy Information Administration (EIA), in its International Energy Outlook 2003 report, forecasts that the annual average rate of increase in electricity consumption will be 2.4% from 1990 to 2025.

The most rapid growth in electricity use will occur in the developing world led by

Asia and especially China with a 4.3% annual increase. Robust economic growth in

developing countries is expected to drive the demand for electricity.

Table 2.5 : World net electricity consumption by region 1990–2025 (billion Kilowatthours)

REGION	History		Projections					Average Annual Per Cent Change 2001–2025
	1990	2001	2005	2010	2015	2020	2025	
Industrialised Countries	6,368	8,016	8,307	9,200	10,106	11,030	11,994	1.7
United States	2,827	3,602	3,684	4,101	4,481	4,850	5,252	1.6
EE/FSU	1,906	1,528	1,768	1,982	2,204	2,423	2,642	2.3
Developing Countries	2,272	4,390	4,886	5,962	7,172	8,555	10,038	3.5
Developing Asia	1,259	2,730	3,103	3,851	4,697	5,634	6,604	3.7
China	551	1,312	1,545	1,966	2,428	2,986	3,596	4.3
India	257	497	528	662	802	958	1,104	3.4
South Korea	93	270	296	372	443	498	552	3.0
Other Developing Asia	358	650	734	850	1,024	1,192	1,352	3.1
Central & South America	463	721	782	925	1,081	1,302	1,577	3.3
Total World	10,546	13,934	14,960	17,144	19,482	22,009	24,673	2.4

Source: Energy Information Administration / International Energy Outlook 2003.

Power Generation

- The annual average rate of increase in electricity consumption worldwide will be 2.4% from 1990 to 2025 (EIA)
- The most rapid growth is expected in developing countries, in particular China (4.3%)
- Coal will be the dominant primary fuel in electric power generation, but natural gas will enjoy the largest share increase, moving from 17% in 2000 to 30% by 2020
- Local demand for electricity should increase by 4.5% annually due to accelerated expansion in housing and industrial development.

Energy consumption in the more industrialized world is expected to grow at a more modest pace than in the developing world, by 1.7% per year — a considerably lower rate than previously seen.

In addition to expected slower growth in population and economic activity, market saturation and efficiency gains for some electronic and electrical appliances are expected to slow the growth of electricity consumption. While the mix of primary fuels used in generating electricity has changed a great deal over the past three decades, coal has been and will remain the dominant fuel for the forecast period. However, natural gas

will enjoy the most rapid gains from 17% in 2000 to 30% in 2020. Fuel cells in distributed generation applications are expected to contribute to power production around 2020, supplying about 100 GW by 2030.

Local Electricity Market

The base forecast assumes a positive economic outlook for Trinidad and Tobago, which will continue to drive sales up in all customer classes (Residential, Commercial and Industrial). Over the period, the average increase in maximum demand and energy generation is expected to be approximately 4.5% and 4.6% respectively.

The government housing thrust will result in higher than normal growth in residential sales over the next few years. The industrial sector is also expected to perform well with the establishment of a number of large petrochemical facilities, as natural gas prices will continue to be extremely competitive.

The high forecast, in addition to the above, assumes the establishment of an aluminium smelter and associated downstream industries in late 2005. This forecast also provides for a few large nonpetrochemical industries later in the period.

Table 2.6 : Trinidad and Tobago electrical demand and energy projection 2003–2020

BASE CASE				HIGH CASE			
YEAR	ENERGY GENERATED (GWh)	LOAD FACTOR (%)	SYSTEM DEMAND (MW)	YEAR	ENERGY GENERATED	LOAD FACTOR (%)	SYSTEM DEMAND (MW)
2003	6,512	78.2	951	2003	6,512	78.2	951
2004	6,783	79.0	980	2004	6,783	79.0	980
2005	7,060	78.8	1,023	2005	7,460	75.8	1,123
2006	7,290	78.1	1,065	2006	8,860	80.0	1,265
2007	7,545	78.4	1,099	2007	9,115	80.1	1,299
2008	7,771	78.3	1,133	2008	9,341	80.0	1,333
2009	8,023	78.3	1,169	2009	9,673	79.5	1,389
2010	8,271	78.3	1,206	2010	9,921	79.4	1,426
2011	8,560	78.7	1,242	2011	10,210	79.7	1,462
2012	8,860	78.8	1,284	2012	10,560	79.1	1,524
2013	9,170	78.8	1,328	2013	10,870	79.1	1,568
2014	9,491	78.9	1,373	2014	11,191	79.2	1,613
2015	9,823	79.0	1,420	2015	11,523	79.2	1,660
2016	10,167	79.1	1,468	2016	11,967	79.5	1,718
2017	10,523	79.1	1,518	2017	12,323	79.6	1,768
2018	10,891	79.2	1,570	2018	12,691	79.6	1,820
2019	11,273	79.3	1,623	2019	13,073	79.7	1,873
2020	11,667	79.4	1,678	2020	13,467	79.7	1,928

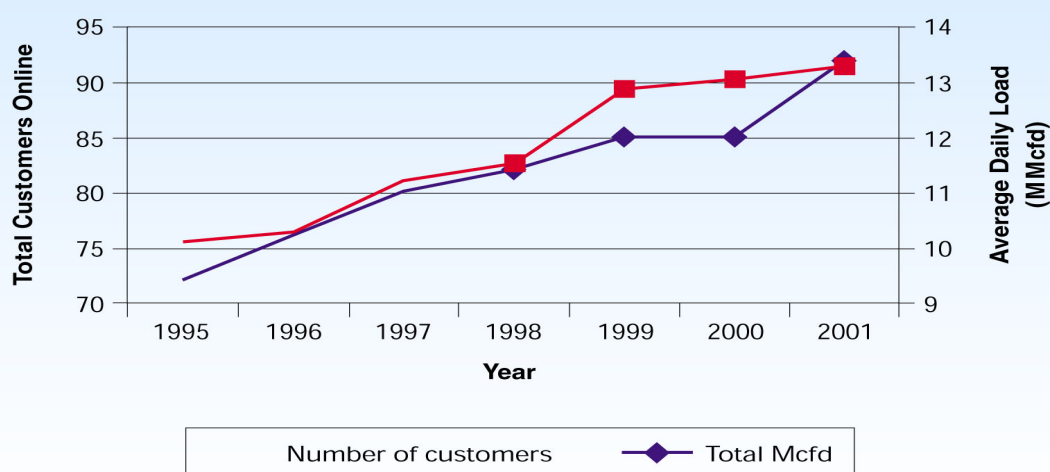
The Domestic Gas Market

The significance of the domestic market for natural gas in Trinidad and Tobago is often lost in the world of large petrochemical plants and LNG. A single LNG plant consumes in excess of 475 mmscfd. Today's typical petrochemical plant consumes 80 mmscfd. However, the typical light industrial or commercial

project typically consumes about 60,000 cubic feet per day (60 mmscfd). Despite the small size of the average customer, the provision of economically priced natural gas to the light industrial and commercial users in the domestic market creates major socio-economic benefits to the nation. These include enhancing export competitiveness, sustaining

employment and improving the environment. The light industrial and commercial sector currently consists a total of 102 light industrial and commercial customers and 12 CNG stations. In 2002, this sub-sector consumed an average of 14 mmscfd. Among the commercial customers are 12 natural gas-fired air-conditioning plants.

Chart 2.17 : Light industrial and commercial sector



The overarching goal must be to make natural gas the fuel of choice in all its commercially viable applications within the domestic economy. For the last eight years, NGC has pursued an aggressive marketing programme to increase gas utilization in the market. The sub-sector has been expanding at an average of six new customers per year.

NGC expects the rate of connection to increase to 12 per year in response to its

three-pronged marketing strategies: expanding the gas distribution network; promoting energy savings to fuel users in the light industrial sector; and continuing efforts to develop the market for gas-fired air conditioning.

Key issues going forward include the growing sensitivity of local manufacturers to price differentials with heavy industry, meeting the challenges posed to gas use

in the transportation, air conditioning and residential sectors, in particular competing against price support for liquid fuels, electricity, and LPG.

TRANSPORTATION

Alternative Fuel Vehicles

More than 99% of today's energy supply for road transport in OECD countries is derived from crude oil (69% gasoline and 30% diesel), while the most

important alternative fuels, LPG (0.9%) and natural gas (0.05%), hold minuscule shares. The U.S. imports 11 billion barrels of crude, most of it to keep cars and trucks on the road. The U.S. Government has expressed serious concern over the impact of emissions on the environment and the increasing dependence on foreign sources of energy. Given the inevitable continued growth in transportation, the only feasible alternatives for reducing emissions and improving energy security are vehicles with high fuel economy and the widespread use of clean, non-petroleum fuels.

Alternative fuel vehicles (AFVs) are still a novelty, expensive to buy and inconvenient to refuel, but much experimentation is still in progress. Present and

future alternative fuels of interest include:

- Gasoline and reformulated gasoline from crude oil;
- Diesel oil and reformulated diesel oil from crude oil;
- Liquefied petroleum gas (lpg) from refineries and associated gas;
- Natural gas;
- Methanol from natural gas or cellulosic material;
- Ethanol from starch-rich or sugar-rich crops or from cellulosic material;
- Biodiesel (esterified oil from crops containing vegetable oil);
- Hydrogen by electrolysis of water; and
- Dimethyl-ether (dme) from natural gas.

The Energy Information Administration (EIA) estimates that nearly half a million alternative fuel

vehicles (AFVs) were in use during 2001. By 2002, nearly 520,000 are expected to be in operation. The rate of growth in AFVs on the road has slowed since 2000. Between 1998 and 2000, manufacturers began massmarketing “E-85” vehicles (vehicles that can use any combination of regular gasoline and fuel with an ethanol content as high as 85%). Also, the rate of growth in compressed natural gas vehicles slowed after 2000. AFVs represent approximately 0.2% of total registered on-road vehicles in the U.S.

Although propane powers over half of all AFVs (276,000 in 2001), the number of propane vehicles has grown quite slowly since the early 1990s, when many trucks were converted to operate on propane for reasons of both energy

security and fuel price. The number of electric vehicles in use grew by approximately 50% between 2000 and 2001, although the number is quite small—about 18,000. A few new liquefied natural gas (LNG) heavy-duty trucks continue to be manufactured. No new methanol vehicles have been produced in the past few years, and the number in use declined from roughly 10,000 in 2000 to 8,000 in 2001.

The vast majority of vehicles driven in Trinidad and Tobago, however, is imported from Japan and not the U.S. Therefore the AFV behaviour in Japan is likely to have a greater impact on Trinidad and Tobago's transport sector.

Because Japan is an importer of petroleum, and transportation accounts for a substantial portion of petroleum-based fuels, the

Japanese government has introduced the subsidy system for low-emission alternative fuel vehicles and refuelling facilities, as a clean-energy-vehicles promotion measure.

However, the programme has not had much success, with AFV accounting for less than 1% of its vehicle production.

It should be noted though that the current U.S. President has pledged US\$1.7 billion over the next five years for development of hydrogen fuels, and expects to see hydrogen fuel cell cars commercially available by 2015, a position which is consonant with Shell's projections as stated in Section 2.3.1.

AFVs are not likely to significantly affect the Trinidad and Tobago motor vehicle industry in the forecast

period because of the anticipated pace of technology development and the large-scale change-out of infrastructure that will be required.

CONCLUSION

Demand for oil, oil refinery products—especially light and middle distillates, natural gas and natural gas derivatives—will continue to provide lucrative markets for Trinidad and Tobago's products and substantial opportunities for growth of the local energy industry. This demand will increase fastest in developing and transition economies.

The global trend towards increasing importance of natural gas in the world energy mix is being aggressively borne out in this country. Trinidad and Tobago

is leading the way in monetizing its gas reserves as it is, or is positioning itself to be first among ammonia and methanol exporters, and will soon have the largest single-train LNG plant in the world. Trinidad and Tobago has performed commendably to attain this global position but must still vigorously consider whether the maximum benefit is being derived from its monetization policies and strategies. This will be addressed in later chapters.

Downstream demand for ammonia and methanol should grow, but both industries could be subject to the shake-out of inefficient plants and replacement by low-cost supply from the Middle East and Latin America as the cost of gas increases in the US. However, it is also useful to

note that new applications for gas are emerging, such as the new GTL technologies that could provide new opportunities.

With the ascendancy of natural gas as the driver of the national economy, less attention seems to be focused on the oil sub-sector in its upstream, midstream or downstream activities.

Despite its long and proud history, the economic structure of this sub-sector has not developed much over the last 30 years.

The long-term decline of crude production, especially on land, can and must be addressed to encourage more exploration and production activity with greater local participation. Also, the same range of products that was being produced in the '70s is still being produced today,

admittedly with upgraded specifications. There has been no attempt to extract greater value from this wasting resource by exploiting the oil-based petrochemical downstream industries or even the midstream processing of more of the indigenous crude. As in the case of the gas sub-sector, opportunities for investment in oil must be identified and pursued in a formal and coherent manner.

While Trinidad and Tobago continues to be a world-recognized player in the global energy industry and has kept pace with some of the major trends, it must be careful to structure the local energy industry in such a manner as to extract maximum value from all its hydrocarbon resources.

WORKSHOP AGENDA

- Assess context
- Define status
- Build the vision
- Determine gap
- Define first steps

SUMMARY OF PROCEEDINGS

Approximately thirty leaders of the energy sector came together on April 10, 2003, to assist in creating a vision for the energy sector in Trinidad and Tobago, under the expert guidance of Dr. Kermitt Walrond, as facilitator. The assembled experts, comprising leaders from both the public and private sectors, institutions and NGOs, were divided into five workshop groups, namely: Oil, Gas, Domestic Operators, Services, and a fifth that treated with Human/Social/Environmental

factors. The Electricity sub-sector was considered integral to all groups.

The key elements of the workshop consisted of three breakout sessions that dealt with:

- Defining the current status of the Energy sector;
- Visioning Energy in TT in 2020; and
- A GAP Analysis with identified first steps.

In summary, the groups all saw the need for an increased emphasis on the further development of the national/local sector activities, including institutions, businesses, services, domestic capital and personnel in the context of an expanding, environmentally benign and efficient energy sector based in Trinidad and Tobago, but serving the

region and the world. The need for appropriate regulatory systems to permit efficient and greater expansion of all aspects of the energy sector—oil, gas and electricity—was noted.

Some final comments included:

- The need to include Tobago in energy developments in the country.
- The likely impact of the World Trade Organization and the Free Trade Area of the Americas on local content.
- The clear polarity which existed between the domestic human resource inadequacy and the objective of quickly increasing local value-added activities.
- The need to prioritize some of the initial steps

outlined in the final breakout session, so as to effect immediate action.

Appendix III presents the full minutes of the workshop.

In this regard, the following steps are regarded as important and should be considered priorities:

- Take all necessary action to create a greater number of upstream suppliers with significant local ownership.
- Establish a regulatory framework that facilitates open access and pricing, within the context of a regional cross-border and interconnected network of gas pipelines.
- Move to distributed electricity generation to

serve multiple industrial activities and isolated rural communities.

- Create an optimal oil refining sector by upgrading and attracting investment (local/foreign/private).
- Create a greater (high) level of private/local participation along the value chain by:
 - Reducing risk aversion and effecting better risk assessment by the non-petroleum participants in this sector.
 - Improving access to capital.
 - Improving the regulatory framework, e.g. Securities and Exchange Commission, Venture Capital Act, Pension/Insurance Act.

- Facilitating the many opportunities in the services sector and along the value chain.
- Increase the level of people skills by developing appropriate strategies, building institutions, creating a leadership cadre, and by enterprise development.
- Ensure compliance with environmental standards; adopt the best health and safety practices.
- Focus on partnering with communities through education, training and co-operatives.

DEFINING THE TASK

- Expand the number of upstream operators with greater local ownership.
- Increase the level of private local participation along the energy value chain.
- Boost institutional capacity.
- Pursue local enterprise development.

INTRODUCTION

The Vision 2020 Workshop on Energy, summarised in the previous chapter, set priorities in developing a vision for the energy sector in Trinidad and Tobago in which the main goals are to maximize the value of the country's energy resources and to maintain a competitive advantage in the world energy market. Further, it is accepted that the exploitation

of these non-renewable resources must maintain a balance between the rate of extraction and the distribution of returns between present and future generations.

There are other elements that are critical to achieving the required balance:

- Optimal distribution of potential energy sector revenues by the State.
- Production and use of energy without generating harmful emissions or encroaching on the environment.
- Creation and nurturing of intellectual capital to add value to the economy.
- Maintenance of a competitive sector to meet the challenges of the global energy market.

The energy value chain, whether measured by

traditional concepts of Gross Domestic Product (GDP), Gross National Product (GNP) or by any suitably customized measure of economic activity, provides a conceptual framework for identifying the critical issues in forging the core strategies of an energy road map for Trinidad and Tobago.

The aim is to create continuous value for the people of Trinidad and Tobago at each stage of the value chain; to do so in an environmentally sensitive manner; to create a sustainable level of human capacity; and to prepare for when the resource is no longer available.

MEASUREMENT ISSUES AND DATA CLASSIFICATION

One key factor is consensus on the components of the value chain for the energy sector and its relationships with individual components.

The value chain presented in Figure 4.1 offers one option in identifying specific

activities for oil and chemicals, and direct energy-related utilities such as gas and power. There are many associated activities that either support the value chain or extend backward and forward from it. Some may offer a much higher capacity for generating and sustaining employment than in the capital-intensive energy sector, one important

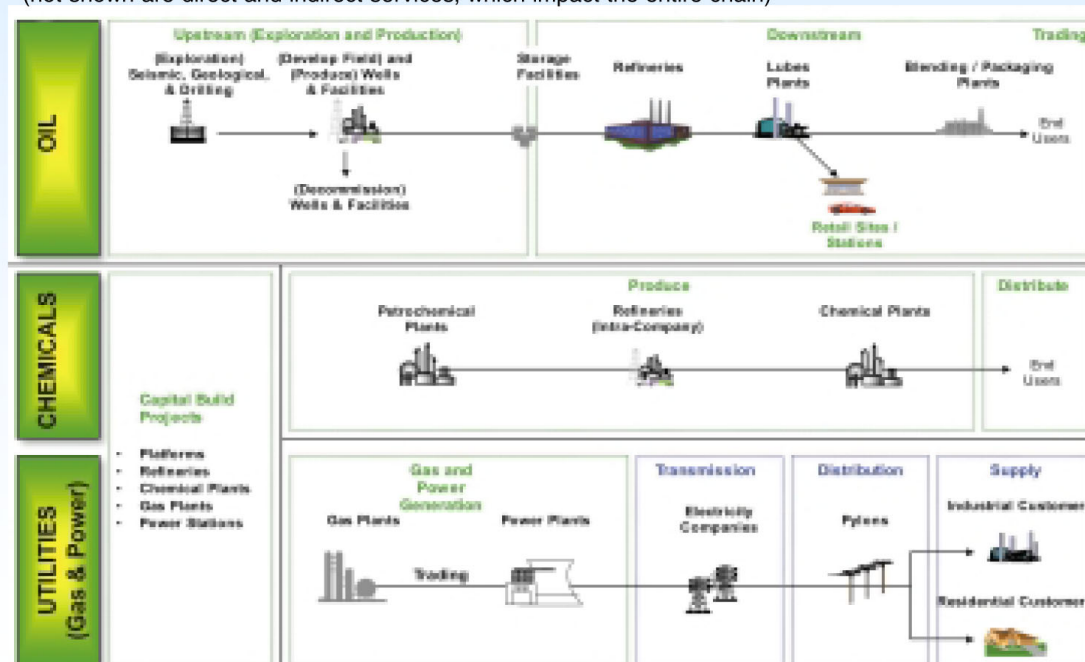
consideration where the employment factor is critical in selecting the value chain along which activity is being developed and tracked. Once the appropriate value chain is agreed upon, it becomes relatively easy to identify those areas where specific activities and sub-strategies can be formalized to improve value-added while increasing the competitive edge.

Figure 4.1

The Value Chain Within Energy

(Oil, Gas, Power & Petrochemicals)

(not shown are direct and indirect services, which impact the entire chain)



In leveraging Trinidad and Tobago's hydrocarbon resources into sustainable national development, one of the principal strategies is to deepen the integration of the sector with the rest of the economy. For this, one imperative is accurate and timely information on current and planned activity in the sector and the potential for

increasing the national share of value-added.

Current public information falls short of the requirement partly because of the transition from an oil to a gas economy and the fact that the sector generates adequate fiscal resources to satisfy reasonable levels of

sustainable government current expenditure.

In altering the perspective on the energy sector from a mere source of fiscal revenue and medium-term employment to a prime creator of national industrial opportunity, a relevant set of data is needed. However, the current methodology for calculating Gross Domestic Product does

not provide sufficient timely, accurate or relevant data to permit informed decisions on energy investment. The current focus on value added within the sector is inadequate.

Even on its own terms, current aggregation must go beyond reporting on the petroleum sector, which includes oil and gas production, refining, petrochemical production, distribution, marketing and services. A more comprehensive index of activity in the energy sector would include steel, power generation and upstream/downstream plant construction sub-sectors.

Furthermore, current methodologies ignore the pivotal role of natural gas, particularly since 1999 when the export of Liquefied Natural Gas began. These

exports now represent more than half of current natural gas production and, as such, need to be fully and separately identified in a category of their own. This becomes even more necessary, given that natural gas output is currently exceeding oil production on an energy equivalent basis. The result is likely to be a sector considerably larger than the historical 25-30% of GDP recorded for the petroleum sector.

It is worth noting that the bulk of gas-producing activity, including drilling and related services, takes place offshore, unlike the highly visible, land-based gas conversion—a fact which makes it difficult to identify within the data. In addition, the very large import-export components of the LNG business require special

attention with regard to the data set being published.

Other major weaknesses of current economic reporting are the considerable lag in published information on national accounts and policymakers' focus on Gross Domestic Product instead of Gross National Product. Over the last decade, the almost exclusive reliance on foreign direct investment in the energy sector has given rise to increasingly heavy outflows of investment income. In this scenario, Gross National Product is likely to be growing at considerably slower rates than Gross Domestic Product. Focusing on GDP may, therefore, give a distorted view of the overall well-being of the national economy, making it imperative that the difference between the two indices are

highlighted and analysed in order to better inform policy.

National Input-Output Accounts

A set of national input-output accounts is an established methodology for providing the type of information at industry level that is required by policymakers, potential investors and other stakeholders in the national economy. The input-output approach enables analysis of inter-sectoral relationships among various industries.

These tables are one method of describing and analysing the productive processes and linkages within an economy using national accounting data. Theoretically, such models enable quantitative analysis for tracing the impact of an injection of expenditure through the different industries in the economy. In effect, an input-output table connects final

demand for outputs of different industries with primary inputs into those industries, detailing the network of intermediate demand of each industry.

The main benefit of this approach is to relate final demand to input requirements so that the implications for each industry are revealed explicitly. This sub-division by industry allows early identification of bottlenecks in the production process such as capacity limits, lead and lag times and levels of stock, all of which are considered on an industry basis. These considerations may be meaningless for production as a whole, but are of considerable value in highlighting input sources and the disposal of output for current production efforts and, therefore, opportunities for investment in support

industries at either end of the production process.

National Benefits Assessment

The regular publication of national income data and current inter-industry demand in the economy are necessary, but not sufficient conditions for the acceleration of industrial development based on the country's hydrocarbon endowment. These ex-post indices, by definition, cannot anticipate emerging opportunities. In this regard, information is required at the project planning stage of major energy sector developments to alert potential suppliers of goods and services to these opportunities. To bridge this gap, more developed jurisdictions have imposed a structured approach to information requirements

STRATEGIC ISSUES IN ENERGY

from would be developers as part of the approval process.

In some provinces of Canada, for example, developers are required to provide:

- A plan for the employment of Canadians and, in particular, members of the labour force of the province.
- A plan for providing manufacturers,

consultants, contractors and service companies in the province and other parts of Canada with a full and fair opportunity to participate on a competitive basis in the supply of goods and services used in a proposed work or activity referred to in the benefits plan.

- Establishment of an office in the province where appropriate levels of decision-making take place.
- Expenditures for research and development, and education and training in the province.

In meeting these requirements, developers have to elaborate on:

STRATEGIC ISSUES IN ENERGY

Approach to Benefits	Project Management
Procurement Requirements	Domestic Industrial Supply Capability
Procurement	Technology Transfer, Research and Development
Employment	Communication, Monitoring, Reporting

The levels of various benefits are subject to negotiations with a statutory board appointed for the purpose and to communicate, report and monitor regimes.

These go considerably beyond public relations declarations of local content targets announced at the conclusion of negotiations between Government and investors, which can be ignored as a mandatory requirement once the first pile is driven.

Re-engineering the Central Statistical Office

Improved information flows cannot be achieved without a re-engineered Central Statistical Office. Mounting evidence suggests that, despite its laudable accomplishments in the past, it is poorly equipped to deliver on its current mandate, to say nothing of the expanded mandate demanded by the changing structure of the economy. In the circumstances, reform may well go beyond supplemental human and financial resources to include new institutional arrangements to permit

greater autonomy in responding to situational dynamics.

In this regard, there is a pressing need to change the disaggregation of the economic data used in National Income Statistics. Currently, the separation lists activities in the petroleum sector to include oil production and refining as separate categories, with the services sector subsuming many of the services that support the energy sector.

Such aggregation tends to under-emphasise the role of the multiplier effects on other sectors, including

STRATEGIC ISSUES IN ENERGY

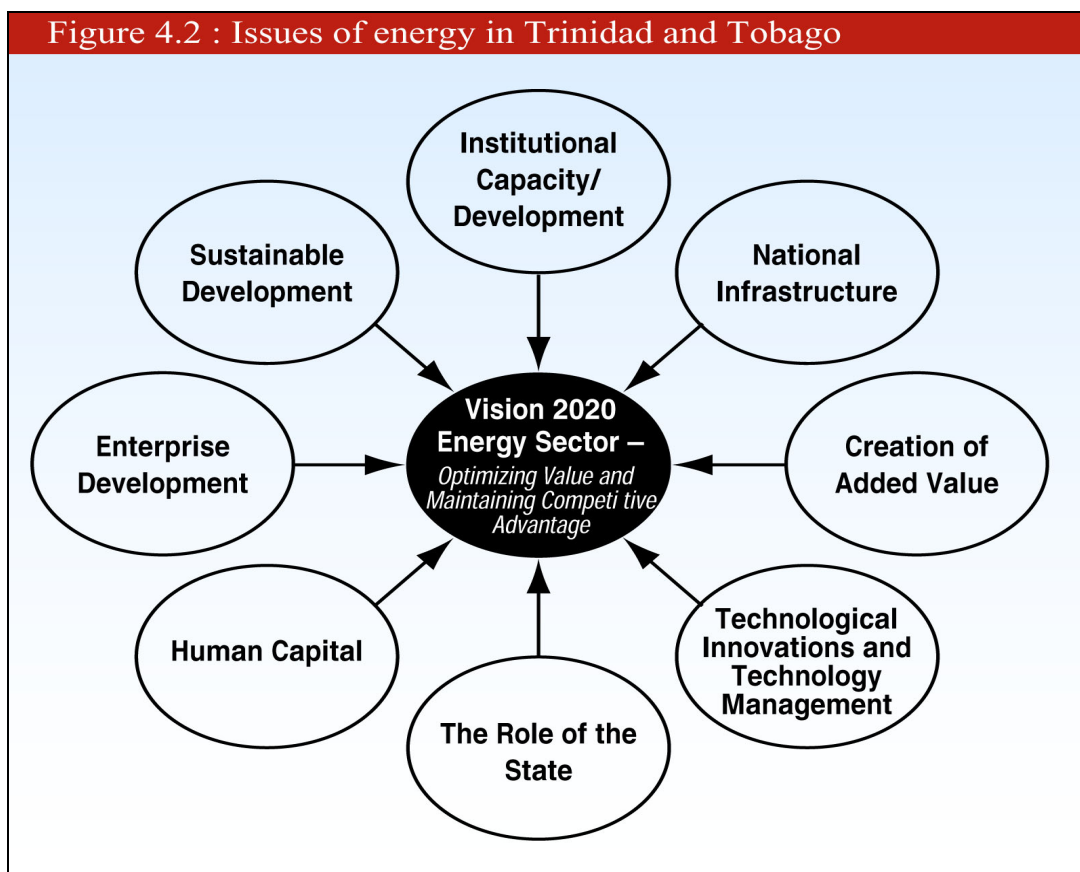
natural gas and petrochemicals. As such, the routine interpretation of data underestimates the contribution of the energy sector to overall economic activity in Trinidad and Tobago.

Assuming that the data sets can be re-ordered and improved for purposes of value identification etc., the findings of the workshop can be condensed into a framework of issues that will form the basis of our

road map to the energy sector of the future.

The issues pertaining to overall economic activity are shown in Figure 4.2, followed by a discussion of the salient issues

Figure 4.2 : Issues of energy in Trinidad and Tobago



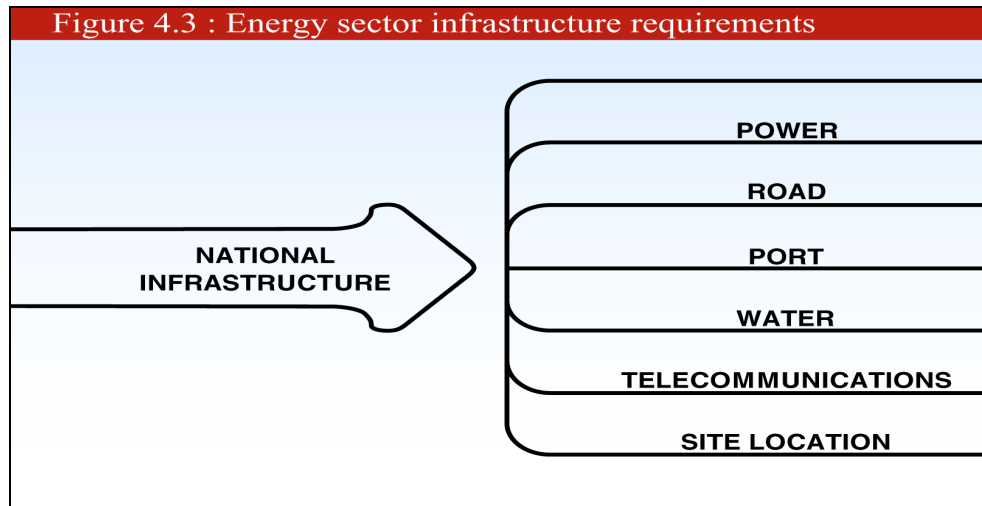
NATIONAL INFRASTRUCTURE

One assumption of the development of a competitive energy sector is the availability of sufficient infrastructure to service the needs of the sector. Figure 4.3 details the areas of infrastructure to be provided.

In each area some of the sub-issues to be addressed are:

- Capital funding, whether from State or private sector resources (project finance).
- Duplication of resources — synchronizing the requirements of competing players.
- Management & maintenance of these additional resources;
- Transparent pricing mechanisms for the use of such infrastructure.
- Compatibility with national physical infrastructure plans.

STRATEGIC ISSUES IN ENERGY



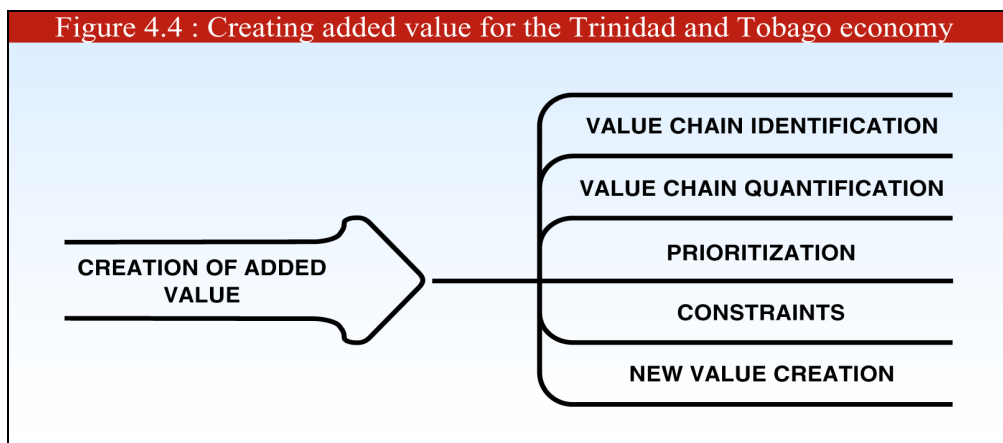
CREATING ADDED VALUE

This pertains to the identification and measurement of the sector's impact on the rest of the economy and addresses the

relevance and accuracy of existing measures. It also calls for a detailed identification of the energy sector value chain. This will, in turn, lead to prescriptions for the optimization of value-added activity at each point

in the chain, constraints to such optimization, and the decisions that must be made in order to create new value.

Figure 4.4 illustrates the relevant issues and sub-issues.



Current ability to maximize value is limited by human resource availability, commitments under trade agreements such as the FTAA, Mercosur, the WTO etc., as well as the extent to which competitiveness is maintained and improved. Building critical mass within the various service sub-sectors to meet standards for quality and price will be an important and necessary pre-condition for success in a competitive environment. Additionally, given the small population size and consequent limited skills base, the establishment of national priorities will dictate the speed at which such capacities can be created or enhanced. The conflicting parameters required by these factors and by the international agreements previously outlined will have implications for aspects of the value chain within which Trinidad and Tobago can obtain greatest benefit and maximum value.

INNOVATION AND CHANGES IN TECHNOLOGY

Technological innovation and technology acquisition/transfer are of critical importance for the future. This is even more so for Trinidad and Tobago where the age of existing plants and technical advances render facilities less competitive. In the context of Vision 2020, it is important to bear in mind that most of the plants at Point Lisas were built between 1974 and 1994 and reflect the technology of that period. In the 2003-2020 period, many if not all of these process plants would have been permanently shut down, upgraded or replaced. In addition, new gas-rich territories would have emerged, offering competitive terms and, very likely, lower gas prices.

In the case of LNG, the lead set by Atlantic LNG as the first Western Hemisphere LNG plant in two decades will be tested by countries such as Nigeria, as the United States becomes a major LNG importer. Even more dramatic are the technological changes that have affected the international ammonia industry, where conversion ratios have now fallen to 24-28 mmbtu per tonne of ammonia produced from 42 mmbtu per tonne in 1978.

In addition, large improvements in economies of scale have been the main development in the local methanol industry over the last two decades. Indeed, Trinidad and Tobago has grown its methanol and ammonia industries at the expense of higher-cost locations in North America and Europe.

STRATEGIC ISSUES IN ENERGY

Over the next two decades, emerging global competitors with flared or cheaper non-associated gas sources and access to cutting-edge process technologies may pose a significant threat to Trinidad and Tobago's industry competitiveness, given its ageing process base and costlier gas. There is, therefore, a very real possibility of these plants pushing the Trinidad and Tobago petrochemicals industry into a vicious cycle of needing lower and lower gas prices to support ageing and inefficient infrastructure, thereby eroding value and, ultimately, revenue.

Even if new sources of gas become available locally, they may not be price competitive with gas from emerging producers. There is also the possibility that LNG will provide a better economic return to the

country. In light of this reality, interventions may become necessary in at least three areas:

- Replacing inefficient conversion capacity.
- Improving the cost structure of existing plants.
- Creating new sources of competitive advantage.

Policy initiatives will be required to encourage investors to undertake the capital works necessary to maintain a competitive edge. Ultimately, the local industry must move towards the production of more complex products that pose higher barriers to entry than ammonia and methanol and require more sophisticated skills. It is therefore also crucial for long-term policies to encourage energy companies to continually upgrade their facilities and to regard Trinidad and Tobago

as a location for technology research and development.

New extraction technology will also help to bring new hydrocarbon reserves on stream from current unassigned acreage, in particular deep-water offshore. Extraction may require larger capital expenditure which would have cost implications for Government revenue and prices.

Moreover, the effects of technology development will have to be monitored and assessed, given its wide impact. For example, conservation technologies affect global demand for energy; developments in exploration and production technology may make more productive acreage available and may continue to lower unit costs of production; scaling down could promote

the development of ethylene more quickly than may otherwise be possible; and developments in gas-to-liquids technology may make some processes more feasible than others.

In that context, the existing partnership between the companies and Government in the expansion of education and training at tertiary level through the Trinidad and Tobago Institute of Technology (TTIT) offers a model that should be expanded to deepen the thrust into relevant areas of process technology development such as natural gas chemistry. With the right conditions, a centre for the study of methane chemistry and its

derivatives could be established under the proposed new University of Trinidad and Tobago (UTT). The impact of such an innovation would be far-reaching in its implications for the development of the country's human resource base and in providing opportunities that contribute to the long-term growth of energy industries.

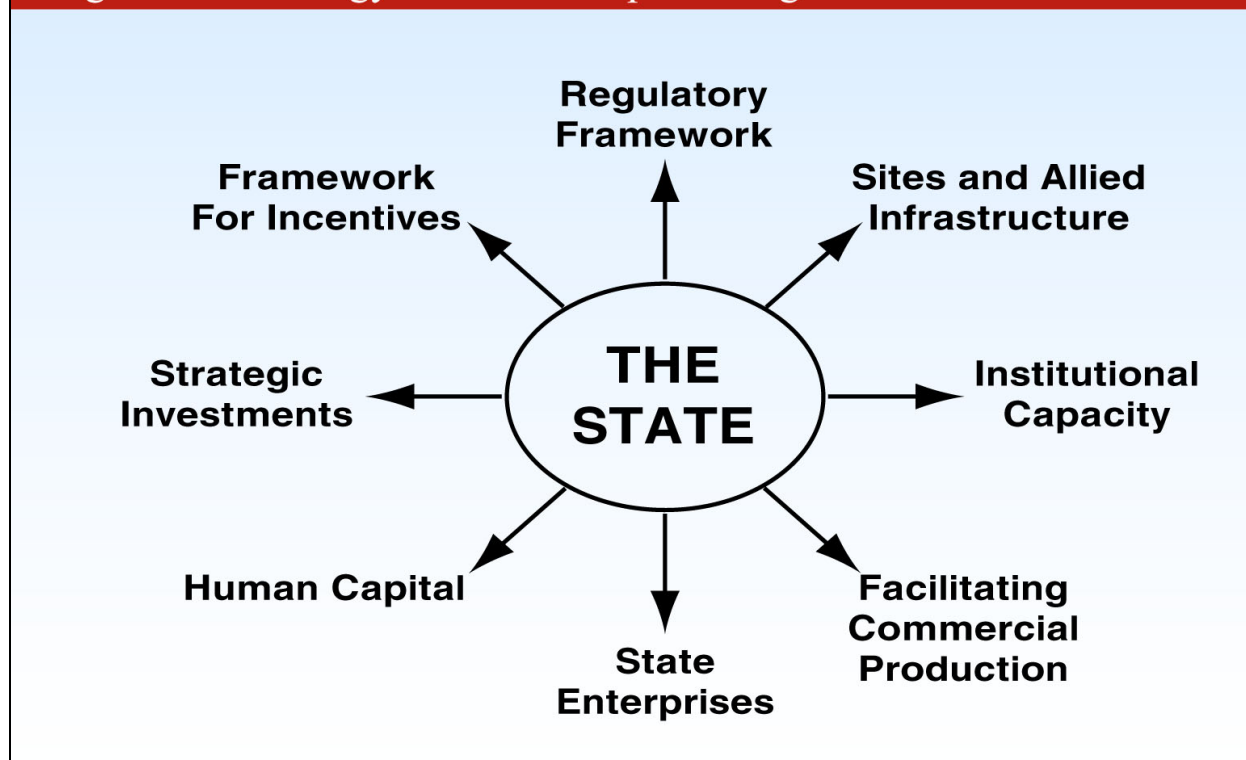
THE ROLE OF THE STATE

There is no doubt that the State has a major role to play in creating added value for the rest of the economy and in maintaining the competitive edge of the

energy sector. The State's dominant role in the sector over the past three decades, both in terms of providing seed capital for industry as well as in creating an appropriate incentive framework for development, suggests a continuing role in fulfilling the vision for the sector.

The sub-issues create a framework for the role of the State which could be either one of direct intervention or of facilitation. Ultimately, the desired outcome would be to meet objectives in a cost-effective manner with maximum positive impact on the economy.

Figure 4.5 : Energy sector issues pertaining to the role of the state



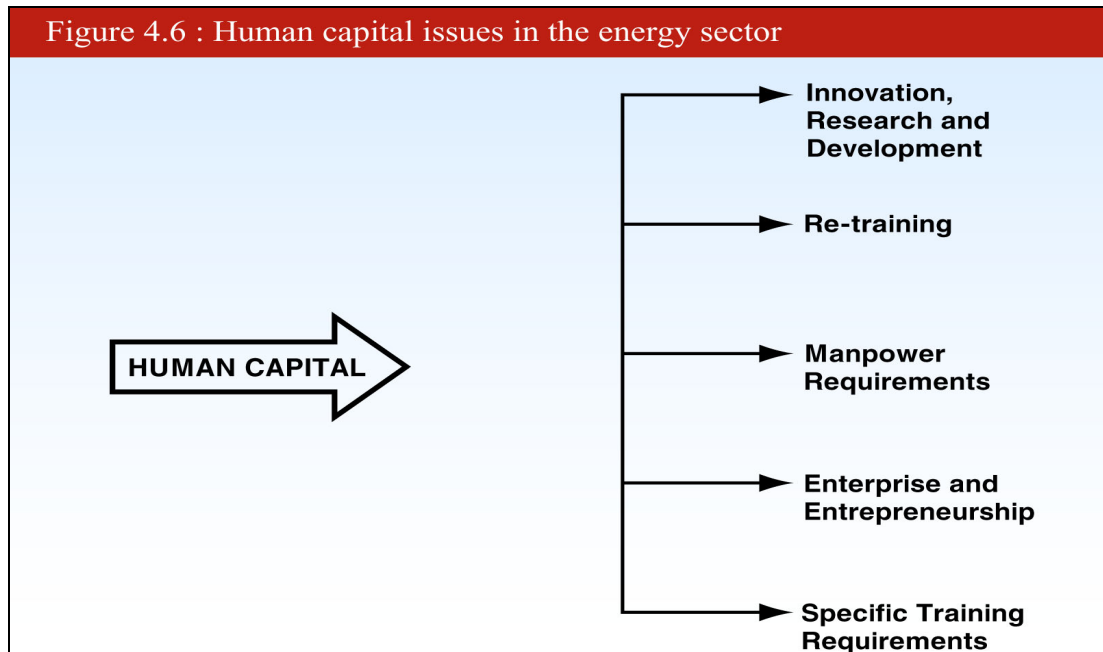
HUMAN CAPITAL

The human capital issues arising out of the workshop and out of subsequent discussions of the energy sub-committee point to a number of issues specific to future growth in the energy

sector. The main issues pertain to sustaining supply of the required resources, re-training for new and improved process technologies, and a structured and coordinated approach to providing the required resources without the

apparent overlap in the current structure.

Human capital issues are also addressed under enterprise development and institutional capacity.



ENTERPRISE DEVELOPMENT

Enterprise Development is a key component of sustainability and needs to be advanced if local businesses are to maximize value from the industry in the quest to encourage economic diversification. The key elements required to develop local enterprise capability are:

- The ability to attract, develop and retain

strategic business skills to ensure that businesses can grow, change and succeed.

- World-class business tools, processes and technology.
- Competitive financing options.

The local energy sector offers superb opportunities for nationals of Trinidad and Tobago, both at home and abroad, to develop and utilize internationally competitive

strategic business skills. This can redound to the benefit of the country, but only if the skills are employed within Trinidad and Tobago, and if the business model of the multinationals changes. Given the latter's practice of compensating nationals at a level lower than expatriates, Trinidad and Tobago nationals abroad who possess critical skills are not inclined to return as employees. However, the opportunity to be equity owners in energy

STRATEGIC ISSUES IN ENERGY

businesses may provide just the right inducement.

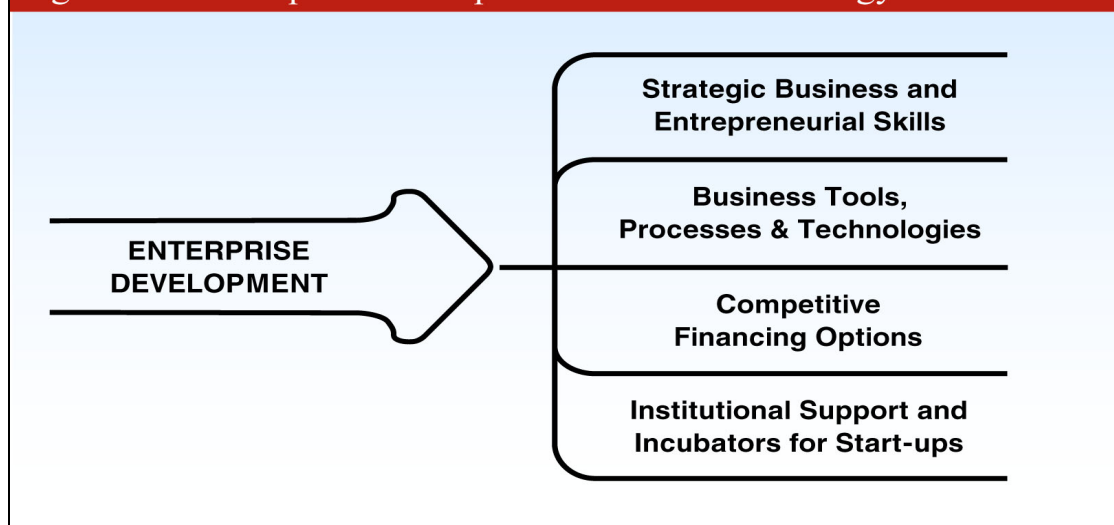
Trinidad and Tobago's energy industry is world class and the companies operating in it are often leaders in their class. Many are among the world's largest corporations – not just in the energy sector. Given the size of this sector, there is little likelihood of the non-energy sector attracting companies of a similar stature into the country, certainly not with the level of impact that Trinidad and Tobago has on their global operations.

This impact is created by the share value of Trinidad and Tobago to their global

business in a relationship of mutual dependency. Trinidad and Tobago is therefore in the enviable position of being able to choose country partners and to develop and convert its resources on the basis of its ability to influence the nature of the multinationals' business in this country. In these circumstances, Trinidad and Tobago has an opportunity to choose partners who are willing to deviate from the traditional operations base model and to conduct more of the business within the country – particularly critical head office functions such as business development, analysis (commercial,

strategy, customer, markets, political risk, etc.), negotiating, mergers and acquisitions, trading and knowledge management. Trinidad and Tobago would therefore have access to the highest level of business and people development expertise, technology and processes. At the same time, these businesses would attract suppliers and contractors of global quality, although, inevitably, the net effect of their presence would be that local businesses would be encouraged to compete in areas within their global level of service.

Figure 4.7 : Enterprise development issues for the energy sector



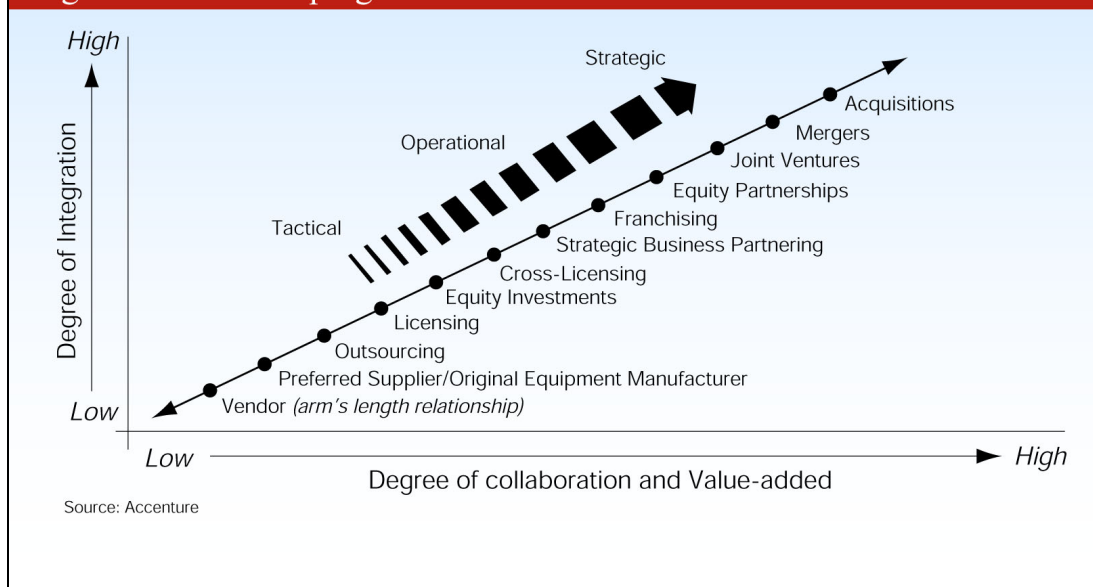
As strategic business skills are needed, training institutions will also be motivated to respond. These skills, more so than the traditional technical and operational skills, are employed in other industries and thus become the basis for

sustainable knowledge transfer.

For their part, local businesses can develop their own capability through strategic alliances, as nations such as South Korea have done. As Figure 4.8 demonstrates, access to technology transfer and

expertise comes from strategic relationships that involve equity ownership. Ownership and control themselves lead to greater likelihood of local financing, with the resultant development of the capital markets.

Figure 4.8 : Developing know-how



The framework for sustainability is a series of building blocks. The technical and operational skills lead to the business being developed within the home country, which in turn leads to the development of higher value-added skills. These then enable ownership and control, which act as the

catalyst for the creation of local firms of the size to influence the development of financial and capital markets.

Apart from local financing, at the top of the framework pyramid is public trading. In addition to creating access to capital markets and aiding wealth creation, local

institutions that encourage transparency and good governance will also encourage the growth of local capital markets. It also recognises the limitations of small and medium enterprises to significantly increase scale or scope.

STRATEGIC ISSUES IN ENERGY

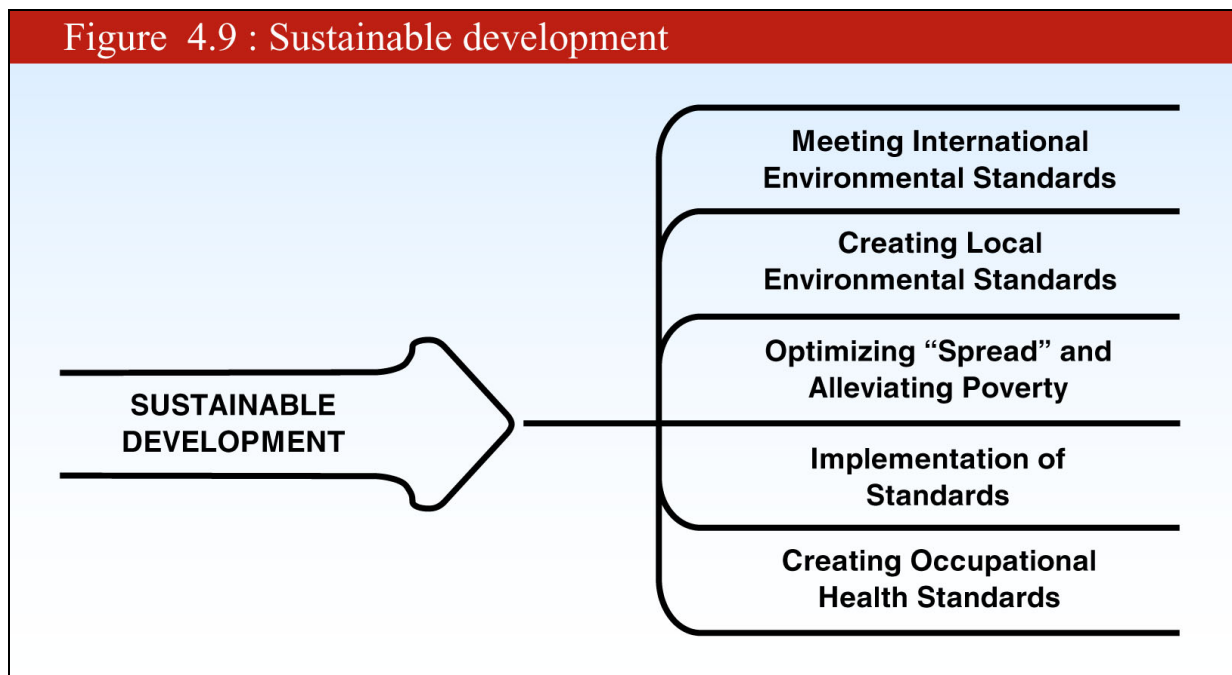
SUSTAINABLE DEVELOPMENT

The issues described above pertain to the sector's commitment to impact positively on the rest of the economy. One way in which this can be achieved is by

meeting international environmental commitments; establishing, monitoring and policing domestic environmental and "green" standards; setting standards for siting and building new plants; establishing health and safety standards for

minimising injury to people; and through deliberate interventions for social purposes. Prescriptive measures for all of these issues are addressed in Chapter 6 of this document.

Figure 4.9 : Sustainable development



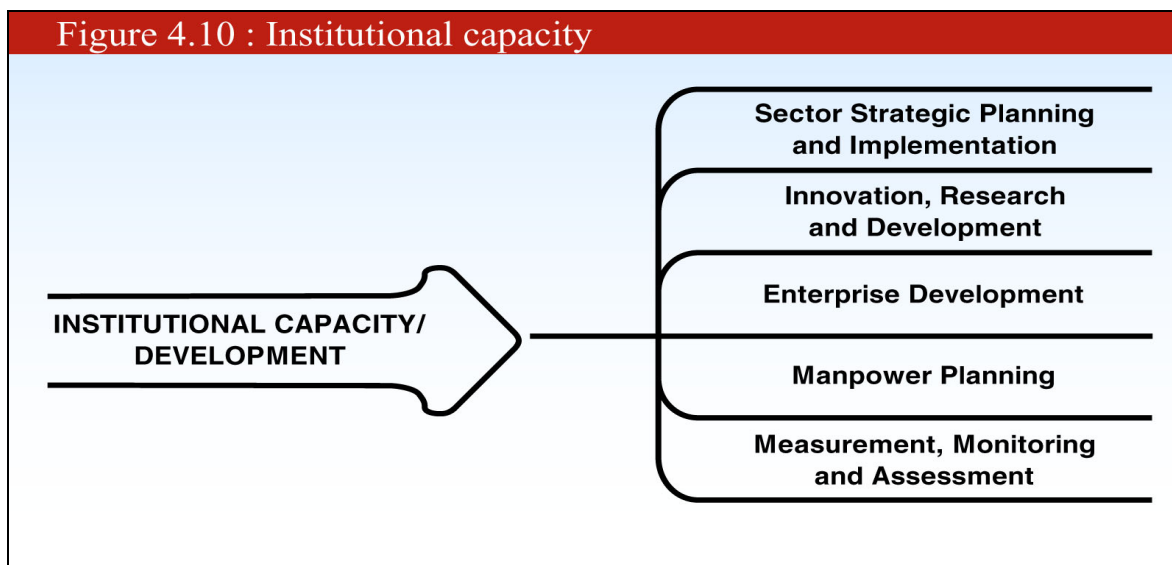
STRENGTHENING INSTITUTIONAL CAPACITY

There was general consensus at the workshop on the existence of major gaps between current local institutional capacity and the

capacity required to keep pace with the increasingly complex and fast growth of the industry. More specifically, it was recognized that existing institutional structures do not adequately permit planning for the sector, monitoring of

the plans and the recommendations for appropriate alterations in strategy. Further, there is need for an institutional framework to support the maximization of value-added activity at each juncture of the value chain.

Figure 4.10 : Institutional capacity



The most critical institutional inadequacies are:

- The timeliness of government policy responses and the response of agencies

responsible for inputs into those policies.

- The perception of both opportunities and threats by:
 - Government;
 - State Enterprises; and

- The Domestic Private Sector.
- Asymmetric information and resource availability between the regulators and the regulated.

The process of developing the vision for the energy sector has underscored the critical importance of having a cadre of competent professionals drawn from across the sector, freed of institutional restraints and focused on national development. This forum provided fertile ground for informed speculation on national possibility, an opportunity not easily available in current arrangements. The proposed Trinidad and Tobago Petroleum/Energy Institute could offer scope for the required focus on energy and national development. Such an institution would have to be independent of vested interest and be charged with the mission to inform public policy and opinion on the optimisation of the country's petroleum resources. Financed by both the public and private sector, the

Institute will commission studies, fund research and undertake public education consistent with its mandate.

The issues discussed under the rubric of Enterprise Development and Human Capital speak to the need for institutional support in these areas, a matter that is dealt with elsewhere in this document. However, there are two additional issues that need to be addressed.

REFINING

There is general agreement that Trinidad and Tobago must create an optimal oil-refining sector. While the country has benefited from the export of crude oil, higher returns would accrue from refining its crude and exporting the refined product. Secondary benefits would be an increased value-added in

the form of refining technology transfer, additional employment during construction, increased shipping revenue, and greater investment opportunities.

The capital-intensive and competitive nature of the refining business present a strong case for recurring investment to keep the local refining business globally competitive. Private capital, both domestic and foreign, would have to play a role in the process, with international capital and licensing agreements providing access to the most modern refining technology.

There are clear policy implications for Petrotrin and the Government. Policy guidelines to attract both foreign and local investment would have to be set, while existing policy on the

wholesale and retail distribution of petroleum products would have to be reviewed, since an investor in a new oil refinery is likely to want direct participation in the local retailing of petroleum products as currently structured.

Expanding the refining sector will in turn demand expanded port infrastructure, with a consequent need for greater human resource capability in maritime operations.

An upgraded refinery would also have to meet pre-set international-level environmental targets. In this regard, care should be taken in choosing appropriate technology. Additionally, the refinery should have ongoing research and development initiatives.

LOCAL UPSTREAM CAPABILITY

The long-term viability of the sector is based partly on the availability of competitively priced inputs and resources. Increased participation and competition in the upstream industry is an important aspect of the process which, if present, would have a wide impact on the energy sector.

Firstly, opportunities will be created for local investors to participate in the sector which would, in turn, result in enhanced capital availability. An increase in upstream suppliers would foster increased competition, which could have the effect of inducing change in acreage allocation. This process presupposes an increase in the frequency with which competitive bid rounds are held, as well as an increase in the number of blocks offered,

with distinct implications for depletion policy. In the event of commercial discoveries of oil, producers are assured of a ready market for both crude and refined products. If natural gas is discovered, suppliers will need to further develop the market. The latter, while now easier, still does not take place in an open-access manner with maximum choice and opportunities, as is the case in some developed countries.

However, increased access to competitively supplied natural gas will enhance the long-term viability of the downstream natural gas-based industries, inclusive of LNG processing. However, the country's energy supply security may be further buttressed even at new, much higher levels of demand.

CONCLUSION

The specific items raised under each heading are not exhaustive. However, they point to the strategic requirements in outlining a vision for the sector and indicate the critical decisions to be made in each area. The remaining chapters of this Report address these issues

and suggest prescriptive approaches.

It would be useful, however, to identify the following:

- Activities that would comprise the “national value chain for the energy sector” with a consensus on value measurement.
- Strengths, weaknesses, opportunities, threats and areas for improvement for

each facet of the value chain, as well as the overall vision.

- The gaps between the desired structure and current sector status.
- Plans for closing the gaps.

The sector must also establish a process of ongoing strategy review in line with changing circumstances.

GOALS, OBJECTIVES AND TARGETS

BRIDGING THE GAP

- Maximize in-country expenditure.
- Promote local capability in businesses, personnel and capital markets.
- Create a sustainable world-class services sector.
- Focus on human development strategy.

INTRODUCTION

This chapter sets out the goals, objectives and targets for the energy sector's contribution to the development of Trinidad and Tobago in the context of the energy sector's vision and the overall national vision for Trinidad and Tobago's achievement of developed nation status by 2020.

The Sub-Committee has articulated a vision of an

integrated and fully developed sector that is a key driver of a sustainable and flourishing local and regional economy while attaining global competitiveness in all its sub-sectors by 2020. The sector is viewed as essential, if not the most important vehicle on the journey towards the national vision.

The Sub-Committee envisages that the energy industry will be sustainable, operating transparently with the full support of the Government (through effective governance) and the people of Trinidad and Tobago. It will include locally owned and managed energy-based companies that participate throughout the complete value chain in projects and operations that are both local and global in scope and scale.

Based on the successes of this industry, Trinidad and Tobago is the regional financial and energy trading centre, supported by a strong and vibrant capital market, and world-renowned educational institutions which will support the development of highly skilled and competent personnel, and a technology hub that stimulates innovation and entrepreneurship, supported by a strong public-private sector partnership.

GOALS

There are five critical goals underlying the achievement of this vision:

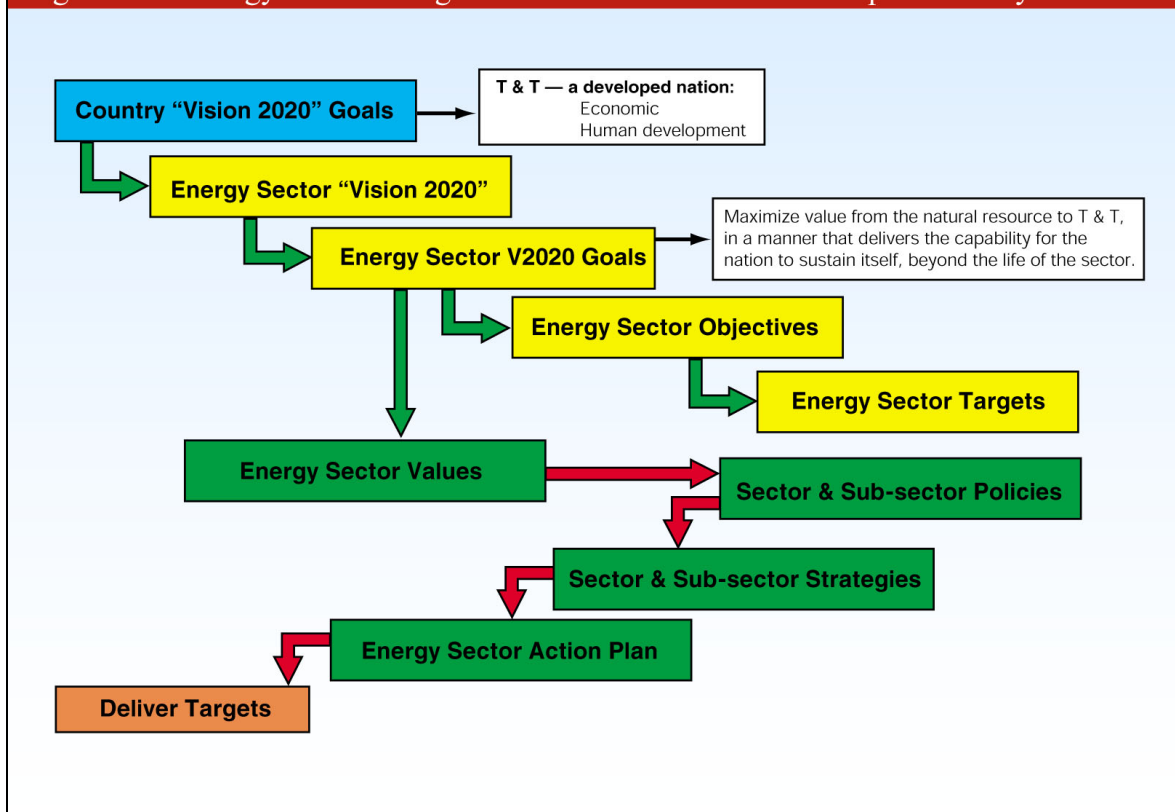
- To extract maximum value from the hydrocarbon resource in a manner that delivers to T&T the capability to sustain itself beyond the

GOALS, OBJECTIVES AND TARGETS

<p>life of the local energy sector.</p> <ul style="list-style-type: none"> ▪ To sustain a competitive world-class energy sector with a high level of local involvement in deeper, broader and more complex and environmentally responsible industries, making Trinidad and Tobago a recognized leader in key sectors, such as finance, education, information technology, maritime services, technology and innovation. ▪ To increase the share of benefits accruing to Trinidad and Tobago 	<p>from the value chain through the strengthening of the linkages between the energy sector and the rest of the economy.</p> <ul style="list-style-type: none"> ▪ To develop a robust framework of governance that establishes and maintains a clear commitment to transparency and ethical behaviour. ▪ To further support sustainable development through the definition and enforcement of high standards for health, safety and environmental practices, as well as the deepening of the sector's participation in 	<p>community and social investment.</p> <p>If Trinidad and Tobago is to avoid the “natural resource curse”, the country must use the sector's outputs (raw commodities extracted, human capabilities created and financial revenues earned) in a manner that captures and transfers those capabilities needed for sustainability to other sectors of the economy.</p> <p>The subsidiary goals, objectives and the road map to delivering targets are presented within a framework depicted in Figure 5.1.</p>
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GOALS, OBJECTIVES AND TARGETS

Figure 5.1 : Energy sector linkages to Vision 2020 and a road map to delivery



GOALS, OBJECTIVES AND TARGETS

OVERALL OBJECTIVES

To achieve the above, the overall objectives which should be pursued by the sector are:

Goals	Objectives
To optimise exploration and production of hydrocarbon resources.	<ul style="list-style-type: none"> ▪ To achieve a sustainable level and pace of upstream sector activity through the efficient management of the hydrocarbon asset.
To maximise wealth creation capture and distribution.	<ul style="list-style-type: none"> ▪ To maximise level of in-country expenditure/activity. ▪ To maximise the level of local participation and equity ownership in the sector value chain. ▪ To optimise revenue capture. ▪ To strengthen the contribution of the energy sector to the local capital market.
Enhanced development of human capital.	<ul style="list-style-type: none"> ▪ To provide high-quality, affordable educational opportunities in a wide range of fields related to the sector, up to tertiary level. ▪ To develop capabilities of TT nationals to enable their participation at all levels and in all parts of the value chain, anywhere in the world. ▪ To create strategic alliances between industry, businesses and educational institutions to deliver and support training and R&D initiatives. ▪ To create awareness within the country about the energy industry and evolving opportunities.

GOALS, OBJECTIVES AND TARGETS

Goals	Objectives
Robust and respected institutional and regulatory framework to manage the industry.	<ul style="list-style-type: none"> ▪ Clear definition and distinction of roles, responsibilities and accountability of various state agencies, corporations and institutions. ▪ To ensure clear, workable, widely articulated and consistent policies on all aspects of the sector that impact national development. ▪ To establish a relevant and flexible regulatory framework. ▪ To strengthen institutional capacity. Key areas of focus include: <ul style="list-style-type: none"> – Sector planning and implementation; – Measurement, monitoring and assessment; and – Classification and interpretation of economic data. ▪ To recruit, develop and retain highly competent human resources in energy-related State institutions. ▪ To enhance business capability of energy-related State institutions.
Transparent governance of energy-related private and public sector institutions.	<ul style="list-style-type: none"> ▪ To achieve transparency of governance, accounting and reporting in energy sector companies, local and international. ▪ To achieve transparency of accounting and reporting of State institutions in all matters relating to the industry where State resources are involved.
Development of competitive and sustainable local energy companies.	<ul style="list-style-type: none"> ▪ To create a sustainable, world-class services sector, which can compete locally and globally. ▪ To foster an enabling environment for local operators to invest.

GOALS, OBJECTIVES AND TARGETS

Goals	Objectives
Significant industrial development and diversification to high-value-added services.	<ul style="list-style-type: none"> ▪ To foster investment in areas where the opportunities for value-added are greatest. ▪ To facilitate and encourage strategic partnering between local and international companies. ▪ To enhance industrial development by diversification and extension of sector service industries. ▪ To foster local and foreign private sector investment. ▪ To increase and improve the level of national innovation and technology adoption in sector to developed world status. ▪ To leverage sector's use of technology, infrastructure and skills to build support facilities, services providers, training institutions and businesses locally. ▪ To enhance industrial development by diversification and extension of sector services.
Protection and enhancement of the natural environment.	<ul style="list-style-type: none"> ▪ To develop an effective management and regulatory framework, that will inform local health, safety and environmental practices. ▪ To ensure that all operators comply with and exceed local and international standards. ▪ To minimise the negative impact of the siting of energy facilities and support infrastructure. ▪ To enable ongoing environmental monitoring.
Sustainable investment in social capital.	<ul style="list-style-type: none"> ▪ To improve community development by industry partnering.

GOALS, OBJECTIVES AND TARGETS

SPECIFIC OBJECTIVES

In defining objectives, the term “optimise” is used to promote the notion that the specific mechanism of local involvement creates higher local value and should be maximised to create greater net value to the country.

Wealth Creation & Retention

Maximize in-country expenditure (capital expenditure & operating expenditure) of foreign oil and gas businesses through:

- Optimal local equity ownership of energy businesses.
- Optimal local capital market financing of energy businesses.
- Maximum local content of goods & services.
- Maximum exports of local goods & services.

Optimal product mix and production levels:

- Create best returns to Trinidad and Tobago; and
- Sustain the industry and country.

Maximize hydrocarbon resources through:

- Adoption of strategic approach to exploration and access to new acreage.
- Employment of production methods to optimise depletion rate.
- Balancing of depletion rate with maximum hydrocarbon recovery rate.
- Continuous de-bottlenecking of plants.
- Optimising of existing and planned infrastructure

Maximising efficiency of investments and activities by strategic planning, taking into account:

- Timing.

- Synergies.
- Capital efficiency.

Promote the building of local capability in businesses, personnel and capital markets by investing in skills development institutions and infrastructure relevant to the sector:

- Human capability development — increasing local participation in industry by building relevant and transferable skills and knowledge.
- Enterprise development — building technology, tools and process capabilities that position local businesses to grow and become competitive in the global marketplace.
- Capital market development — creating a financial environment conducive to business development and broad

GOALS, OBJECTIVES AND TARGETS

local participation in the industry.

- Foster an enabling investment environment for local operators with clearly articulated policies regarding local content and local value-added.

Create a sustainable, world-class services sector with the capability to compete globally and deliver operations and projects to the local and international industry:

- Foster investment in areas where the opportunities for value-added are greatest, such as research and development.
- Create and lend support to joint-venture initiatives between local and international private companies.
- Foster local and foreign private sector investment,

recognising the vital role of a dynamic private sector in making strategic investments in technology, research and development, education, knowledge/information and physical infrastructure. Without such investments, the Trinidad and Tobago economy is unlikely to break free of its dependence on the energy sector.

Human Development

- Develop and maintain a country manpower development plan that attracts, motivates and retains the best-qualified Trinidad and Tobago nationals from throughout the world to the industry.
- Create a secretariat based in Trinidad and Tobago with a cadre of commercial and business development

professionals who are highly skilled, analytical and motivated and who are supported by technical experts and knowledge management systems for evaluating, negotiating, contracting and partnering for new investments in Trinidad and Tobago.

- Maximise the level and number of Trinidad and Tobago nationals involved in all aspects of the value chain.
- Focus on development of nationals in high value-added positions and with strategic business skills such as management of technology, engineering design and other commercial skills.
- Create strategic alliances between industry businesses and educational institutions.
- Establish an Institute of Energy Business as an

GOALS, OBJECTIVES AND TARGETS

independent “Centre of Excellence” for energy education in Trinidad and Tobago and as the core of the proposed University of Trinidad and Tobago, offering training, research, analysis and consulting in technical, strategic, policy and commercial issues for private individuals, industry, individuals and government. Other energy-related education institutions should be upgraded and integrated into the proposed framework.

Industrial Development & Diversification

- Intensify the linkages between the energy and non-energy sectors, both to assist economic diversification and to ensure that the benefits from the energy sector

flow throughout the economy.

- Where possible, eliminate barriers to energy sector participation which have been imposed by business development institutions, such as the business development company (BDC) and the tourism and industrial development company (TIDCO). Business development support is needed by the energy sector and, with participation, the best practices can be effectively transferred to other sectors of the economy.
- Increase innovation, technology application and research and development capability.
- Create a centre of petroleum research excellence through collaboration with the institute of petroleum,

business and industry, service companies and other universities which would have a global reputation in specific areas, such as drilling and completions, natural gas-derived c1/acetic acid chemistry, seismic imaging and ocean engineering.

To make this vision a reality, stakeholders will have to share some responsibility for national development through a process with clearly defined roles for all. In this regard, it would be fruitful to include primarily local operators such as NGC, Petrotrin and Phoenix Park Gas Processors, as well as predominantly foreign-owned entities such as bpTT, PCS Nitrogen, Hydro Agri, BG, BHP, CLICO Energy, ISPAT, ALNG and EOG. Valuable contributions to this process could also come from banks,

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credit unions, multilateral and other financial institutions as well as business associations such as the Chambers of Commerce and NEBA.

TARGETS

To extract value from the energy sector, a clear understanding of the areas of

value creation is required in order to capture value from the sector and to determine the best strategic fit and the potential for value and revenue generation.

Figure 4.1 previous illustrates some components of the oil, gas, power and petrochemicals value chain.

However, it does not specify the direct (e.g. services) and indirect (e.g. education) sources of value or other ways of getting value within the global energy chain.

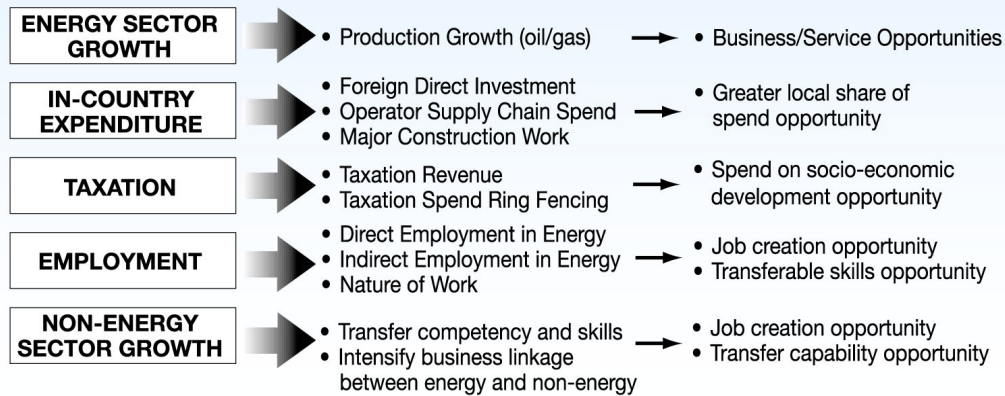
Figure 5.2



FIGURE 5.3

**ILLUSTRATION OF THE KEY AREAS OF INFLUENCE
OF THE SECTOR ON NATIONAL DEVELOPMENT**

5 key contributors to Vision 2020 areas exist that can be leveraged.



Simply put, the value chain provides sources of value to the nation through five key levers — output growth, in-country expenditure, taxation, employment, and non-energy sector growth, inclusive of community development. (Fig. 5.3)

An enabling environment must be created to support initiatives in these areas. Apart from ensuring the optimal environment for the capture of value, such as the right institutional and legislative framework, the government would have to

clearly communicate to operators the target requirements for local content and local capability and evaluate, monitor and report on their progress in the transfer of knowledge. Figure 5.4 illustrates the elements of this framework.

Figure 5.4: Creating The Enabling Environment

Institutional Framework

Clear definition of roles and responsibilities of the State agencies in:

- Oversight
- Policy Making
- Strategic Planning
- Defining, valuing and pursuing opportunities (including cross-industry linkages — clusters)
- Analysis — data collection, evaluation and knowledge management of all aspects of the industry, markets, competitors, partners, best practices, technology, finance, global and regional issues, opportunities and trends, etc.
- Tactical/Business Development
- Legislation/Regulations
- Analysis
- Negotiating/Contracting
- State and Private Sector Involvement
- Marketing and Trading
- Operational
- Monitoring/compliance assurance
- Contract management
- Education, training and development — attract and retain right skills
- Technology development and innovation
- Design, implement, operate, maintain, abandon

HSE

- – Standards
- – Benchmarks and baseline industry metrics

GOALS, OBJECTIVES AND TARGETS

Energy Sector Growth

The underlying source of value in the sector is the production of natural gas and crude oil and the respective product derivatives. The following selected charts represent near-term targets, based in most cases on current conditions. In a few cases, upside potential is indicated on the chart. In turn, production levels are determined by the reserves found. Most of the forecasts consider only those known reserves.

Indeed, some analysts are of the view that Trinidad and

Tobago continues to hold tremendous upside potential for the discovery of new oil and gas reserves, particularly in the unexplored “ultra-deep” areas off the east coast. Companies operating in the local industry would be encouraged to participate in Trinidad and Tobago’s offer of licensing for new areas of exploration by the fact that most of the major oil discoveries of the past have been in acreages with similar conditions to the unexplored acreage. In addition, a more aggressive approach to exploitation of land, oil and gas resources through the use

of private capital, including domestic capital, modern technology and management techniques, will very likely yield additional hydrocarbon reserves and subsequently new production of crude oil and gas.

Advances in seismic imaging provide the incentive for pursuing acreage with the potential for giant oil and gas fields onshore and below the existing East Coast basin that delivers most of the country’s current production.

Figure 5.5 : Target areas increasing production

— **Resource Management: Production**

OIL PRODUCTION

(upside from deep water and deep imaging on shelf)

- Refinery throughput
- Local petroleum product market

GAS PRODUCTION

(upside from small field and infrastructure-led development, BHP, compression, deep water and deep imaging success)

- Gas demand / supply — domestic / total
- Petrochemicals production
- LNG production

ELECTRICITY

- Demand / supply
- Rates and cost

Figure 5.6 : Trinidad and Tobago: oil and gas reserves 2003

NATURAL GAS

	Tcf
Proved	20.3
Probable	8.1
Possible	5.9
3P Total	34.3

N.B. Identified leads point to reserves of approximately 30.7 Tcf and unidentified resources estimated at 28.0 Tcf.

OIL RESERVES (MMBBL)

Proved	716
Probable	500
Possible	1,400

Figure 5.7

RESERVES POTENTIAL
Exploration Management-Leasing of New Acreage
ULTRA-DEEP AREA

Survey commenced July 15, 2002
In total, 12,454 line kilometres were asquired.
Survey completed October 2002.
Bid round due 2004.

Figure 5.8 : Oil, condensate and gas production forecast 2004 - 2009

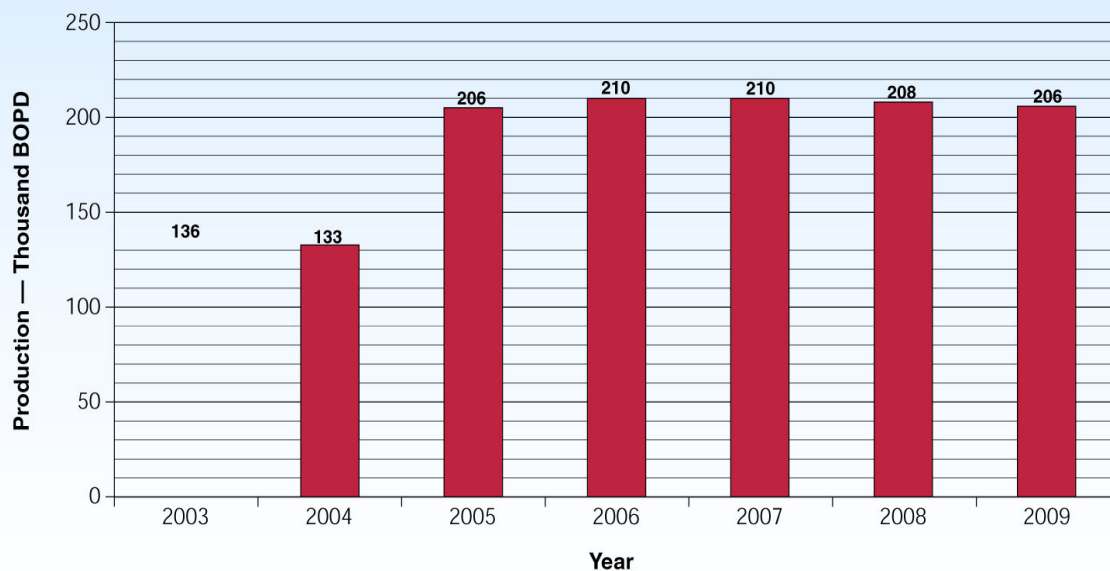


Figure 5.9 : Oil and condensate production upside forecast

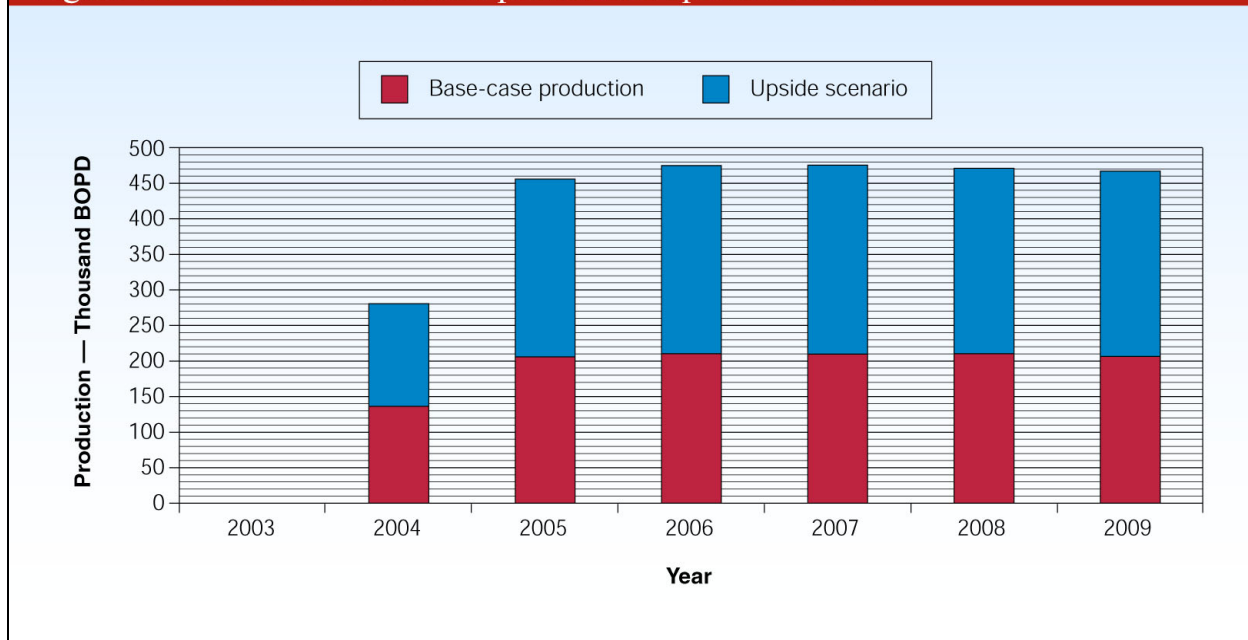
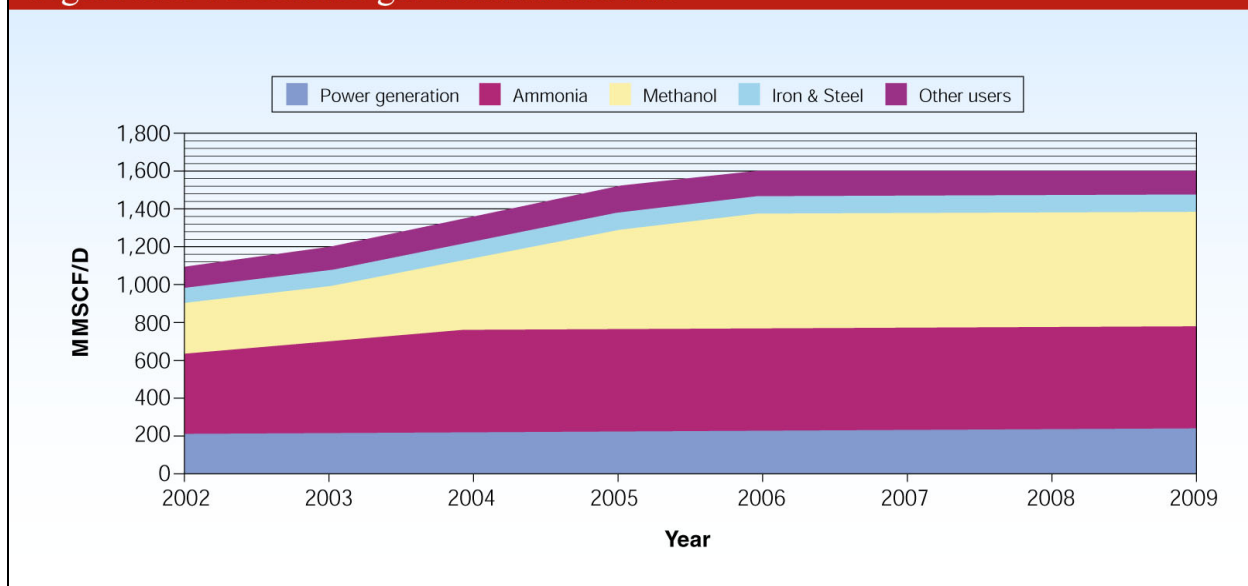


Figure 5.10 : Domestic gas demand forecast



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Figure 5.11 : Gas demand forecast - domestic & LNG export

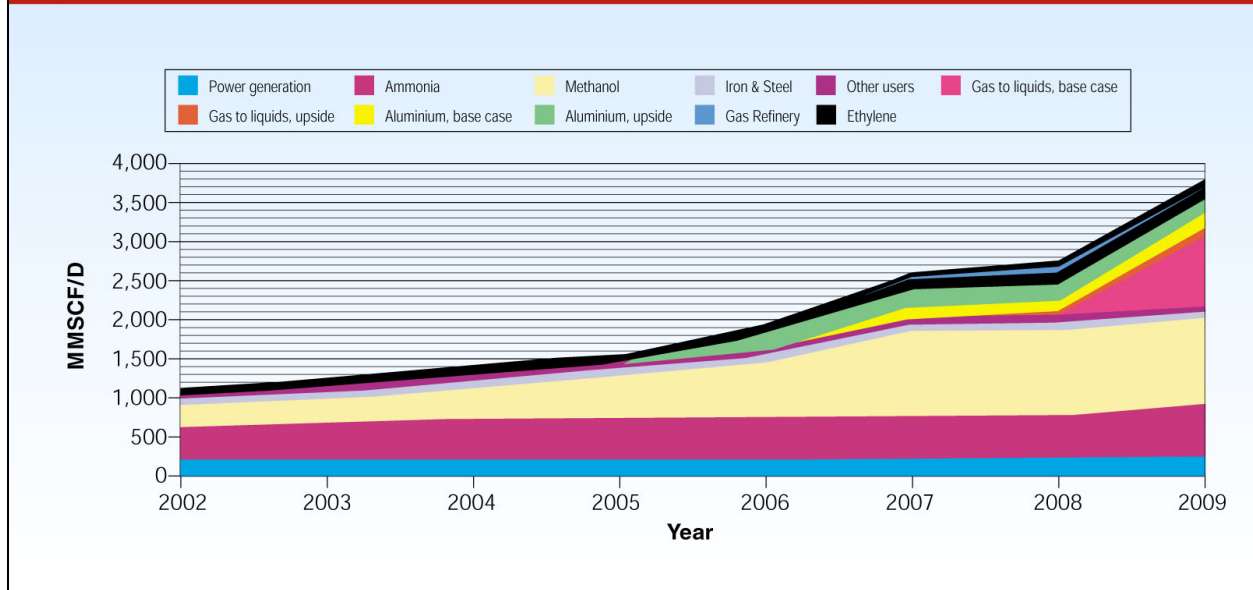


Figure 5.12 : Domestic gas demand forecast - upside

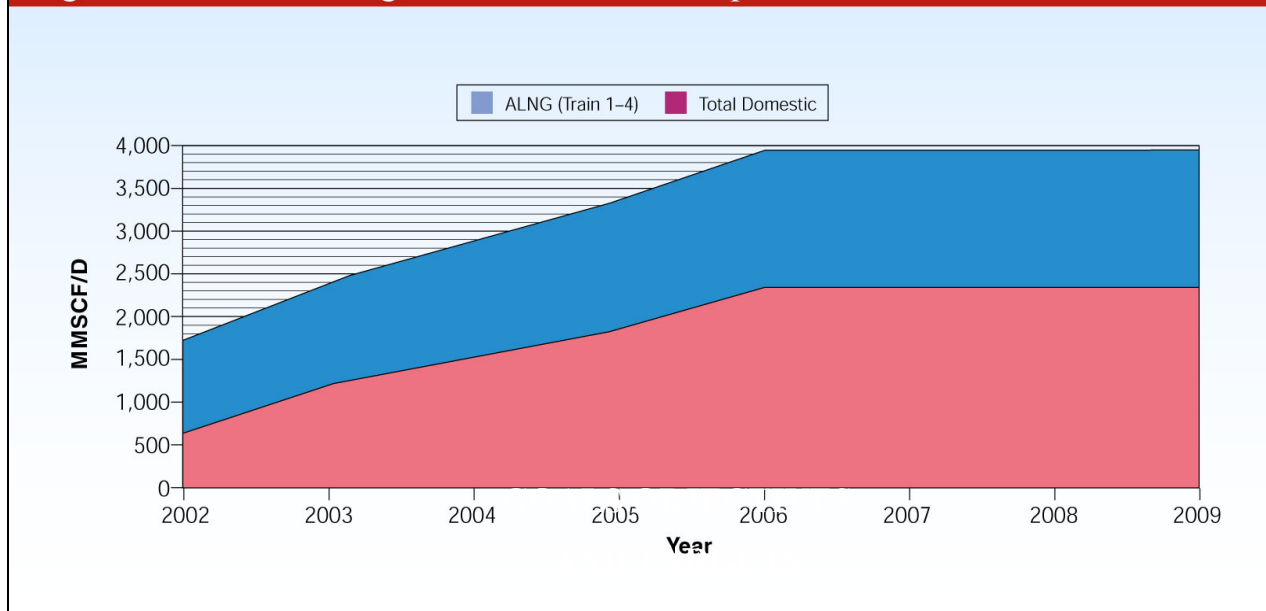


Figure 5.13 : LNG production forecast 2004 - 2009

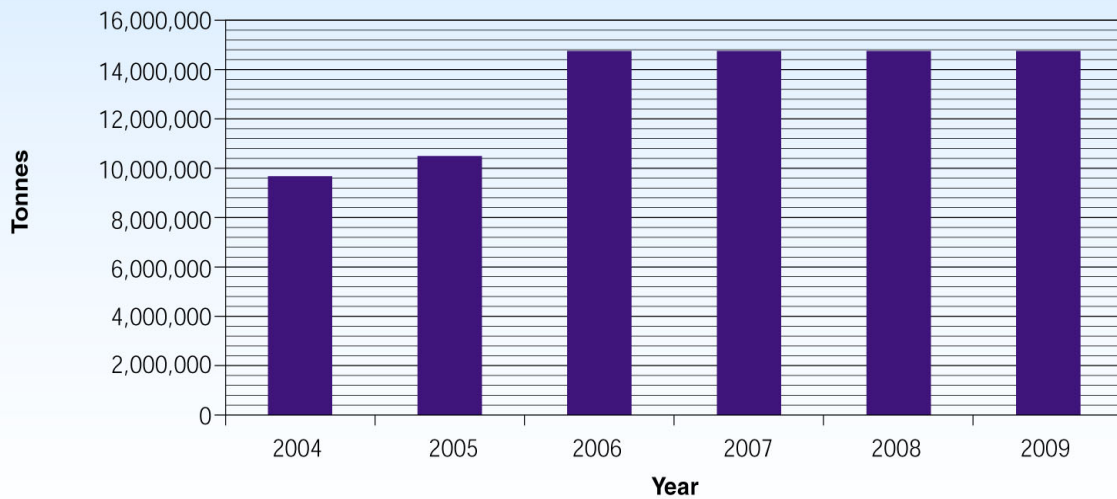


Figure 5.14 : Ammonia production forecast 2004 - 2009

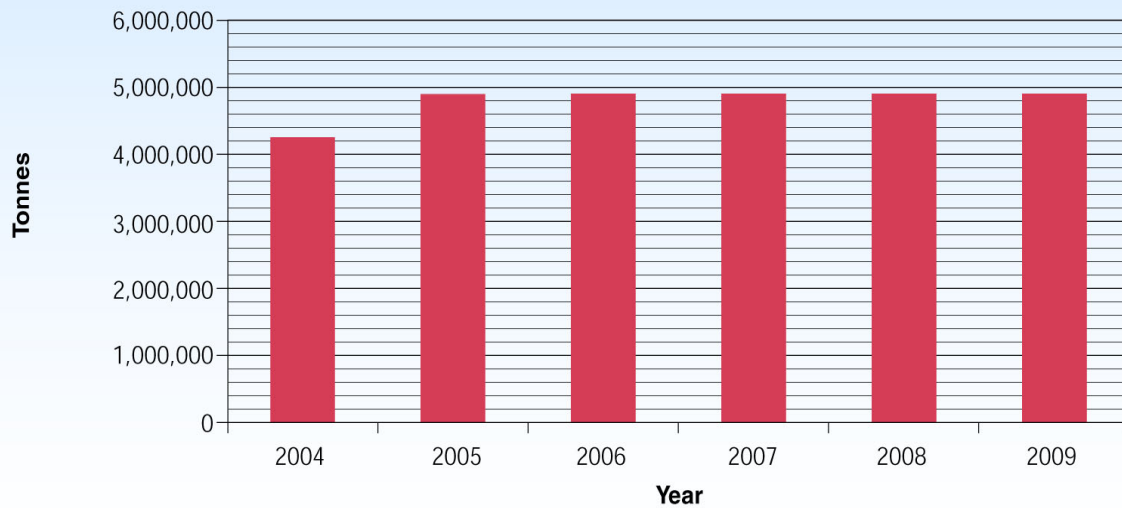


Figure 5.15 : Methanol production forecast 2004 - 2009

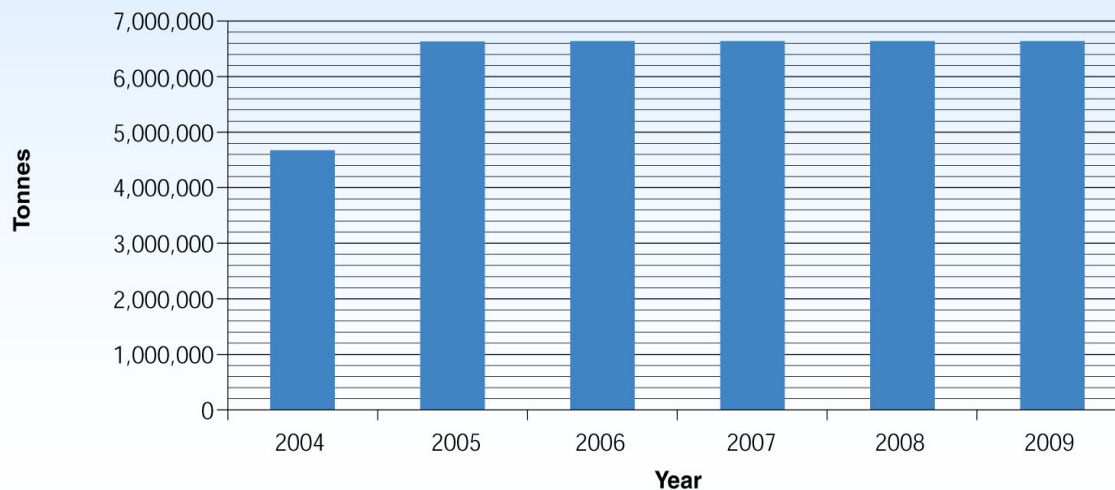


Figure 16 : Urea production forecast 2004 - 2009

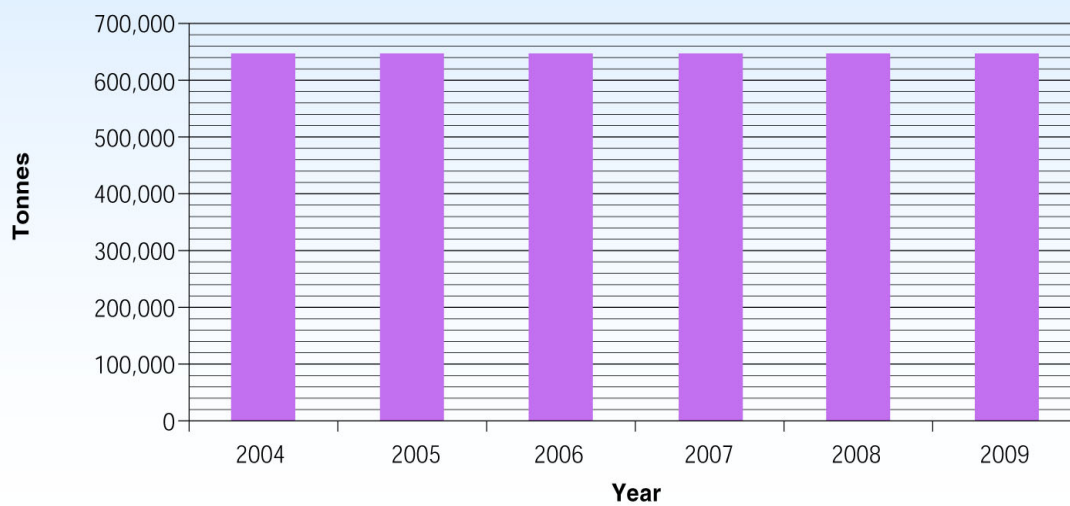


Figure 5.17 : Natural gas liquids production forecast 2004 - 2009

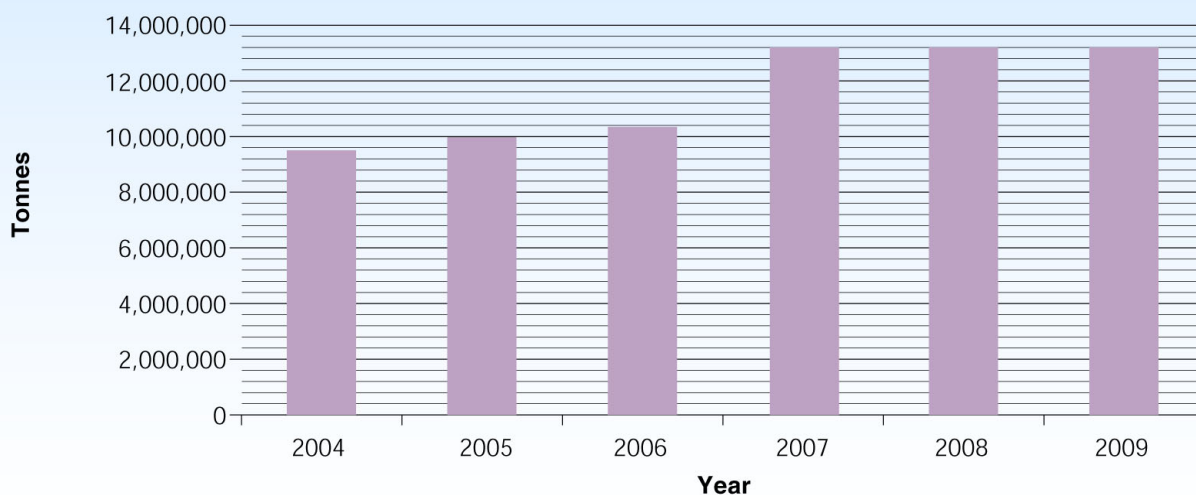


Figure 5.18 : Refining estimates 2003 - 2009

YEAR	T'PUT MMB	LOCAL SALES MMB	EXPORTS MMB
2003	54.8	7.3	47.5
2004	60	7.3	52.7
2005	61.3	7.3	54
2006	61.3	7.3	54
2007	57.6	7.3	50.3
2008	60.1	7.3	52.8
2009	60.1	7.3	52.8

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Figure 5.19

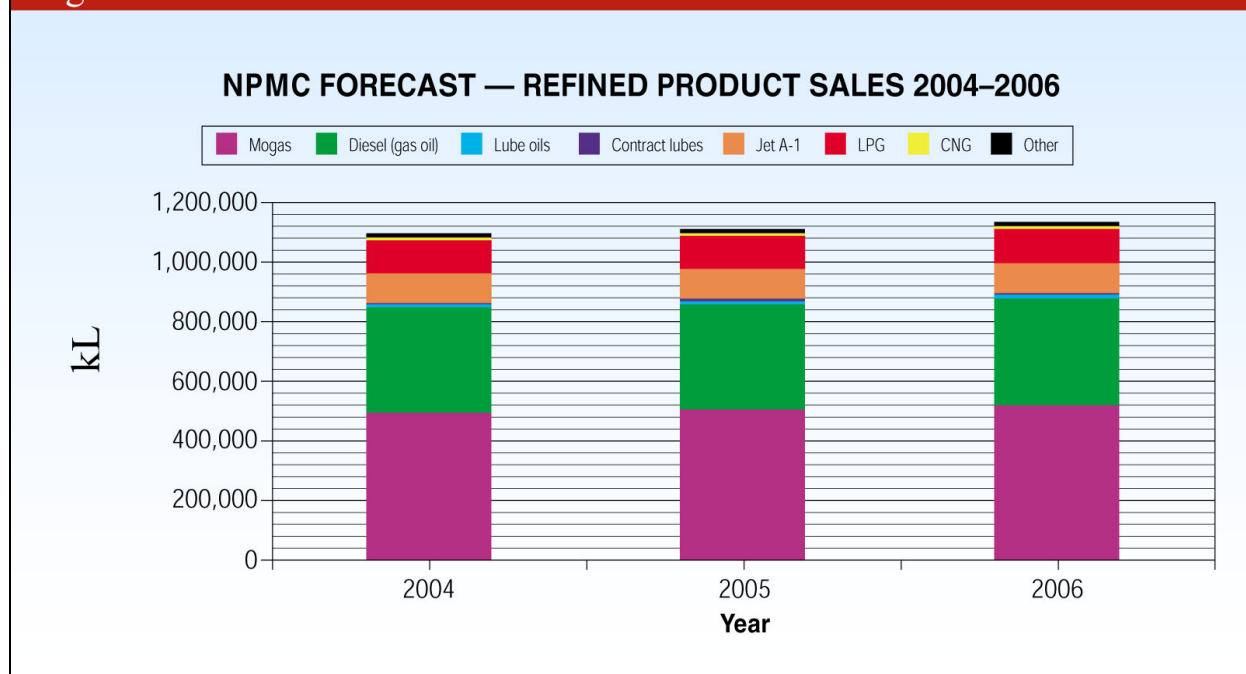


Figure 5.20 : Electricity demand and supply forecast

YEAR	2004	2005	2006	2007	2008	2009
No. Customers (x 1,000)	346	353	359	366	371	376
Peak Load (mW)	980	1,023	1,065	1,099	1,133	1,169

YEAR	2004	2005	2006	2007	2008	2009
Capacity Additions (mW) (Contracted and New)	65	75	75	—	75	—
Cumulative Capacity (mW)	65	140	215	215	290	290

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Figure 5.21 : Projected new infrastructure projects

NATURAL GAS PIPELINE SYSTEM — NEW PROJECTS

56-Inch B/Field–Pt. Fortin (76 km)

— US\$205 million

— 2.4 – 3.2 BCFD

36-Inch Cassia–B/Field (76 km)

— US\$150 million

INDUSTRIAL ESTATES AND PORTS

LABIDCO Industrial Estate

La Brea — 154 hectares

Plan — Develop new estate — 450 hectares

Plan — Develop Fabrication Yard

2003 Start-up

Galeota Point Port

Under consideration

Figure 5.22 : Potential major investments in Trinidad and Tobago downstream natural gas centre

Product	Project/Company	US\$Million	Employment	
			Permanent	Peak Contr.
Methanol	Atlas Methanol Co., Methanex / bpTT	400	90	160
	Methanol Holdings (MHTL) — M5 Plant	520	60	1,000
	Starchem Methanol	891	58	2,000
Ammonia	CNC I	300	70	1,500
	CNC II	300	70	1,500
Ethylene	Ethylene Petrochemicals Complex	1,000	505	2,500 – 3,000
	Ethylene Downstream	na	na	na
Aluminium	Noranda Aluminium Inc. (Canada)	1,000	500 (50 expats)	4,000 – 5,000
	Sunal (Venezuela)	na	na	na
Iron and Steel	Nucor Iron Carbide	na	na	na
	Cliffs and Assoc. Ltd.	na	na	na
Gas Processing	PPGPL Expansion	na	na	na
GTL	Syno'oloum	na	na	na
	Shell	1,545 +315 (cont)	500	6,000 – 7,000
	Chevron-Sasol	na	na	na
	Caribbean Pipeline	na	na	na
	Gas Refinery	na	na	na
TOTAL		~6,271	~1,953	~21,160

Figure 5.23 : Target focus areas

Value Capture

Percentage of Resource Value Captured in Country

- Government revenues from energy — taxes and royalty
- T&T companies share of value
 - Local content of services
 - Local finance
 - Services outside Trinidad and Tobago (shipping, trading, marketing, retail, etc.)
- Employment levels/skills development and certification
- Wealth distribution
- Cross-industrial linkages (clusters)

Investment (CAPEX/OPEX) Schedule

- Exploration and acreage management
- New field development/depletion schedule
- Infrastructure development — ports, estates, facilities, pipelines, etc.
- Plant construction (including refineries and major upgrades)

Energy Share to GNP and GDP

- Rate of change of ratio of GNP / GDP — closing the gap

Target Focus Areas

The four areas discussed below are adjudged to be where the most significant gains can be made towards achieving the sector's long-term goals.

In-Country Expenditure

This relates to all operator capital expenditure (CAPEX) and operating expenditure (OPEX) by companies in Trinidad. Industry analysts estimate that over the next five to ten years, the upstream oil and gas industry alone will spend about

US\$500-\$600 million per year in support of exploration and production in Trinidad and Tobago. During growth periods, this aggregate is the highest injection that an operator makes or can potentially make in this economy. However, it is estimated that only about 10-

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20% of current operators' CAPEX is spent on Trinidad and Tobago goods and services. CAPEX tends to be infrequent, one-off investments made over a short period and is thus unsustainable. CAPEX expenditure is also elastic with respect to the oil/gas price and is a useful tool for jump-starting sectors of the economy. An operator's per annum OPEX is usually significant and provides continuous annual expenditure that has the potential to bring stability to finance flows in the domestic market.

In-Country Expenditure and Enterprise Development Targets

In-country expenditure is closely associated with enterprise development. Indeed, the higher the level of expenditure the greater the potential for real enterprise

development which could be stimulated by the following strategies:

- An annual increase of 10% over a period of five years from 2003 levels in the local component of the agreed capital expenditure budgeted for Trinidad and Tobago.
- An annual increase of 15% over a period of five years from 2003 levels in the local component of the agreed operating expenditure budgeted to be spent in country.
- Government monitoring and reporting on the percentage of the total contribution from individual operators, e.g. percentage of CAPEX and OPEX spent in country, tax revenues, the number of local employees and the nature of their work, and the procurement of goods of

local origin (direct and indirect inputs).

- Introduction of a 15% minimum level of local content by the Ministry of Energy in all services contracts procured from the first day of project execution. If deemed to be initially unachievable, companies should be required to present an action plan for meeting the requirement as an average, over a specified time or series of projects. Developing local capability beyond simply using local content should be a nonnegotiable requirement for operators.
- Introduction of incentives for operators to encourage supplier development through the transfer of skills and resources to the local workforce, their suppliers and contractors.

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<ul style="list-style-type: none"> ▪ Joint investment between the state and operators in building capacity such as the upgrade of a fabrication yard as part of an infant industry philosophy. ▪ Regular and scheduled planning and review sessions between the government and stakeholders in relation to information transfer and capability building of local businesses and human resources. ▪ Weighting of no less than 15% for the level of local content within each bid for tender. ▪ Designated date from which all engineering and fabrication of offshore structures and facilities will be done locally, using local businesses (whether wholly or partially owned by Trinidad and Tobago residents) to a minimum 	<p>level of 15% local content.</p> <ul style="list-style-type: none"> ▪ Establishment of a special fund to support domestic investment in services that build capabilities/capacity that do not currently exist. ▪ Phased establishment of an appropriately scaled workshop or factory for the production of prefabricated piping spools of internationally acceptable standards for use in both onshore and offshore facilities. ▪ Establishment of a trading marketplace and trading floor for LNG, methanol & ammonia — creating a Trinidad and Tobago Gas Exchange with a minimum of 50% level of local ownership and which enables the development of the capital market and technology. 	<ul style="list-style-type: none"> ▪ Encouragement of synergies and business opportunities in order to benefit from large use of computing power in the upstream services sector, one of the biggest users of computing power in the world. Operators and their suppliers should be required to build the digital infrastructure to support their work with local suppliers, using open standards and formats that enable other businesses and sectors to leverage the network to support the country's ongoing transformation to a digital economy. <p>Employment of Nationals</p> <p>The local energy sector accounts for just over 3% of total employment in the economy, according to official statistics. This is so despite the fact that the energy sector tends to grow</p>
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at a faster rate than the non-energy sector.

Although an increase in jobs for nationals in the sector has limited impact on the overall economy, it is still a worthwhile goal since there are benefits to be derived by fertilizing the non-energy sector with value-added skills in energy, such as in the commercial, leadership, management and analytical areas.

The following targets are appropriate:

- For all upstream and downstream projects with high levels of expatriate labour (e.g. >50% of man hours employed) and management (e.g. >20% of man hours employed), a targeted programme should be set up to ensure a specified annual increase in both the

number of nationals employed directly and indirectly in energy sector projects, and in the number of nationals employed in management positions over a designated period from 2003 levels. This can be tracked by comparative indices, such as ratios per category of employee.

- A Government-driven manpower development plan for the energy industry should be implemented. This plan would go beyond training to include the systematic replacement of expatriates with qualified nationals. This plan would need to be linked with the operators' work permit and manpower planning programmes, and monitored for compliance.
- Government policy should ensure that

nationals are developed in all operational, technical, commercial and leadership activities of foreign companies engaged in these services. These companies should be required to contract for the development of nationals during their activities in Trinidad and Tobago through a process that measures actions, outcomes and timelines, and that contains penalties for default.

- Operators should be required to develop training programmes with local institutions to deliver the required level, quality and number of skilled personnel to meet their growing demand, as required by the Petroleum Act and Regulations.
- A US\$5 million incentive scheme for businesses that support research and development programmes

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should be implemented. The establishment of research and development programmes at the proposed University of Trinidad and Tobago should form part of the conditionalities for businesses that apply for incentives for participating in the development of a new industrial park. This should be pursued with great urgency.

Collaborative (Community Partnering) Initiatives

Collaborative initiatives such as skill development, technology transfer, education, training, arts, and sporting and community initiatives are not easily measured since they can either be made to flow from operator to domestic recipients, either directly through government

intervention or indirectly, without such intervention.

The following initiatives should be targets:

- An Institute of Petroleum / University of Trinidad and Tobago.
- A US\$500,000 per annum investment in the arts.
- A US\$500,000 per annum investment in sport.
- A US\$500,000 per annum investment in communities.

Tax Contribution

The operator's total tax contribution forms a large portion of Government revenue and can vary according to the operator's activity. A team of consultants is already reviewing the Petroleum Tax Regime, last amended in 1992, and this work should form the basis of establishing targets for activity.

STRATEGY FOR DELIVERING OBJECTIVES & TARGETS

A strategic approach is required in attempting to maximise the value of the oil and gas resource to the nation. To achieve this, delivery of each objective and target should be approached in the following manner:

- A clearly defined and well communicated set of values that states where Trinidad and Tobago stands on issues of:
 - Value creation (financial and otherwise).
 - Corporate governance, control and transparency.
 - Ethical behaviour.
 - Human development.
 - Health, safety and the environment.
 - Community relationships.

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<ul style="list-style-type: none"> ▪ Institutional strengthening with clarity on, and distinctiveness of roles, responsibilities and accountabilities. ▪ A clearly articulated and widely communicated policy, underpinned by and supporting the country sector values, must: <ul style="list-style-type: none"> – Be defined for the sector and each sub-sector. – Be championed at the highest level in the nation, compatible with the national impact potential. – Have alignment with all key decision-makers and implementers. ▪ For each objective, a clear, well-thought-out strategy must be developed to include: <ul style="list-style-type: none"> – Identification and evaluation of all the opportunities for locals 	<ul style="list-style-type: none"> (individuals or corporations) to participate in all parts of the value chain (including the direct and indirect services sectors along the chain), either directly or indirectly, locally or internationally, wherever the resource or its value-added derivatives progress through the chain. – Consistent definition of “local content” with measurable targets for specific components and performance indicators. ▪ For each opportunity, this analysis will include, inter alia: <ul style="list-style-type: none"> – The nature of the activity involved; – Requirements to participate - capital, technology, skills, alliances, barriers to entry, etc. 	<ul style="list-style-type: none"> – Number, frequency and timing. – Evaluation of the opportunity along defined metrics (cost, number and type of jobs, etc). – Current country capabilities. – Issues involved. – Risks (impact, manageability and mitigation). – Sources of value. – Mechanisms for accessing value. – Mechanisms for leveraging activities to benefit other sectors. ▪ Development and adoption of an analytical process that consistently determines best value for the nation, in terms of, among other things: <ul style="list-style-type: none"> – Fitting with national values and sector strategy.
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<ul style="list-style-type: none"> – Participation opportunities and approach (including nature of partnership, public or private equity). – Method for defining and comparing the value of opportunities in various parts of the value chain (including the direct and indirect services sectors along the chain) in terms of financial and social benefits, e.g.: upstream tax/royalty vs. low gas price to downstream plant; job creation vs. tax incentives. – Capital efficiency of investments, using standardised metrics so that different opportunities can be compared. – Accelerated pace of growth of infrastructure/plants in any one market segment vs. reduced investment by 	<p>planning on benefits of extended lifespan of infrastructure/plants resulting in an offsetting effect of depreciated assets and lower efficiency for older plants.</p> <ul style="list-style-type: none"> – Downstream investments — depth of downstream integration, choice of portfolio mix. – Upstream portfolio management — acreage access, exploration, development and production optimization to avoid overheating and enable sustainability. – Prudent resource management (depletion policies, reserves-to-production ratios, infrastructure and equipment sharing/vs. competition or self-interest, reducing redundancy and 	<p>inefficiency from a national perspective).</p> <ul style="list-style-type: none"> – Application of technology to improve efficiency, particularly in collaboration (data, knowledge and project management), statutory reporting, approvals, permitting and reporting. – Well-defined and measurable performance targets that can be linked to the national goals. – Data collection, measurement and analysis that enable fast and accurate determination of performance. – Benchmarking performance and setting improvement targets. – Tracking and using best practices in other areas. – Exit strategies at all stages (particularly end-of-life for major infrastructure in rural communities).
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GOALS, OBJECTIVES AND TARGETS

<ul style="list-style-type: none"> – Enrolment and understanding of the value evaluation process by the public sector stakeholders, so that the benefit to the nation takes priority over that of individual institutions – the value of the whole. ▪ Enabling and participating agencies charged with delivery must be clearly identified and empowered with: <ul style="list-style-type: none"> – The highest quality resources when needed. – A supporting legislative and regulatory framework. – An enabling environment that creates the conditions for long-term development of people, enterprises and capital markets. 	<p>Next Steps</p> <p>The more immediate imperatives may be grouped into two tasks:</p> <ul style="list-style-type: none"> ▪ Set energy-sector countrywide targets/standards (2003–2020) for: <ul style="list-style-type: none"> – The ratio of nationals to non-nationals in energy sector employment. – The ratio of nationals to non-nationals in value-added work roles. – Percentage of in-country expenditure for all operator third-party expenditure. – Percentage of taxation to be allocated for socio-economic development. – New business development agency/ies providing high-end skills to energy and non-energy sectors. – Skills sets for nationals to target. 	<ul style="list-style-type: none"> ▪ Take immediate steps to develop: <ul style="list-style-type: none"> – Policy on local content, in line with petroleum regulations and Production Sharing Contracts (PSCs) . – Local content definition communicated and applied widely. – Local content measurement system that can be applied by independent auditors. – Certification process for “local” companies, goods and services. – Educational programme to support skills development. – Energy sector and sub-sectors for local businesses to play a bigger role. – Human resource development policy that incorporates work permit process.
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- Industrialisation strategies that target clusters to effect cross-sector transfer.

LONG-TERM TARGETS (Getting to 2020)

This chapter has focused on the short and medium term (2003 - 2009 period) with respect to inputs into national development—oil and gas production, driving secondary products (petrochemicals, power, metals, etc.) Tertiary targets have also been described in the indirect benefits that create the core sustainability that will propel Trinidad and Tobago to a developed nation status by the year 2020. It is clear that the primary outputs (oil and gas production) are within our control only insofar as we manage the national asset optimally. Going further and managing

the hydrocarbon assets within a broader strategic framework is the necessary approach to maximising value to the nation.

Maximising country value from these assets requires astute and strategic management of the exploration portfolio, field and infrastructure development and reservoir depletion, with the highest standards of human welfare, safety, environmental care and commercial diligence, including the most efficient use of capital and risk assessment and management, with a commensurate increase in secondary and tertiary benefits. Since the choices that become available to Trinidad and Tobago for downstream activities and cross-industry benefits depend on how well the country does in the primary upstream areas, the focus

now turns to long-term forecasts for oil and gas production, and the scenarios.

Each scenario can deliver a range of options downstream, further emphasizing why it is important for Trinidad and Tobago to quickly come to terms with a mechanism for valuing and comparing the different options. It is assumed that the Gas Master Plan would have painted scenarios for global demand for petrochemicals, metals and power, and that there would be a set of options fit for each scenario, aligned with gas production levels.

In the future, upstream oil and gas production in Trinidad and Tobago will be determined by many factors. The forecasts to 2009 reflect hydrocarbon resources that are known with some high level of certainty – proven and probable reserves.

GOALS, OBJECTIVES AND TARGETS

Possible reserves, especially from new provinces, have not been factored in. The following are a few of the upside opportunities to be considered in examining the potential production landscape for the period 2009 to 2020:

Onshore

- Cretaceous reservoirs.
- Lower tertiary reservoirs.
- Deeper reservoirs (of similar geological age to those currently producing, in another part of the basin).
- Improved reservoir and structural understanding from 3D seismic imaging. (Over 80% of all new oil and gas found in Texas and Louisiana in the past few years has come from mature fields, using 3D seismic imaging. Up until the past four years, no oil on land in Trinidad was discovered using seismic

imaging — due to poor-quality seismic data and the gross under-imaging of the basin. In contrast, the successful offshore discoveries depended heavily on quality 3D seismic imaging.)

Gulf of Paria

Prospectivity in equivalent environments continues into the Gulf. (See above, points a – c). With respect to point d above, 3D seismic imaging does exist and has been useful, but is of poor quality generally.

East Coast offshore shallow (shelf) areas

- Deeper drilling below current production (drilling technology has progressed significantly, so that, despite current challenges, reaching deeper reservoirs should soon become routine).

- New seismic technology will allow better imaging.
- Bigger, less deformed structures, with the likelihood of larger field sizes and simpler depletion plans.
- Reservoirs are likely to be more oil- than gas-prone.
- Follow-up of the BHP discovery in the older tertiary reservoirs of the fold and thrust belt.
- Increased gas reserves become available as development costs are reduced with improved infrastructure availability (pipelines, processing facilities and compression).
- Smaller gas fields will become economic.
- Smaller reservoirs will be suitable recompletion candidates.
- “Stranded” reservoirs will be accessible via sub-sea completions, with tie-

back to nearby infrastructure.

East Coast Deep Water

- The Orinoco delta is the reservoir of the most prolific oil and gas basin in the world — the Eastern Venezuelan Basin has more reserves than any other. This is the result of the richest source rock (cretaceous shales) and a massive delta system (the Orinoco was the only major river draining the South American continent until fairly recently).
- Most of the major oil and gas discoveries of the past decade have been in deep-water basins. On the Atlantic margin, the Gulf of Mexico, West Africa and offshore Brazil have their equivalent in offshore Trinidad, where there has been drilling only in the inner part of

the slope, where there appears to have been a bypass of reservoir rocks, heading to deeper water accumulations. This area (referred to by the Ministry of Energy as the “ultra-deep”) has only recently acquired 2D seismic data and is not likely to be drilled for another two years at best.

- Oilfields in deep water have tended to be extremely large (of the order of 1 billion barrels) and very highly productive (wells make in excess of 20,000 bopd and fields produce in the order of 300,000 bopd.) The deep-water Caspian fields of Azerbaijan are said to have more reserves than Kuwait, for example.
- The expectation is that Trinidad and Tobago will discover several oil and gas fields in deep-water

areas, with three to five giants and a few smaller ones, giving a country production in the order of 1 million bopd of oil, from after 2010.

- Technology and markets would have advanced to allow for deep-water gas to become commercial, so that the associated gas from the oilfields as well as predominantly gas fields will deliver high levels of production (2–5 bcfd).

South Coast (Columbus Channel) & Platforma Deltana:

- This gas-prone part of the basin has been tested and proven to be gas-bearing on both sides of the border. As markets evolve and infrastructure improves, there could be increased exploration and production from these fields.

GOALS, OBJECTIVES AND TARGETS

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|--|---|---|
| <p>■ With a commercial arrangement in place, Trinidad and Tobago would have captured some Venezuelan gas to monetise in Trinidad and Tobago, pushing up country production in the order of 1 bcfd. The following table on the next page reflects a vision of oil and gas production,</p> | <p>from 2009 to 2020, with three scenarios:</p> <ul style="list-style-type: none"> – Low case — only a handful of “new” discoveries. – High case — most of the “new provinces” pan out successfully. – Medium case — a few of the “new provinces” pan out partially. | <p>These estimates have not been subjected to rigorous geological or risk procedures, but are back-of-the envelope numbers, estimated on the basis of limited data points without any judgment about accuracy. However, the conclusions are intended to stimulate discussion in the absence of any published data that consider the upside.</p> |
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Year		2009	2015	2020
Oil & Condensate (bopd)	Low	210,000	250,000	200,000
	Medium	250,000	350,000	500,000
	High	350,000	600,000	1,000,000
Natural Gas (bcfd)	Low	3.9	5	6
	Medium	6	7	10
	High	7.8	10	15

<p>The main message is that there is a reasonable probability that Trinidad and Tobago's production levels, high as they are, may go even higher after the current phase</p>	<p>of growth. Nevertheless, this growth will always be finite and for a limited period. This presents opportunities as well as dangers. The biggest danger is complacency,</p>	<p>which allows a tremendous opportunity to slip as we fail to prepare Trinidad and Tobago and its future generations for long-term competitiveness.</p>
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MAKING THE CONNECTION

- Establish framework for close collaboration among key stakeholders.
- Utilize the energy sector to build a world-class services sector.
- Leverage energy sector strengths to build competitive capability in other sectors.
- Active participation of domestic capital in the energy sector.

INTRODUCTION

As pointed out at the start of this report, a major goal of the visioning exercise is to identify those viable pathways through which the benefits of energy sector expansion can be transferred to the rest of the economy.

The need to infuse the non-energy sector with the global thinking and best practices approach of the highly competitive, leading-edge energy sector is now self-evident. It is accepted that many of the services used in the energy sector can be transferred to the wider business environment and used as a basis for expansion into overseas markets.

Already, many nationals are exponents of technological competence and global management best practices in energy, both at home and abroad. In the final analysis, the goal must be to create conditions for the full realisation of the potential of the people of Trinidad and Tobago through the development of the economy beyond the current dominance of the energy

sector. Doing so, however, will require a much better integration of the sector into the economic life of the country and its people.

Most previous attempts at diversification have focused on alternative sectors such as agriculture, manufacturing and tourism.

The case being made here, however, is for using the country's leading-edge status in energy as the basis for economic diversification. In this way, the already well developed human resource capability can be strengthened for export; services and maritime, too long ignored, can be a significant provider of jobs and services; and the growing recognition and status of Trinidad and Tobago as the economic and financial centre of the Caribbean can

be enhanced by creating access for the region's capital for use by the energy sector. This chapter seeks to link the energy sector with the following:

- Human resources and its development in Trinidad and Tobago.
- Services.
- Downstream Industry.
- Electricity.
- Communities and community development.
- The physical environment.
- Domestic capital and the need to further integrate the domestic capital market with the energy sector.

EDUCATION AND HUMAN RESOURCE DEVELOPMENT

The energy sector of Trinidad and Tobago has always competed in an international

environment in operating as part of a global industry. As a result, local industry has always had to maintain international performance standards. This has set the standards for the quality of human resources employed in the sector at every level, from those involved in clerical and administrative tasks to craftsmen, technicians and engineering professionals.

According to the Central Statistical Office, the sector provides direct employment for approximately 16,000 persons in Trinidad and Tobago. The profile of employees at all levels has changed from one decade to another, and has been influenced by the introduction of new technologies, especially over the past 10 years.

To attract new talent to the sector, energy industries have

been in constant contact with the public education system and with organisations involved in human resource development. After more than seventy years of interface, the linkages between the energy and education sectors have grown to the point of influencing human resource development activities well beyond the energy sector.

Historical Development

During World War II, Trinidad's petroleum refinery infrastructure made it a vital supplier of fuel to Allied forces in this part of the world. The industry was, however, largely self-contained, with its human resource development activities oriented towards supplying its own manpower needs. As a result, the following initiatives were implemented by the

companies involved in this industry:

Apprenticeship Programmes

Strong apprenticeship programmes were established to provide a continuous supply of craftsmen and technicians to support the needs of the industry. The output of this system eventually provided the foundation for the petroleum industry as well as the petrochemical and gas-based industries established in Trinidad and Tobago from 1958. These apprenticeship programmes later served as models for other craft and technician-level training programmes implemented by industries and national bodies.

Professional Development

Up to 1975, expatriates accounted for a high proportion of the

professionals and senior managers within the energy sector. Under pressure from the Black Power movement, the Government pushed companies to draft more nationals into their senior professional and management ranks. This led to scholarship programmes for nationals interested in engineering and other university-level training, primarily at foreign institutions.

This process was accelerated by the expansion of the Faculty of Engineering of the University of the West Indies as well as the purchase by the State of the local operations of several multinationals.

In-house training departments were created at all the major companies to develop and upgrade staff. The scope of these internal programmes increased over time as the companies' needs became

more complex and as they implemented policies of internal promotion of staff. Over time, token contributions to the education system (mainly for public relations purposes) evolved into targeted financial grants and scholarships and the provision of physical and other resources, as the multinational companies realised that the output from the general education system created the supply base for all the local staff employed in the sector.

However, throughout this period the focus remained on meeting specific energy industry needs with little consideration given to supporting human resource development with an impact on other sectors of the economy.

Current Situation

With the growth and increasing sophistication of the energy sector, and the State's realisation that energy industries have a responsibility for supporting development in the overall economy, today's human resource development activities have undergone significant changes along the following lines:

- Separate craft apprenticeship programmes have been consolidated into national programmes such as the National Energy Skills Center (NESC), and the National Skills Development Programme (NSDP), both of which service the needs of all industrial sectors.
- The technician component of apprenticeship and in-house training has been

consolidated into two national institutions, TTIT and COSTAATT. The TTIT, a partnership between major energy industries and the State, was created to provide high-level skilled technicians for heavy industry. COSTAATT, on the other hand, is designed to "...provide the highest quality tertiary education and training in respect of specialised skills in a range of professions and occupations identified on the basis of the continuing education needs of the population and the demands of an expanding, diversifying economy".

- Applied undergraduate level engineering training is now available at TTIT for technician graduates, allowing upward mobility for employees.

- The industry continues to grant a number of annual scholarships for craft, technician and professional level training relevant to its areas of activity.

Budget allocations for specialised professional development programmes are increasing at all levels within energy sector organisations. Over the past decade in particular, the increasing availability of industry relevant courses has encouraged energy companies to fund employee participation and even to provide, in some instances, programme instructors.

Today, energy sector companies are more aware of their responsibility to facilitate development in economic activity in all sectors of the economy. They have become aware of the

LINKAGES: ENERGY AND THE COUNTRY

inter-relationships between their operations and seemingly unrelated national economic activities, such as the environment, infrastructure, shipping, telecommunications, and community development. This has resulted in individual firms embracing

the role of catalysts in piloting and driving national initiatives in areas that would have been seen, previously, as unrelated to their core activities. This is particularly the case with respect to education and human resource development.

Looking to the Future

Following is the current and desired qualifications profile for technical personnel employed in middle management and at supervisory levels within the energy sector:

	Current Profile	Desired Profile
Engineers	20%	25%
Technologists	-	40%
Technicians	25%	35%
Craft Diploma or less	55%	-

The ongoing introduction of new and advanced technology into the operations of energy sector industries necessitates the upgrading of the industry's employment profile if they are to remain competitive into the future. The new plants being established in

Trinidad and Tobago are already attempting to hire staff with the desired profile. Attaining this industry objective requires very deliberate actions in the education process which will, in turn, have an impact on technological education for the rest of the country. The

energy sector possesses the largest single cadre of highly trained and experienced personnel within Trinidad and Tobago, with skills that are urgently needed in other areas of economic activity, especially within the public sector. This makes the energy sector uniquely poised to play

a catalytic role in providing expertise, safety and

environmental standards, and quality human resources for

the development of the rest of the economy.

Human Resource Development

- A sharp change in approach is required, from the historical emphasis on satisfying the needs of the energy sector to a broader perspective of enhancing the skill set for all strategic sectors.
- Serious deficiencies and shortages exist among technical personnel particularly at the level of engineers and technologists.
- The new approach must be characterised by a commitment to partnership among key stakeholders — Government, energy private sector, institutions, and professional and trade organisations.
- Key initiatives could include:
 - National apprenticeship schemes.
 - Upgrade of physical plant and course offerings at COSTAATT, TTIT and the proposed University of Trinidad and Tobago (UTT).
- Greater collaboration between UWI (and UTT) and industry — scholarships, research grants, secondment.
- Establishment of specialty institutions — Drilling School, Centre for Maritime Studies.
- Inform the general education system.

A Vision

By virtue of its physical resources and human resource capability, the energy sector will be required to play a more direct and influential role in fostering

change at a national level. It may therefore be appropriate for the sector to establish a mechanism to facilitate this process in such a way that it has a simultaneous and

positive impact on its core activities.

In the medium term, Trinidad and Tobago should develop an international centre for high-quality training and

scholarship on energy issues. By virtue of its international reputation, Trinidad and Tobago should be able to attract the best students and the most highly qualified and experienced professionals from around the world to work and teach in the country. A high-quality training facility in energy has the potential to develop into a major services export.

In making the next critical steps towards this goal, the following initiatives need to be strengthened and enhanced:

Partnerships

Close collaboration among the key stakeholders — Government, private sector, educational institutions and professional bodies — is required in order to effectively execute the strategies outlined below:

- Establishment of a well-resourced Secretariat/Agency staffed with highly skilled and experienced professionals with the capability to analyse the industry and participate in high-level negotiations with multinationals and other foreign investors. Development of this agency should be the product of joint collaboration between the State enterprises involved in the energy sector and the Government.
- Enhancement of current initiatives towards the establishment of a national apprenticeship programme for the development of skilled personnel.
- Expansion, modernisation and upgrading of existing tertiary-level institutions such as COSTAATT and the proposed University of Trinidad and Tobago.
- Continued expansion and upgrading of the NESC/TTIT to support energy sector growth and the rest of the economy.
- Partnerships with the university system through scholarship programmes; participation on advisory committees and secondment of staff to undergraduate and postgraduate programmes.
- Close working relationship with the major institutions and professional societies in continuous development and upgrading of professional staff through seminars, specialised courses and customised programmes.
- Active involvement in private/public partnerships to establish a Drilling School, a Centre

for Maritime Training and a Centre for Energy Studies, among other specialised institutions.

- Setting of standards for business activities, as well as national standards for safety, environmental management, security, community development, project management, and other economic activities that can be positively influenced by the capabilities within the energy sector.

- Provision of expertise at the primary and secondary education levels in recognition of their roles as feeder to the energy and other sectors.

INDIRECT LINKAGES — THE SERVICES SECTOR

Since, as global experience shows, expansion in services provides the most sustainable route to long-term economic growth, a prime target for transference of energy sector

activity should be services. These include banking and financial services, computer and information technology-related activities (hardware, software and IT services), analytical laboratory and testing facilitation, operations and maintenance support, mechanical fabrication and erection, and instrumentation and electrical services. This list, though not exhaustive, illustrates some of the areas that can also be developed through energy sector activity.

Linkages to Services

Key Initiatives

The services sector provides the most sustainable route to long-term economic transformation. The energy sector provides tremendous opportunity to build world-class service capability. This requires conscious effort, including:

- Boost local linkages with the offshore sector by outsourcing services.
- Explore all opportunities for cluster development around energy.
- Target major energy players to build local competence.

It is therefore important to acknowledge the following, while leveraging them to advantage:

- The energy industry is a large user of IT infrastructure and telecom bandwidth which could be used to accelerate the development of e-business.
- Cluster development, widely advocated as an economic development strategy, has not been explicitly employed with the energy sector as a cornerstone of a cluster development strategy. There is already an array of services that use the energy sector as a core market while extending into outer areas. Other possibilities include:
 - Capabilities developed from the local fabrication of structures for offshore production platforms and

processing plants can be applied to boat-building, machine shops, or pressure vessel manufacture to name a few. Trinidad and Tobago may have a competitive advantage in some of these areas.

- Services that support the maritime energy environment are applicable and viable in the fishing industry, both local and international. A world-class maritime service capability would be attractive to international fishing fleets.
- Trinidad and Tobago's global status in commodities trading could be leveraged to establish a trading exchange in energy and commodities.
- Trinidad and Tobago enjoys a reputation for

supplying world-class drillers to the global hydrocarbon industry but has not, however, converted this into any sustained competitive advantage. One option is the establishment of a world-class drilling school. The experience gained in training drillers could be extended to other areas, with the consequent development of a world-class training methodology.

A single large firm with a desired competency, such as 3D seismic interpretation, could be invited to set up in Trinidad and Tobago and build a technology centre around its operations similar to what Shell did in Malaysia.

**DIRECT LINKAGES:
DOWNSTREAMING
WITH PURPOSE**

In considering downstream hydrocarbon possibilities, the convention has been to look for derivatives of the intermediate or basic products of existing primary processing facilities. In part, this explains the effort expended on the development of an ethylene/polyethylene complex. In this particular case, opportunities may also exist to go further downstream into plastics and plastic products. Other examples are chemical products from methanol and ammonia, the proposed aluminium smelter and fabrication shops. Although worthwhile, these all have hurdles to overcome, such as limited local demand for the product, proprietary technology, the relatively

high cost of installations, and lengthy project development phases. An alternative approach would be to find direct linkages to areas of the economy not generally associated with the energy sector.

**Energy Sector Linkages —
A Model**

This model shows how direct linkages from the energy sector could be used in the expansion and growth of a normally unrelated area of economic activity. As demonstrated, the model uses the case of an integrated wood and forestry operation. While focused on the wood products market there is abundant opportunity for the general application of this model to enhance inter-industry linkages and boost economic transformation.

Background

Trinidad and Tobago is a producer of urea and methanol, with the local industries built on its natural gas resources. By producing formaldehyde from methanol and reacting it with urea, urea formaldehyde resins (glues) can be produced. The country also possesses significant acreage of plantation teak and Caribbean pine in addition to acres of natural forests. Most manufactured wood products, e.g. hard-board, particle board, veneers, parquet, medium-density fibre-board (MDF) etc., are bonded with glues and other resins. A case can therefore be made for building a wood products business in Trinidad and Tobago, given the availability of the required ingredients.

The chart below outlines the concept:

Table 6.1
Horizontal and Vertical Linkages

Natural Resource	Forest – Natural And Plantation	Natural Gas
Primary Products	Teak, Pine, Mahogany, Cedar	Methanol, Ammonia
Secondary Products	Logs, Lumber, Wood Chips, Sawdust	Formaldehyde, Urea
Tertiary Products	Veneers, Particleboard, etc	Urea Formaldehyde (glue)
Final Consumer Products	Furniture, Cupboards, Shelving, etc. Counter-Tops, Splashboards, etc.	Melamine, Melamine Formaldehyde

Reforestation

Over the past several years, there has been steady and accelerating degradation of the natural forest cover, especially in north Trinidad. The causes include squatting, slash-and-burn land clearing, forest fires in the dry season, indiscriminate quarrying and encroachment of housing settlements. Whatever the cause, irreparable damage will be done to the tropical rainforest cover and the country's rich flora and fauna

unless the process is halted and reversed by reforestation.

One recurring consequence is rainy season flooding and the resulting destruction of livestock and damage to property. A good illustration of the problem can be gleaned from the statistics gathered by the Forestry Department which compare the 36 hours it took for rain water from the Northern Range to reach the Caroni

River in 1991 with the 16 hours it took in 2003.

The proposed development of a modern wood products industry based on energy sector inputs, integrated with an aggressive reforestation programme, could provide a means for economic transformation while meeting goals of sustainability, environmental improvement, increased employment, export earnings and

enhancement of Trinidad and Tobago's natural assets.

Wood Product Market — Veneers

The world veneer market is estimated to be approximately 6 million cubic metres, of which 2 million cubic metres are decorative. The most popular species are teak, mahogany, cedar and purpleheart, all of which are well known, but expensive. These species are available locally, in Guyana and in Suriname.

The major consuming countries are the USA, the UK, Germany, France, Japan, Italy, Spain and China. Local producers could find a good export niche market for Caribbean veneer, given the size of the market and the potential for developing a high-end product.

There is abundant opportunity for the general application of this model to enhance linkages and build downstream capacity.

ELECTRICITY

Local Electricity Market

Quality support infrastructure, particularly a strong electrical power industry, is crucial to attaining developed country status. Nations such as Japan and Singapore could not have been successful without a highly reliable, secure electricity service which served the entire population. This is even more significant when one considers that both Japan and Singapore import most of their primary energy.

As the engine of development in the industrial, services and social sectors, the existence of a reliable electricity supply

will be a prime determinant in Trinidad and Tobago's drive for developed nation status by 2020. It becomes even more relevant with the increasing importance of computers, the Internet and telecommunications, which in turn support electronic commerce, communication, international and regional trade, as well as the entertainment and education sectors.

The electricity sector has served Trinidad and Tobago well in being able to anticipate demand and install additional capacity in response to high levels of industrial development and escalating demand, especially in the late 1970s, when annual growth reached as high as 25%. At present, 66% of national electricity production is used by industry. On the residential side, 97% of households are

served by electrical mains connected to the national grid, allowing consumers to enjoy appliances and electronics, hallmarks of modern living.

Quality and Penetration

While the presence of high-quality power is critical for achieving developed country status by 2020, it is not necessary for most of the connected loads, such as lighting and motor-type loads. However, electronic loads and, in particular, digital devices are sensitive to supply-quality imperfections. On the supply side, one requirement of developed country status is the supply of electricity to all. An obvious goal therefore, is to reduce the estimated 3% of households not currently served by T&TEC.

At present, economic factors militate against the

electrification of these households, because their remote locations would require costly extension works. Upward tariff adjustment in line with the economic cost of delivering electricity would improve T&TEC's ability to meet these needs. It would then be possible through an appropriate arrangement with Government, such as the ongoing National Skills Development Programme (NSDP) 2002, and by the application of alternative energy sources or distributed micro-generation close to load centres, to close the gap and increase electricity penetration to levels nearer to 100%.

Electricity and IT

Part of the overall vision for Trinidad and Tobago calls for the development of a thriving IT industry, support for which requires a higher

degree of electrical reliability and quality than is normally available from a utility mains supply. The ideal situation is supply without interruption (100% reliability) with perfectly clean and consistent quality of power.

However, this would be uneconomical to provide for the entire grid and is unnecessary, since the majority of connected loads do not require premium power. Corporate IT users routinely employ uninterruptible power supplies (UPS) to meet their requirements, with some industries supplementing these with standby generators.

In an effort to meet the demands of the future IT industry in Trinidad and Tobago, the power utility should work with relevant agencies in establishing

“premium power parks”. This would guarantee a power supply that is 100% reliable and of consistently high quality to commercial and industrial businesses with sensitive digital loads, at an economic rate.

This could be achieved by:

- Continuing the re-engineering of the

transmission and distribution architecture and expanding the use of live-line work to reduce, if not eliminate, planned maintenance outages.

- Extending the underground distribution network to improve overall system reliability, particularly in premium power parks.

- Locating small-scale standby electricity generation in or near the parks (e.g. internal combustion engines, micro-turbines, fuel cells).
- Installing distributed electrical storage (e.g. batteries) to provide immediate power before standby generators ‘kick in’.

Critical Role for Electricity

The existence of a reliable, competitively priced electricity supply will be a prime determinant in Trinidad and Tobago’s drive for developed nation status. Key elements of the energy sector should include:

- Use of distributed power to accomplish 100% penetration in all market segments.
- Establishment of premium power parks to provide 100% reliability to sensitive digital load associated with the IT industry.
- Continued private sector involvement in power generation.
- System upgrade including installation of underground transmission and 240Kv trunk.
- User tariffs and gas pricing policy that balances the objectives.

System Development

To ensure that Trinidad and Tobago's future power requirements are met with the reliability and quality consistent with developed country status, the utility has already identified a number of major projects to be undertaken.

On the generation side, 600 MW of new capacity will be installed by 2020. With an aluminium smelter, an additional 200 MW will be required. A significant amount of this capacity will be installed in the La Brea/Pt. Fortin area. A new generating site is also proposed for the Beetham area, to provide new capacity and to replace the capacity of the existing Port-of-Spain power station as units are retired. If gas is brought to Tobago, base-load generation can be installed on the island, thus minimizing reliance on the dual

submarine cable connection to Trinidad.

On the transmission side, developments include the proposed introduction of 132 kV transmission into Port-of-Spain, the Commission's first such underground transmission development. This will also be extended into the Mt. Hope area, reinforcing supply to the East-West Corridor.

The integration of the new southern generation block into the national grid will likely require an upgrade of the maximum transmission voltage, possibly to 240 kV. In addition, other lines and sub-stations are also planned between 2004 and 2020.

These will be designed with state-of-the-art switchgear, advanced numerical relays and digital communications to provide the reliability and flexibility required to meet

the demands of an industrialised society.

The current structure of the electricity sector allows for private sector involvement in electricity generation, with T&TEC as sole transmission and distribution provider. There are opportunities for the local private sector, either on its own or in joint-venture arrangements with T&TEC, to provide new generation capacity, particularly for mega projects such as aluminium or steel production. New entrants into the power generation industry could help ensure that the country remains up to date with the most modern technology.

This would also position Trinidad and Tobago as the most important electricity market in Caricom and one in which all power is generated by natural gas. As more

countries move towards gas for fuelling their electricity demands, Trinidad and Tobago could have a role in partnering with other electricity generation companies or otherwise assisting in this growth.

Natural Gas Pricing

Appropriate natural gas pricing for power generation is crucial if electricity-intensive mega projects are to be attracted to this country. At the same time, the Regulated Industries Commission must consider an appropriate pricing regime for residential customers, who currently enjoy the lowest tariffs in Latin America and the Caribbean. The right balance must be struck to encourage efficient electricity usage by customers, for T&TEC to successfully implement demand-side management strategies, and for efficient

and environment-friendly combined-cycle plants to be used in electricity generation.

COMMUNITY RELATIONS

Background

The energy sector has a vital role to play in the social and community development of Trinidad and Tobago. With their direct and indirect access to human development expertise, energy companies can creatively assist in redressing the many social ills affecting the national community.

Over the years, their involvement has ranged from patronage and sponsorship to attempts at participation and empowerment. The resort to patronage over sustainable development programmes has conspired to place some of the communities with long-

standing relationships with energy sector companies among the most depressed in Trinidad and Tobago, with poverty and unemployment levels more than double the national average.

Towards a New Approach

The challenge facing the sector is to use its considerable financial, technical and managerial resources to implement sustainable community development programmes that promote self-reliance. This requires a shift in focus from the traditional corporate patronage to the establishment of long-term partnerships with the local communities. A central tenet of the partnership initiatives is an acceptance of community aspirations as legitimate and worthy of serious consideration by the companies.

Moving communities onto a path of sustainable development is a long-term process, which does not easily comply with the short-term need for public relations mileage and publicity. However, if sustainability is an imperative of the community/energy sector interface, then programmes must be designed

accordingly, with emphasis on expanding the human and social capital available within the communities to facilitate long-term development.

In this regard, companies should be discouraged from using development templates that are based on experiences external to the local community, since key

demographics may differ significantly.

The following table contrasts the key characteristics of the old approach to community relations based on patronage with the suggested new approach built on partnerships.

Key Characteristics of Community Relations Strategy	
Patronage	Partnership
<ul style="list-style-type: none"> ▪ Short-term objectives ▪ Dependency ▪ Focus on events ▪ Priority on PR mileage ▪ Top-down implementation ▪ Weak social structures 	<ul style="list-style-type: none"> ▪ Long-term objectives ▪ Sustainability ▪ Focus on people ▪ Priority on social impact ▪ Self-mobilisation ▪ Expansion of social and human capital

THE ENVIRONMENT

Trinidad and Tobago is the most industrialised country of the Eastern Caribbean, as is evident from the necklace of

factories and process plants along the west coast, the petroleum operations in the entire southern half of the island, and the exploration and production activities off

the north, east and west coasts of Trinidad. The 1990 CSO census reported that Trinidad has 14 industrial estates comprising petroleum, petrochemical, chemical,

food processing, manufacturing and mining industries. There are also seven offshore operators producing oil and gas.

Air Pollution

The four major sources of air pollution are (i) fossil fuel combustion, (ii) incineration at solid waste disposal and landfill sites, (iii) motor vehicle fuel combustion and (iv) other industrial operations. The industries that generate the most air pollutants are cement, iron and steel, sugarcane, petroleum refineries, methanol, urea and asphalt.

The oxidation reaction of the burning of fuels for energy production produces carbon dioxide, carbon monoxide, oxides of nitrogen, polyaromatic organic matter, unburnt hydrocarbons, and particulate matter such as fly ash. Some of these pollutants

are also precursors to the formation of more harmful photochemical oxidant pollutants. The tropical climate with its high concentration of nitrogen oxide provides the ideal setting for the production of photochemical oxidants.

The air pollutants in Trinidad and Tobago affect the respiratory and nervous systems of the population and initiate and accelerate the ageing process in the case of the photochemical oxidants. A significant particulate pollutant is lead, present in most of the gasoline currently sold in Trinidad and Tobago. Combustion of leaded petrol creates high concentrations of lead in the environment, which is then deposited onto roadside vegetation and crops, which eventually get into the bloodstream of the general population.

Water Pollution

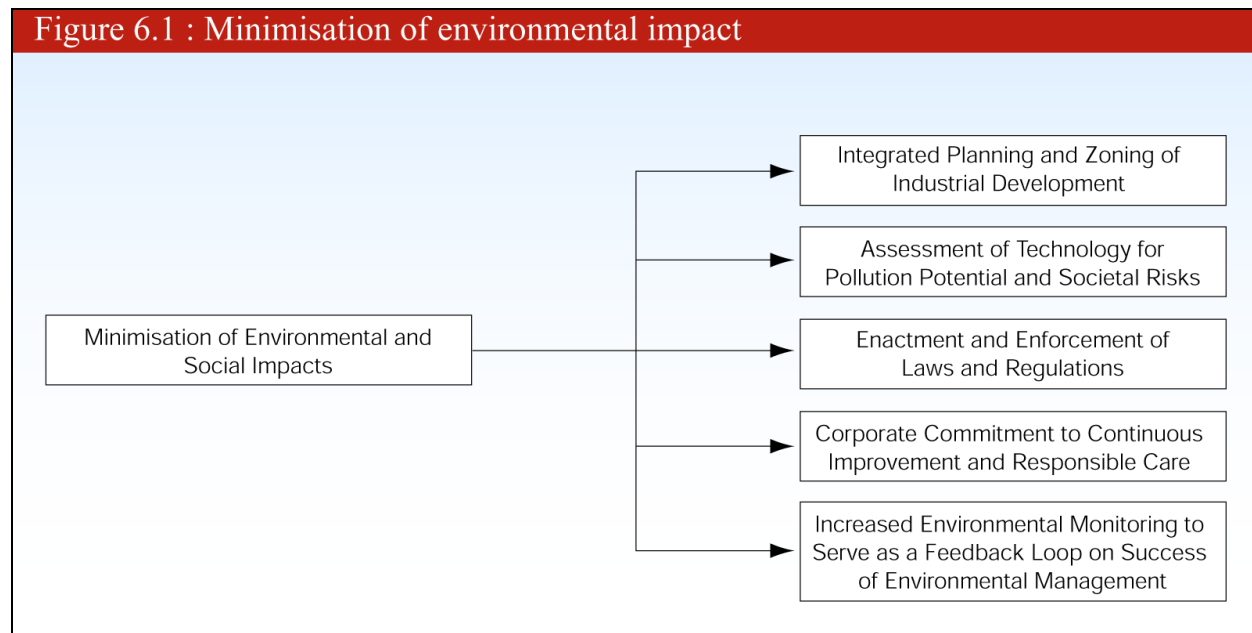
The major sources of water pollution in Trinidad and Tobago are oil seeps, land-based operations and industries, wastewater, agricultural run-off and quarrying activities. The polluted water from industry often escapes and finds itself in streams, rivers and eventually the sea. For the petroleum industry, exploration, production, refining and marketing produce valuable petroleum products, but also harm the environment through discharges and spills. It has been estimated that an average of 2000 barrels of oil is spilt annually in the marine area around Trinidad and Tobago. Marine oil spills and waste from drilling can damage marine ecosystems, damage mangrove ecosystems and lead to accumulations of oil on the shoreline. Drilling operations

also generate produced water with elevated chloride levels.

Other refinery waste includes heavy metals that also bio-

magnify in the biota of the marine environment.

Figure 6.1 : Minimisation of environmental impact



The petrochemical industries in Point Lisas produce methanol, hot water, and effluents of high BOD5, which affect aquatic life and vegetation. In the retail petroleum sector, spent lubricating oil from service stations and petrol leaks from tanks and pipelines at gas stations threaten surface and ground-water resources. Water pollutants can cause

renal and intestinal diseases, cancer and heart failure.

Land Pollution

The petroleum industry is a major source of land pollution, with periodic oil spills from leaks and ruptured pipelines and from produced water, resulting in impacted soils with high TPH and chloride levels. These can penetrate to depths of over two metres and affect

vegetative growth. Another solid waste of particular importance in industry is spent catalyst. To date, there are no hazardous-waste disposal systems in Trinidad and, as a result, industries export the spent catalyst and other waste to the original suppliers.

The Future World

As outlined earlier, most of the elements of the value

chain of the petroleum sector pose significant risks to the environment through rapid degradation and its negative impact on human health. Planning and Environmental Management Authorities must issue clear and effective directives to ensure that the industry meets international best practices.

The following needs to be specifically addressed:

- Planning and zoning of industrial development — The pollution potential and risks posed by energy sector operations warrants that attention be placed on planning and zoning and the siting of facilities and support infrastructure. This is to ensure that the potential negative environmental, social and human health impacts of industrial

developments are minimised.

- New Technologies — Before approval is granted, decision-makers need to critically appraise new technologies prior to approval in relation to:
 - The risks introduced.
 - Best available technology vs. best practical technology.
 - Proven technology against prototype (non-proven) technology.
 - The relocation of existing facilities from other countries.
- Laws and Regulations — Trinidad and Tobago must move aggressively to ensure that environmental and occupational health and safety laws/rules and regulations conform to international best

available/ best practical technology/best environmental options.

The laws must be enacted and enforced, revised and updated regularly. The use of tax and other incentives by the State to encourage conformity to required environmental standards also needs to be explored.

- Corporate Commitment and Responsible Care — The petroleum and petrochemical industries should meet the challenge of establishing a culture among the workforce that “pollution is unacceptable”. This objective can be achieved by establishing a comprehensive environmental management system, which will incorporate all working aspects of industry. The mandatory adoption by all energy

industry companies of ISO 14001 EMS and other similar environmental management standards before 2020 will effectively address environmental concerns. Facility operators must also commit to the basic tenets of responsible care or similar initiatives that ensure that facility owners take proactive steps towards minimisation of the negative impact of their operations on neighbouring communities.

- Environmental Monitoring and Carrying Capacities — Support of basic environmental research (State and private sector) must be undertaken via holistic monitoring programmes to permit the tracking and

modelling of cumulative environmental impacts. This process would determine environmental carrying capacities and lead to the determination of the most appropriate areas to site facilities from an environmental impact perspective. The long-term benefits would result in the use of cumulative impacts as an iterative feedback loop for coastal zone/watershed planning and management. In particular, the following two assessments need to be made:

- A comprehensive baseline survey of the west coast should be undertaken over a three-year period to ascertain the potential impacts of industry on communities, the ecological and

physical environment and on the Gulf of Paria.

- A detailed vulnerability assessment study of the coast, including beaches, wetlands and coastal infrastructure, should be conducted to determine the impact of sea-level rise on coastal and nearshore ecosystems, as well as facilities and coastal erosion. This study will help determine the mitigation measures and adaptation techniques to be implemented to prevent erosion and the harmful effects of a rise in sea level.

FINANCING NATIONAL PARTICIPATION

The central theme of this Vision 2020 report is that a key aspect of attaining sustainability in the energy sector is the accelerated

expansion of national capital. In this regard, the real and perceived impediments to greater national participation in the energy sector have been identified historically as:

- Access to technology.
- Access to markets.
- Large capital requirements.
- Relative risk.

Whilst in the past these constraints may have been accepted as valid, by definition, the contemporary challenge of energy sector development is the crafting of strategies to mitigate, if not to altogether remove, the constraints to local participation in the sector. The presence of an entrepreneurial culture as well as the appropriate institutional framework and flexible response are two additional elements that are

absolutely indispensable to a successful development thrust. These issues are all examined in detail elsewhere in this report, but in this section the focus is on capital mobilisation and risk management.

The Strategy

Reduced to its most basic level, the principal strategy of development is to increase national income. In the context of a capital-intensive industry whose scale determines that it will continue to be export driven, the corollary is that the most efficient means of achieving this objective is the expansion of national equity along the value chain. While diversification into other sectors remains a laudable objective, it can be argued that capital deepening within and along the energy value chain may provide a more secure platform and spawn a

greater set of horizontal linkages on which to predicate the development of new sectors and the expansion of already existing sectors.

This approach demands the cessation of the national ambivalence towards the sector that casts debate almost exclusively in terms of the “Dutch Disease”, giving rise to a collective anxiety from quibbling about the merits of the petroleum endowment as a blessing or curse. Additionally, increasing the share of national equity in the energy sector is one of the few strategies that directly address the issue of the scale of FDI outflows from the sector. FDI outflows have increased markedly from US\$200 million in 1998 to almost US\$700 million in 2002.

At this historical juncture, a new beginning requires the unequivocal embrace of the energy sector as the leading sector of the economy. As a result, all medium-term plans for Trinidad and Tobago should recognise this fact and plan accordingly. At this time, the unique opportunity for sustainability beyond the exhaustion of natural resources can be generated by the creation of national enterprises in the energy sector which are globally competitive, both in their ability to compete for international markets from their local base and in their ability to win resources, create product and capture markets beyond the geographical boundaries of Trinidad and Tobago. Toward this end, a strategy

for the mobilisation of financial resources and risk mitigation is articulated hereunder.

Central Government

The collective achievement of Government in the energy sector is formidable by any standards. The creation of Point Lisas and this country's entry into the Western Hemisphere LNG market bear eloquent testimony to this fact. However, given the need for national investment in the energy sector, the policies that served as a catalyst for those developments may require adjustment.

From its inception in the mid 19th century to the mid 1970s, development of the energy sector was financed exclusively by foreign direct

investment. The fiscal surpluses generated in Trinidad and Tobago in the 1970s (resulting from the oil price surge driven by the emergent power of OPEC combined with the Arab/Israeli conflict) were used to finance a range of investments in the downstream sector. Point Lisas is the principal legacy of that era. The completion of the last of the Government's major projects in the sector (the country's first urea and methanol plants) in the early 1980s coincided with the onset of a decade of economic decline. The resulting adjustment effort was partly financed by the divestment of a significant part of the State's energy sector portfolio.

The Imperative of National Participation

- National policy must embrace the energy sector as the leading sector in the economy.
- Increasing national equity along the value chain is the most efficient means of meeting key development objectives such as increasing national incomes and stemming the growth of FDI outflows.
- State equity participation should be on a monitory basis with a commitment to divest when commercial viability has been achieved. Joint ventures with the local private sector seem necessary.
- Government should maintain a balanced portfolio of investments in seeking to optimise the utilisation of fiscal surpluses. The portfolio should contain:
 - Heritage Fund.
 - Stabilisation Fund.
 - Physical Infrastructure Fund.
 - Education Fund.
 - Equity Investments in local energy sector
- Energy sector State enterprises need to become internationally competitive and move operations beyond the confines of national boundaries. An infusion of private sector may be necessary.
- Regulatory reform is necessary to allow enhanced business transactions between the local and regional financial private sector and the energy sector.

The current period is now witnessing a significant expansion of fiscal revenues from the energy sector, triggered by the advent of the first three trains of the Atlantic LNG project,

increased oil production (as a by-product of increased gas production) and buoyant energy prices. The sustained increase will accelerate with the start-up of LNG IV and anticipated further

expansions in the natural gas sub-sector, and the coming into production of the BHP Billiton oilfields. The anticipated surpluses are of sufficient magnitude to induce the State to move

beyond the current policy of narrow fiscalism. The policy of direct investment in the energy sector was abandoned in the 1980s, in part by force of circumstances. The Treasury restricted itself to maximising fiscal returns from what was still a largely foreign-owned sector. In the emerging era of increased fiscal revenue generated by the energy sector, the timing may be appropriate for the State to embrace the challenge of sustainability by direct investment in the sector. The arguments in support of such a policy shift include:

- **Scale of Energy Sector Investment**

The energy sector may account for over 50% of GDP with the State, by virtue of its tax receipts, being the most important national beneficiary of surplus generated. The State is

therefore the most well endowed among national actors to come to terms with the scale of capital requirements in the sector.

The anticipated fiscal surpluses also ensure that the State can generate the required liquidity. To ensure sector best practices prevail, State participation should generally be on a minority basis with a commitment to divest its share to the national community after commercial success is assured.

- **Optimal Utilisation of Fiscal Surpluses**

The impulse to optimise the use of fiscal surpluses generated by a booming sector emanates from two very valid concerns:

- The inflationary impact of unsustainable expansion of expenditure,

in the context of limited absorptive capacity.

- The need for rainy day strategies.

In Trinidad and Tobago, it may prove difficult to resist the temptation to seek instant solutions to perennial structural problems in the social sector by increasing expenditure on “make-work” schemes to foster the illusion of addressing the concerns of constituents.

Therein lies the road to economic ruin, marshalled by inflation.

The country’s previous experience of fiscal surpluses on the scale likely to be witnessed over the coming period saw the initiation of a number of development funds under Cabinet control. Predictably, this effort at sterilisation proved inadequate since these funds

were quickly dissipated in an attempt, among other things, to prolong unsustainable levels of recurrent expenditure beyond the period of fiscal surplus.

In reaction to this policy failure, current conventional wisdom advocates investment in hard currency instruments, with its management sterilised from the reach of the incumbent administration. This approach leans heavily on the experience of more developed jurisdictions untroubled by our own levels of national investment and well endowed with institutional and entrepreneurial infrastructure with the requisite global reach to which this country is only now beginning to aspire. If this hypothesis were correct, then it would be irresponsible for Trinidad and Tobago not to continue to seek its own salvation by

seizing the opportunity now available for sustainable participation in the energy sector.

Viewed in this light, the passive sterilisation of funds advocated by current conventional wisdom cannot be an acceptable singular strategy. A more balanced strategy might perhaps see the State with a balanced investments portfolio, including investment across the energy value chain, both locally and abroad, in conjunction with private domestic and international capital.

The investments portfolio would also contain the following key elements:

- Heritage fund – Since available funds could encourage expenditure patterns that exceed the absorptive capacity of the

economy and are exacerbated when prices for primary market products are above their long-term average, Government should reserve some current earnings for future generations in the form of a Heritage Fund. An Act of Parliament should define the rules and regulations governing the management of the Fund.

- Stabilisation Fund – Investments in hard currency instruments, with the specific objective of managing fiscal deficits arising out of cyclical downturns or catastrophic events impacting foreign exchange earnings.
- Physical Infrastructure Fund – Funds reserved for investments in infrastructure, such as electricity, roads, industrial sites and water,

in order to support the industrialisation thrust.

- Education Fund ---- This is required to support the thrust in human resource development both for the energy sector and in order to establish a platform for the provision of internationally recognised and competitive training.
- Chaperone to the National Private Sector – A renewed investment thrust by Government in the energy sector must be accompanied by new strategies for improved governance of those investments, beyond anti-corruption legislation. This objective will be served partially by joint ventures with the local private sector. In addition to demanding a more aggressively commercial State sector, such joint ventures will assist in mitigating some of the

risk perceived by the domestic private sector and therefore assist in the latter's transition into the energy sector. The ease of transition is further facilitated by the reduction of the entry-level capital requirements for any single project for the domestic private sector. To date, both Government and local private sector investment in the energy sector appear to have both been more comfortable and more compatible with foreign partners than with each other.

It is also evident that the divestment of non-strategic State sector assets to domestic private sector interests could facilitate this transfer of trust between the State and the national investment community.

Currently, there is no doubt that the energy sector is viewed by the general public as being a privileged enclave in the society. This attitude pervades the local private sector, most of whom believe they have neither the competence nor the financial wherewithal to participate in any aspect of the energy business.

One way in which a change in this attitude can be achieved would be to encourage direct investment in the sector by as many citizens as possible through the stock exchange. The State can be the catalyst for this effort through divestment of portions of its holdings in various energy enterprises, such as Petrotrin, The National Gas Company of Trinidad and Tobago Limited (NGC), National Petroleum Marketing Company, Atlantic LNG and Phoenix

Park Gas Processors Limited (PPGPL) (through NGC). This would not be done as part of the National Enterprises Limited (NEL) initiative, however. The success of the Unit Trust Corporation seems to indicate that the time is right for such an initiative.

There are different ways to make this happen, such as through the development of energy-based mutual funds, by direct sale to equity investors (e.g. credit unions) or directly on the stock exchange. The effect would be a broadening of the base of direct ownership to the citizenry to encourage a more informed perspective of the energy business and to enhance the long-term sustainability of the sector.

The State Enterprise Sector

The imperative to develop national enterprises that are

internationally competitive beyond Trinidad and Tobago's geographical boundaries is not currently embraced by existing State enterprises in the sector, principally Petrotrin, NGC and T&TEC.

Resident in these three companies are the most important national repositories and concentration of physical and human resources and financial assets in their respective sub-sectors. However, they are far from achieving their potential, particularly in the context of their endowments. An infusion of commercial culture ushered in by national private sector joint-venture activity would therefore be most appropriate.

This would be over and beyond the existing programmes, such as the

Petrotrin Lease Operatorships, the principal example of partnering with nationals in evidence. This approach would also allow for maximum leverage of these companies' own financial resources. The NGC gas pipelines and LNG equity, as well as T&TEC's power generation facilities, are prime short-term candidates for immediate domestic private sector participation.

It would be ironic if we were to ignore the very real opportunities in oil because of our enchantment with gas. While the Trintomar experience of 1991 and the more recent Trinmar acquisition may present a case for caution, Trinidad and Tobago cannot be content with simply monetizing our production share of oil output without exploring the potential for expanded value-

added or increased national expertise through joint-venture partnerships in exploration and production (offshore in particular), but also in other aspects of the petroleum business in the Caribbean and in North, Central and South America.

If our aim is to position Trinidad and Tobago as the other major energy player in the Caribbean and Latin American region, we should eagerly seek out opportunities that may be reasonably available to us. As an example, the deep water off Guyana and Suriname as part of the Orinoco Basin is believed to have significant hydrocarbon potential. It may be feasible to assume that by 2009 those areas would be in hydrocarbon production.

In keeping with Vision 2020, by that time we should be in a position to play an

important role in the development (whether technical, financial or operational) in this and similar areas in the Eastern Caribbean and indeed in the wider Caribbean and Latin American region.

Therefore, the task is to craft a strategy that would ensure that Trinidad and Tobago gets to play that role, based on its upstream petroleum experience, well-developed gas-based industries and close economic and political relations with countries in the region.

The Financial Private Sector

The financial sector has dual but complementary roles as both beneficiary and facilitator of the realization of this national vision. While national savings are still not adequate to satisfy the investment needs of the

energy sector, the recent emergence of the hard-currency loan portfolio of the indigenous financial sector gives reason for optimism that they can rise to the mandate to increase the national share of value-added generated in the sector.

Certainly, recent volumes deployed in the Caribbean market indicate the capacity to service minimum equity of a potential national private sector portfolio in the energy sector.

Long-term savings institutions, both public and private, remain a major source of potential hard currency funds that might be deployed in the energy sector. Moreover, the pool of potential funds available for use by the local financial sector is not limited to domestic institutions. Regionally, national

insurance schemes are usually the largest pool of long-term savings in their respective jurisdictions, but tend to suffer from a deficiency of available low-risk investment instruments. Currently, limitations in the existing regulatory framework restrict use by the financial sector of instruments and techniques that can be applied to meet

the needs of the domestic energy sector.

While the principal of these long-term funds needs to be assured by continued adherence to risk-minimising investment strategies, the variable and surplus funds can be used in aggressive investment strategies, including investment in the energy sector. The funds then generated can be reinvested,

with the multiplier effect of the investment increasing the pool of money available to the sector, and attracting financing from external sources. And herein lies the true potential for the emergence of Trinidad and Tobago as a regional finance centre. In addressing financial sector reform (addressed elsewhere), stakeholders may therefore need to widen their vision.

YEAR 2020: PARADISE FOUND?

- Sound management of energy portfolio.
- Energy is an engine of growth for achieving national development.
- Sector has been a catalyst for economic diversification.

OR...PARADISE LOST?

- Natural resources are depleted.
- Slow industrial expansion due to uncertainty about competitively priced gas.
- Failure to achieve developed nation status.

THE OPPORTUNITY

Over the past decade, Trinidad and Tobago has experienced declining levels of oil production while gas

production has increased significantly. This is primarily as a result of new discoveries that have increased proven reserves, as well as the strong demand for natural gas by energy consumers. The shift from oil to natural gas as the mainstay of the energy industry and the economy is now firmly entrenched. There is a significant benefit to this shift since gas field developments have to be phased out to meet market contracts. Due to the nature of trade within the global gas market, demand for gas is consequently more predictable and requires a more sustained level of upstream activity.

In the wake of this unprecedented level of activity, it is imperative that local suppliers and contractors are adequately prepared to take advantage of coming opportunities.

However, the pace of development is rapid — 80% of Trinidad and Tobago's proven reserves have already been committed to Atlantic LNG Trains I, II, III and IV.

A window of opportunity exists for local business to capitalize on the growth in the energy sector. By and large, most of the local economy remains unprepared to pursue the opportunities opened up by the forecast growth.

Demand for Services

The upstream area is a primary area of expenditure for companies operating along the energy value chain. According to the Ministry of Energy and Energy Industries (MEEI), \$900 million was spent in the upstream industry in 2003. This amount was approximately 40% more than earned tax revenue. Additionally, the

CREATING SUSTAINABILITY

typical integrated energy company spends 70-80% of its expenditure on upstream activity. Of this expenditure, up to 80% is allocated to the procurement of goods and services from third-party suppliers and contractors.

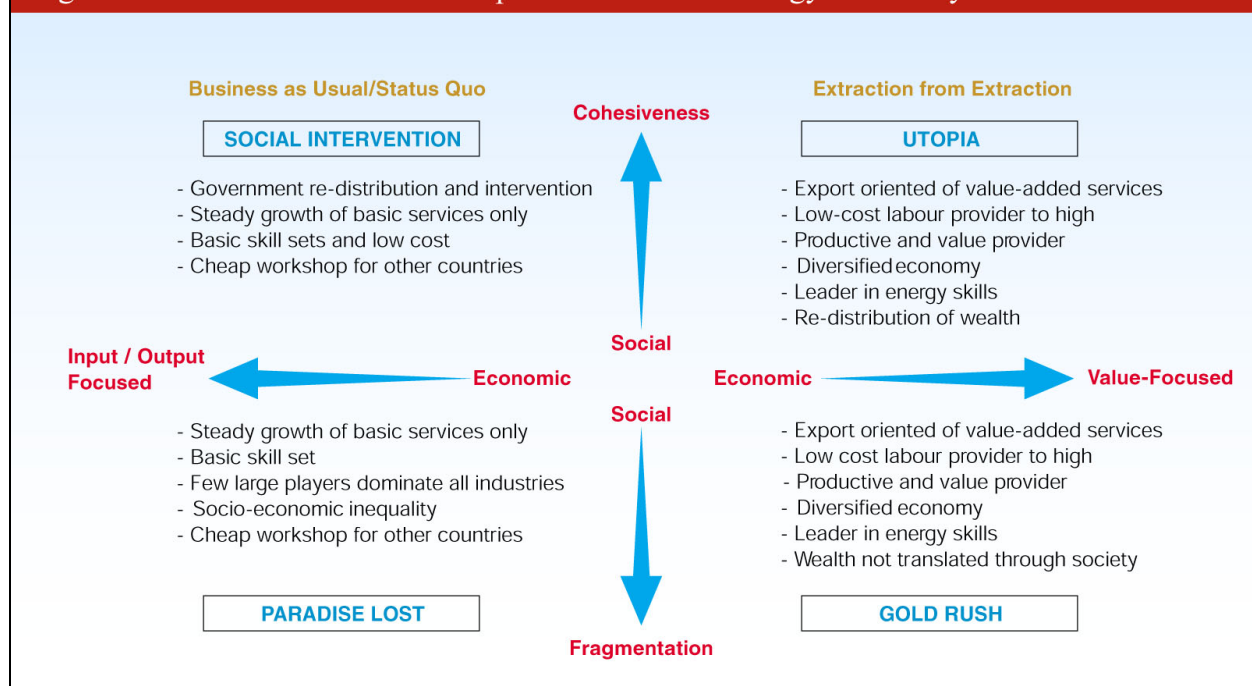
Thus, the potential returns for companies providing support services for the

upstream industry are highly attractive.

The predicted increase in upstream activity, coupled with the magnitude of expenditure within the sector, provide a strong incentive for Trinidad and Tobago to maximise the national share of value-added. The enhanced activity in the upstream sector could be

used as (i) a platform for the development of skills and ancillary services that can also be used in the downstream sector, and (ii) indirect work for energy related/ cluster industries, such as machine shops, technology products and services, business support services, tax advisory services and accounting.

Figure 7.1 : Socio-economic development scenarios - energy as a catalyst



POSSIBLE SCENARIOS — TRINIDAD AND TOBAGO BEYOND 2020

Maximising the Impact of the Energy Sector

Figure 7.1 illustrates four scenarios for progress, based on four different mechanisms to leverage the development of Trinidad and Tobago's natural resources for its future economic development. The level of proactive intervention the country chooses to undertake determines each option. All the representative segments are possible and achievable, bounded by the two extremes: the lower left quadrant — “Paradise Lost” — which represents the status quo; and the upper right quadrant — “Utopia” — which represents the best possible outcome that is attained with the highest level of intervention. The characteristics and

significance of these two scenarios are discussed in detail below.

Scenario 1: Paradise Lost (Status Quo)

A Developing Nation with some Improvements

Status-Quo Characteristics

- Plantation economy continuation
- Strong natural resource legacy
- Non-diversified
- Capital-intensive
- Failed to become a developed nation
- Cheap labour — workshop for other nations

Trinidad and Tobago has successfully extracted its natural resources and penetrated markets in North America and Europe over the past 20 years. However, in 10

years time, the country's energy industry, widely recognised for its contribution to world energy, but now forgotten, will be mature in terms of reserves and the size/difficulty of exploitation of its fields.

In 2030, the landscape is littered by a plethora of plants that once led the world in efficiency, all completely paid off with 20 years of life left. The tradeoffs between efficiency and operating cost, coupled with their freedom from the burden of capital repayment, enable them to compete in spot markets for LNG, methanol and other commodities.

Unfortunately, Trinidad and Tobago does not have adequate gas reserves to support their operation, since available reserves are either already depleted or too small to be economically exploited,

because Trinidad and Tobago pursued inappropriate policies and strategies, and did not pursue appropriate policies on reserves-to-production requirements, marginal field development, an aggressive exploration programme and optimal basin depletion policies.

This situation is the result of the country's haste to exploit reserves in an effort to be first to market, without consideration for national capital efficiency. As a result, many plants were developed simultaneously, each with physical lifespans beyond their resource allocation. This prevented the upside benefits of capital depreciation from being captured by the country.

Looking around the world, we see that resource-rich developing countries have all markedly performed worse in

terms of GDP growth per capita than countries with no resources — a fact previously known and emphasized by advocates for development policies.

Trinidad and Tobago has witnessed some development but has failed to reach “developed nation” status in both economic and social terms. In fact, the country did not effectively translate its wealth from rich but depleted resources into sustainable opportunities for the development of Trinidad and Tobago. Without its rich natural resources base, it is unclear how Trinidad and Tobago will now propel itself forward. The country still aims to grow its non-energy sector through growth in tourism and manufacturing, but these sectors have not developed significantly since 2003.

The end result of this strategy was that Trinidad and Tobago, though growing in the period between 2004 and 2020, remained a relative underachiever, with the country not living up to its full potential.

Scenario 2: Utopia — Value Capturer A Great Oil and Gas Economy

Utopia Characteristics

- Globally competitive
- World class in energy services
- World class in non-energy services, e.g. IT, training
- Hub of trade in CARICOM and Latin America

Trinidad and Tobago has successfully extracted its natural resources and penetrated markets in North America, Europe and other

countries over the past 20 years. However, the country has managed its energy portfolio brilliantly. A highly capable commercial and business development Secretariat informed policies and developed and implemented strategies for extracting maximum value from the oil and gas value chain, both inside and outside of Trinidad and Tobago.

A Developed and Dynamic Nation

The energy sector has acted as a growth vehicle for national economic development, having successfully built:

- A world-class energy services industry, comprising competitive enterprises using best-in-class tools, processes and technology.
- A vibrant and dynamic capital market, the hub for investment in Latin

America and the Caribbean.

- The capability for wealth to permeate deeper into the society, via investments by pension funds, mutual funds, credit unions and individuals in the industries created by the hydrocarbon services sector.

Economic Diversification

The industry has successfully acted as a catalyst in the diversification of the economy. Using the technology, skills and expertise of the energy industry, the country has been able to develop value-added strategic business skills (previously retained by multinationals at corporate offices abroad), transferable to other industries and sectors.

The business-support service industries have extended their services to non-energy companies, meeting international standards and improving performance in all areas, including information technology and knowledge management. Many service businesses have grown and are now large-scale providers to Trinidad and Tobago and global markets. Additionally, these companies can source financing from multiple sources at competitive rates, while at the same time building a strong and dynamic local stock market.

Training

To support Trinidad and Tobago's growth agenda, local training institutions have been established and these are now world-renowned in specialist fields. Technology, innovation and research and development are prominent in the local

landscape and Trinidad and Tobago is known as a centre for specialist energy and non-energy research. For example, people from around the oil world compete to enter the Trinidad and Tobago Institute of Petroleum, as well as our premier Drilling School.

Energy Trading

As a major exporter of gas and gas products, Trinidad and Tobago has become a major centre for trading in energy derivatives. LNG, NGLs, and other commodity products are now traded around the world with f.o.b. prices quoted from Point Fortin, Point Lisas, to cite two examples.

The end result was that Trinidad and Tobago maintained and even extended its global competitive advantage by successfully leveraging its

opportunities. The net result was that by 2020, Trinidad and Tobago had a diversified economy, with approximately equal benefits being derived from the energy and non-energy sector; Trinidad and Tobago had established a world-class energy services sector by 2020, with extensive local participation and ownership; the country had established world-class competencies in specific non-energy services, leveraging the experiences gained from transforming the energy sector; and Trinidad and Tobago had succeeded in its aim of being the hub of CARICOM and Latin America, and its primary connection with the rest of the world.

GETTING TO UTOPIA — A RATIONALE FOR CHANGE

Without change, Trinidad and Tobago will fail in a globalised and interdependent world. Trinidad and Tobago needs to move from a position where its competitive advantage lies in capital-intensive, low-value-added products, with diminished exports and cheap labour industries, to one where competitive advantage is based on knowledge rather than capital, and high-value and high-value-added exports from productive investment, resulting in expanded trade with developed countries.

In 2020, What Would We Have Learnt If We Looked Back?

What went wrong in the status-quo world?

- 80–90% of company expenditure was not spent within Trinidad and Tobago.
- There was continued over-reliance on foreign skills and services throughout the years.
- Strategic skills were not transferred from expatriates to locals.
- Goods and services continued to be sourced from abroad.
- Revenue from taxes was not earmarked for future development, but spent on consumption of consumer durables and recurrent expenditure.
- Local people and businesses were relegated to non-decision-making roles.
- There was limited local ownership of capital and assets, and thus interest and profits.

On the other hand, what went right leading up to Utopia?

- There was increased company expenditure within Trinidad and Tobago.
- There was extensive transfer of skills, technology and processes.
- There were high-value-added exports.
- Energy sector resources were leveraged to the non-energy sector.
- Locals held managerial and decision-making roles.
- There was extensive local ownership of capital and assets, and thus interest and profit.

MOVING FORWARD

The energy sector can provide key levers to transform the economy. The sector in Trinidad and Tobago is world-class, and its players are part of a global marketplace and often leaders

in their class. Trinidad and Tobago therefore has access to world-class business and personnel, know-how, technology and processes.

The energy industry provides an opportunity to develop human and enterprise capabilities to become globally competitive, and to build the local capital market by converting the excess liquidity that characterises the financial system into equity investment. In this way, profits from the energy business remain in Trinidad and Tobago and, as a result, the country has more control over the energy business and can use it to develop key business skills that are needed beyond the hydrocarbon sector.

The local energy value chain is long and wide. Trinidad and Tobago has the opportunity to position its people, businesses and capital

CREATING SUSTAINABILITY

in other parts of the value chain, beyond traditional areas. The upstream services sector, for example, includes a wide variety of services from which arise a potential portfolio of opportunities for the involvement of local capital. While there are many challenges to be faced, a

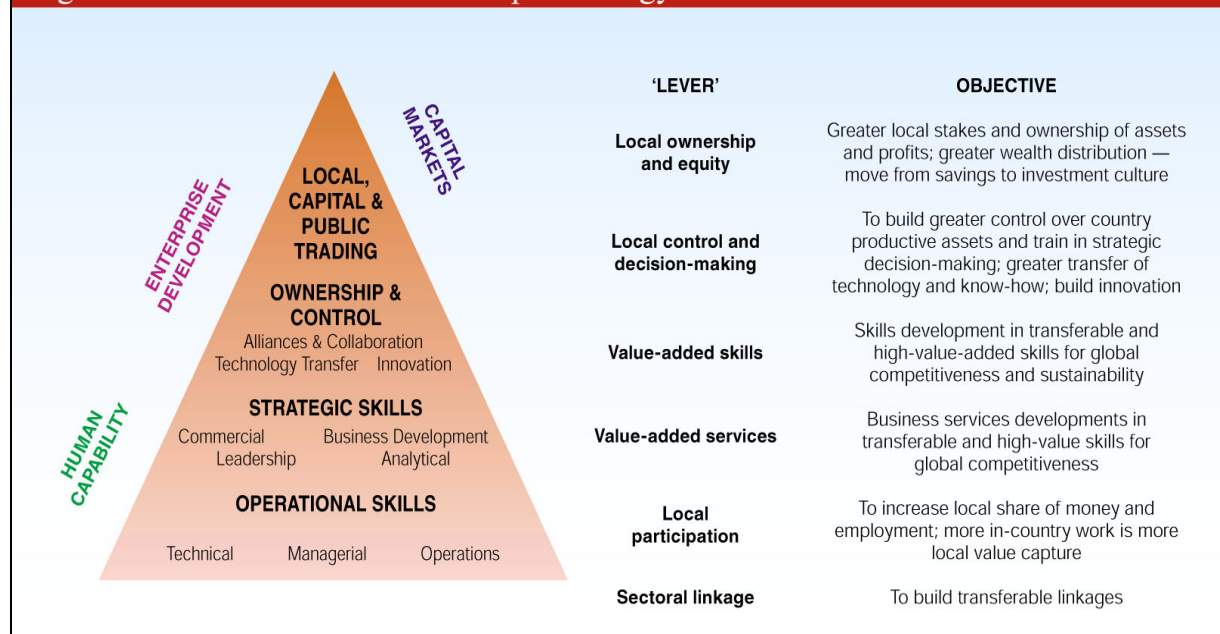
world of opportunity beckons.

Developing the capacity to create people and businesses that can compete in this global industry is key to the sustainable development of our economy. This

development hinges on three key levers:

- Development of human capability.
- Development of enterprises.
- Strengthening of the local capital market.

Figure 7.2 : Framework levers to exploit energy sectors



Critical Limitations

There are several significant obstacles that must be addressed, before any significant inroads can be made in achieving these three objectives:

Increased Public Ownership in and Access to Energy Businesses

The energy sector requires a significant level of U.S. dollar investment. This means that, due to the limited size and scope of our local capital market (as well as legal constraints), investment is largely funded from abroad. Currently, legislation surrounding investment mechanisms, such as all pension funds, mutual funds and the Venture Capital Fund, prohibit investment in energy-based businesses. Local energy-based businesses continue to be

restricted by an inability to access debt or equity financing. It is imperative that avenues are opened to enable accessibility to financial resources throughout the sector, while facilitating the sharing of wealth throughout the country. Pension fund reform and reform of the Venture Capital Act are critical elements that could impact significantly on the growth of the local capital market.

Local investment in long-term projects, rather than funds languishing in overseas reserves, could provide the country with a much-needed boost to the development of its capital market.

Additionally, a reduction in the Central Bank reserve requirement (currently at 14%), could free funds that

can be used for local energy sector investment.

Increased Energy Sector Support from Business Development Agencies

Energy businesses are unable to access the support resources provided by state business development agencies (BDC and TIDCO), since energy businesses are excluded from their client portfolio. The need for reform in this area is paramount, since local energy-based businesses are in dire need of business development support, while State agencies stand to reap significant benefits from the industry knowledge to be gained from these businesses, which would place the support agencies in a better position to further enable development of the sector.

STRATEGY

The objectives will be delivered by specific actions as highlighted in Figure 7.3.

Figure 7.3 Moving From Objectives to Actions	
Desired Outcomes	Required Actions
Local ownership and equity	Clear and enforceable policy
	Sector industrialisation policy
Local control and decision-making	More company CAPEX and OPEX in-country
	Operator contracting strategy
Value-added skills	Business alliances/joint ventures
	Transfer of technologies, tools and processes
Value-added services	Targets on minimum local participation
	Focus on building local capability in value-added areas of industry
Local participation	Investment in capacity building
	People development planning
Sectoral linkage	Local stakes and equity in business ventures
	Build institutional capacity

Transition Actions — Enterprise Development

Enterprise development is a critical and key component of sustainability. This must be vigorously pursued if the country's economy is to be diversified, and local businesses are to extract maximum value. The key elements required to develop the enterprise capability are:

- The ability to attract, develop and retain strategic business skills to ensure that businesses can grow, change and succeed
- World-class business tools, processes and technology
- Competitive financing options

The level of impact that can be created by the sheer value of Trinidad and Tobago to its global business partners now operating in the country can be reasonably quickly

converted to mutual dependency. Trinidad and Tobago can choose companies as partners, to develop and convert the world-class resources it now possesses on the basis of the country's ability to influence the nature of their local business.

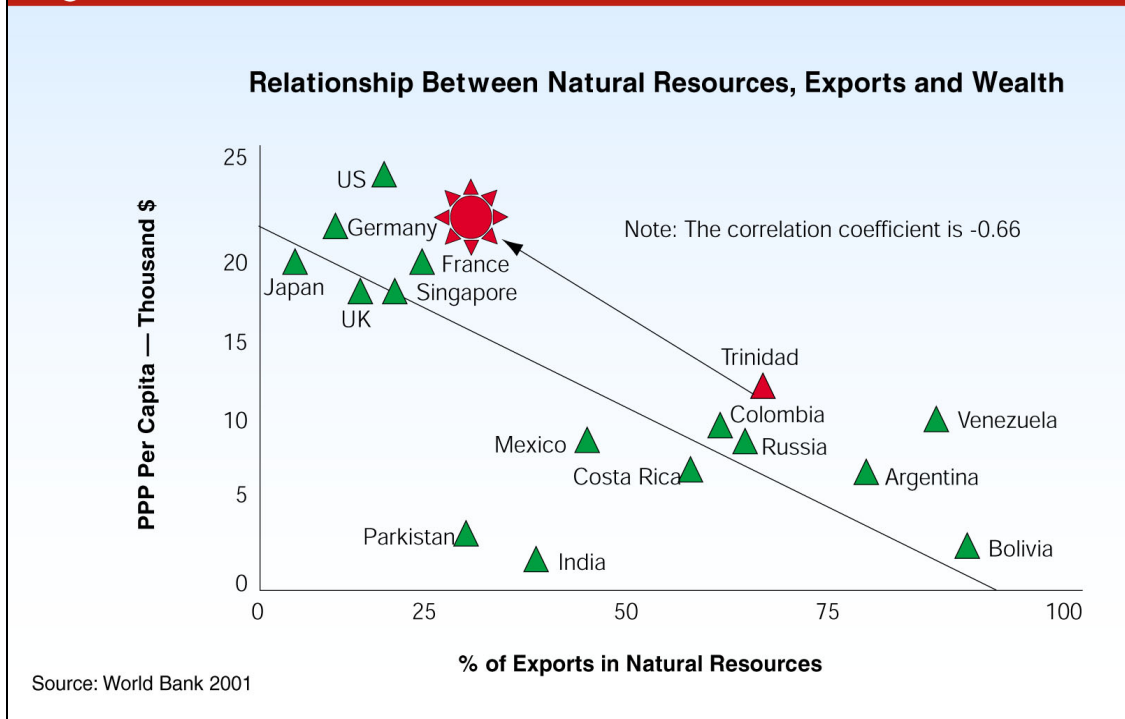
Trinidad and Tobago has an opportunity to choose partners who will move away from the traditional model and require that more of the business be done locally, particularly head office functions, such as business development, analysis, commercial, strategy, customer relations, markets, political risk, negotiating, mergers and acquisitions, trading and knowledge management. Trinidad and Tobago would therefore have access to world-class business methodologies and personnel development,

technologies and processes. These businesses, in turn, will attract suppliers and contractors at a similar level, encouraging local businesses to develop their services to international specifications.

VIEW OF FUTURE SUCCESS

To become an economically developed nation, Trinidad and Tobago needs to increase GDP and reduce dependency on oil and gas. The strategy followed in Scenario 2 is designed to create a diversified economy with reduced dependency on hydrocarbon exports, increased purchasing power parity, greater equity in wealth distribution, a world-class workforce and a dynamic inshore economy satisfying local demand and exporting its surpluses.

Figure 7.4 : The future



NOW MAKE THE MOVE!

- Establish an Energy Institute.
- Establish a policy framework to maintain current competitiveness.
- Issue a policy declaration on local content and sustainable development.
- Set energy sector countrywide targets and standards.

THE OPPORTUNITY

This report has noted the dominance of the energy sector in the national economy, evidenced by the large share of energy in all key macro-economic parameters. The last decade of positive real economic growth was strongly correlated to expansion in energy which saw this country emerge as a leading exporter of methanol,

ammonia and LNG.

Moreover, with the planned growth in the LNG sub-sector, the prominence of the energy sector in the economic and social life of Trinidad and Tobago is likely to continue into the foreseeable future.

Despite this impressive record of growth, a few disturbing trends have been noted. One is the widening gap between Gross Domestic Product (GDP) and Gross National Product (GNP), reflecting both the limited participation of local equity capital in the sector and weak linkages between the energy sector and the rest of the economy. Another is inadequate institutional capacity (including the legal and regulatory framework) to manage the growth and development of the energy sector in the most effective manner.

More than ever, energy has become simultaneously the country's greatest asset and its Achilles heel. Properly managed, the sector is capable of providing Trinidad and Tobago with the necessary resources for making the transition to a stable and developed society, with a dynamic, diversified economy that endures beyond the gas era.

There is a danger, however, that income generated from the energy sector can create a false sense of security, luring the society into settling for short-term gains, only to discover little progress in meaningful economic diversification by 2020. The Vision 2020 plans for the energy sector provide an opportunity to pre-empt the latter scenario.

LONG-TERM GOALS

There are perhaps three overarching goals for the energy sector in the context of Vision 2020:

- To sustain a competitive world-class energy sector with deeper, broader, and more complex and environmentally responsible industries.
- To increase the share of benefits accruing to Trinidad and Tobago from the value chain through strengthening of the direct and indirect linkages between the energy sector and the rest of the economy.
- To extract maximum value from the hydrocarbon resources in a manner that delivers to Trinidad and Tobago the capability to sustain itself beyond the life of the energy sector.

The pursuit of long-term objectives in any vision requires stakeholders to have consensus regarding the philosophical underpinnings that shape the identification, selection and prioritisation of strategies to meet stated goals.

In the case of the Trinidad and Tobago energy sector, the Energy Sub-Committee suggests two important principles:

The development model must be based largely on private capital. An investment role for the State and State-owned companies should be based upon clearly enunciated principles regarding commercial viability as well as governance guidelines designed to minimise political influences.

Market forces and the independent commercial

viability of enterprises must drive investment options.

This should apply equally to private companies as well as public and State-owned companies.

A commitment to transparency and the highest ethical standards in the conduct of business, the behaviour of its participants and accounting of the benefits of the sector.

FIRST STEPS

In the context of Vision 2020 and the long-term objectives previously established, initial steps should include the following priorities.

Realising the Vision

The Sub-Committee appreciated the opportunity to contribute to this important exercise. However, given the size, scope and depth of the

energy sector in Trinidad and Tobago in a volatile and changing globalised world, the Sub-Committee unanimously agreed that three critical issues in respect of quality and sustainability need to be addressed immediately. They are:

- The employment of expert consultants who could provide dedicated, expert and independent advice on the matters raised in this Report. The Sub-Committee suggests that international expertise operate in a joint venture with local capability as may be necessary and available. Given the nature of the task, a high degree of confidentiality may be a prerequisite for successful implementation of the various elements in the plan.

- Establishing the institutional capability to continue the work started by this Sub-Committee permanently, for the benefit of the domestic energy sector rather of the Government. In this regard, the establishment of an Energy Sector Association to further the goals of the sector may be necessary.

- Many of the issues that require serious work are outlined in Chapter 5. Further, the executive summary in Chapter 3 notes some of the discontinuities that arise from Trinidad and Tobago being a member of the World Trade Organisation and a potential participant in the Free Trade Area of the Americas, and national expectations and aspirations for greater

involvement in the domestic energy sector. Resolving these issues and prioritising the country's needs may require full-time dedicated personnel with the relevant expertise.

Strengthening Institutional Capacity

The energy sector has been growing rapidly, particularly over the past 10 years, with little commensurate growth or modernisation of existing institutions. There have been changes in the size and scope of industries, the number of players, and technology and commercial arrangements. The new era will bring new challenges to existing institutional arrangements, which may mean that other new initiatives are required.

There is a need to establish (revamp) a permanent technical secretariat —

Energy Intelligence Service (EIS), appropriately staffed with skilled, multidisciplinary staff, involved in in-depth research and analysis of the industry, including market trends, technology developments and risk management.

As part of a Petroleum/Energy Institute, the EIS can function as an independent industry consulting research group and can serve both the Government and private sector parties with an interest in pursuing opportunities in the energy sector.

A second initiative within the State sector will be an audit on the roles and functions of existing institutions to determine their appropriateness and fitness. The Ministry of Energy, the National Gas Company, Petrotrin, T&TEC and the existing Business

Development Institutions are perhaps the most important.

This report has highlighted that the existing business development institutions and business development legislation are focused on the non-energy sector, reinforcing the cleavage between the energy sector and the rest of the economy. Reform of the charters or mandates of these institutions and/or the establishment of specialist enterprise development institutions are essential if more local participation in the value chain is to be achieved.

Maintaining Competitiveness

The history of the energy sector has been one of constant change. In the decade of the 1990s the energy sector was characterised not only by significant growth but also by

major changes — positive and negative. Trinidad and Tobago established itself as a premier location for gas-based industries and holds the position of being the world's largest exporter of ammonia and methanol and a major player in LNG.

On the other hand, major energy sector players exited the sector, being replaced by new firms and companies. In ammonia, the Fertrin holdings were sold to Arcadian Partners and were subsequently sold to PCS Nitrogen. More recently, Koch replaced Farmland and MissChem, original partners in FMCL. In the upstream oil and gas sector, Amoco became BP Amoco and then bpTT and now includes Repsol as a partial shareholder. EOG Resources replaced Enron, while BHP Billiton is a new entrant involved in exploration and

development, with production of hydrocarbons expected to start in 2004. Among the new players are Methanol Holdings Trinidad Limited (MHTL) and Methanex in methanol and BG in LNG and upstream oil and gas. Finally, the local metals sector has seen the entry and exit of Nucor (iron carbide) as well as the start-up and closure of the Cleveland Cliffs facility.

Since April 1999, the major influence in local energy has been LNG. Diminishing gas reserves and hydrocarbon exploration in the U.S. as well as an increasing need for clean-burning fuel created the demand for imported natural gas as LNG in that market. In the U.S., high gas prices led to the closure of methanol and ammonia plants with the concomitant gap between output and industry requirements, resulting in

increased imports of methanol and ammonia. In Trinidad, a deliberate competitive gas-pricing policy adopted by NGC in the early 1990s has been a significant factor in the industry's expansion.

New entrants into gas conversion activity in the sector are likely in the future. In addition, newer gas exporters and potential exporters of gas such as Nigeria, Angola, Equatorial Guinea and Colombia can become serious competitors, with significantly lower gas prices than Trinidad and Tobago. The potential price difference can offset the freight disadvantages they may have relative to Trinidad and Tobago in the main markets in which the Trinidad and Tobago companies trade. In that scenario, it may become more difficult to attract new

investment in the traditional ammonia and methanol merchant business. As a result, policy interventions may be needed in three areas:

- The replacement of aged petrochemical capacity.
- Improving the cost structure of existing plants to increase the competitiveness of these facilities.
- Innovating to create new sources of competitive advantage.

Given anticipated changes in the global environment for oil, gas and petrochemicals, Trinidad and Tobago must leverage its existing strengths and know-how to remain competitive. These strengths include:

- Continued improvement and development of physical infrastructure to ensure safe, easy and

efficient access to and egress from ports and harbours.

- A user-friendly one-stop shop to facilitate potential investors.
- Transparent and uncomplicated approval and permit procedures.
- An open and flexible attitude towards gas pricing.
- A meaningful package of incentives to ensure that old and obsolete plant and equipment are replaced.

At the same time, the State should encourage gas conversion processes with higher barriers to entry than methanol and ammonia (such as GTLs), in recognition of Trinidad and Tobago's acknowledged expertise in constructing, operating and managing petrochemical plants. Sector policy-makers should also develop specific mechanisms to achieve that

goal, including choosing partners who share our vision.

Development of Human Resources

The availability of human resources with the skills to operate and manage at strategic levels in the industry is an indispensable condition for future growth and sustainability. The report identified several areas of deficiency in energy sector human resource capabilities, both in numbers and skills. However, opportunities exist to leverage Trinidad and Tobago's rich hydrocarbon history and diverse industry structure to become a world-class centre for professional and technical-level training in the energy sector. The following initiatives seem most urgent.

- Expansion/Upgrading of NESC/TTIT and its

teaching staff for the technical training of skilled personnel for the energy industry.

- Inclusion of energy studies among course offerings in the undergraduate programmes at UWI and the proposed University of Trinidad and Tobago. These institutions should be granted funding by industry stakeholders to pursue research in areas relevant to the Trinidad and Tobago industry, coordinated by the Petroleum/Energy Institute.
- Establishment of a drilling school and college for marine and maritime studies. Both areas are critical to the projected expansion.
- The NGOs (SPE, GSTT, NEBA, Chambers of Commerce, APETT) should undertake a

sustained energy sector public education and awareness programme about the existing and evolving energy business, along with the new career opportunities available.

- A human resource development policy that incorporates the work permit process.
- Industrialisation strategies that target clusters to effect cross-sector transfer.

The contribution of private institutions to secondary and tertiary-level education has risen significantly over the last two decades. There is no reason why private institutions, in conjunction with industry partners, could not be encouraged to replicate their efforts in the energy sector, given the availability of opportunities and the future potential of such an initiative.

Local Content and Sustainable Development

The goal of increased local content will remain elusive unless supported by positive action on the part of Government and the firms that account for most sector expenditure. In this regard, the following policy initiatives seem appropriate:

- A policy declaration on local content and sustainable development, in keeping with petroleum regulations and PSCs. This may extend to a requirement for an economic impact assessment (similar to an environmental impact assessment) to be part of every major energy sector project. The policy should ensure that:
 - The local content definition is communicated and applied widely.

- The local content measurement system can be applied by independent auditors.
- A certification process for “local” companies, goods & services is developed and implemented.
- Review the Central Statistical Office data measurement methodology in respect of natural gas and offshore activity and its impact on the key macro-economic parameters. The purpose is to provide a basis for better measurement of the real impact of the petroleum sector on the economy, as well as to establish the value of GNP as an index for economic analysis and policy formulation.

Major energy sector companies should all issue their individual Local Content or Sustainable

Development Charter, in keeping with their expressed support for the national vision. The company charter will contain defined targets and strategies for increasing local content in projects.

- Private sector umbrella bodies should implement structured programmes for ongoing sensitisation of their membership to emerging investment opportunities, both at the micro and macro levels in the energy sector.

Strategic Targets

A strategic approach has to be taken to maximize the value of the oil and gas resource to Trinidad and Tobago. To achieve this, delivery of each objective and target should be approached in the manner outlined in Chapter 5. In keeping with those strategies, Trinidad and Tobago should

set energy sector countrywide targets and establish standards (2004–2020) for:

- The ratio of nationals to non-nationals in energy sector employment.
- The ratio of nationals to non-nationals in value-added work roles.
- Percentage of in-country expenditure for all operator third-party expenditure.
- Percentage of taxation ring-fenced for socio-economic development.
- Targeting of specific skill sets for nationals.

Tax and Legislative Reform

The reform of legislation governing the energy sector seems to be a short-term priority. In part, the urgency is fuelled by the rapid pace of expansion in the industry, the concomitant need for flexibility in taxation and the age of the current legislation.

The last major change in petroleum tax legislation was in 1992.

The key areas of focus appear to be the following:

- A review of the petroleum tax legislation to revitalise the onshore oil sector, the expansion or proper abandonment of marginal fields, marginal field development (both offshore and onshore), and the issue of cross-border gas.
- A revision of existing legislation and the strengthening of supervisory capability to ensure that the industry observes world-class HSE standards.
- A flexible tax regime to encourage wider involvement of local small and medium enterprises (SMEs) in the industry.

There is also a need to review relevant legislation to remove current gender biases.

Domestic Capital

The rate of past sector growth, as well as forecasts for energy growth in the medium term, is unusually high. The cumulative returns to the State (taxes, royalties and dividends) are forecast to reach unprecedented levels and are atypical when compared to the past two decades. The available funds could encourage patterns of expenditure that exceed the absorptive capacity of the economy. The situation is exacerbated when market prices for primary product are above average. Given this reality, it seems appropriate that Government use its surpluses to:

- Invest in new energy projects with prospects

for longer-term development, or other strategic reasons.

- Reserve some windfall earnings that accrue from above-average commodity prices for future generations in the form of a provident fund: a Heritage Fund. An Act of Parliament should define the rules and regulations governing the management of the Fund.
- Provide capital for chaperoning domestic private capital into the energy sector.
- Make provisions for risk mitigation with regard to economic downturns in global energy conditions.
- Use the surpluses and the opportunity now provided to become the source and repository of capital for the Caribbean region, i.e. make Trinidad and Tobago the financial

centre of the Caribbean and Latin America.

Tobago

- A task force should be established to identify sites and opportunities for industrial development in Tobago, based on the availability of energy for such use in Tobago. This should include maritime service support as the basis for such a site.

The allocations of offshore acreage for bidding should include the acreage off Tobago, with a view to identify and establish the potential of such acreage. Tobago can be used as a pilot project for testing alternative energy options for the islands of the Eastern Caribbean. Initially, the pilot projects proposed will focus on solar power and wind power.

Upstream

- Develop a long-term schedule of competitive bid rounds to assist in ensuring better delineating of the hydrocarbon resource base.
- Establish firm mechanisms to ensure that necessary arrangements with Venezuela with respect to cross-border field development and commercialization of reserves is finalized.

Downstream

All operations in energy should seek to become independently commercially viable. This includes the refining sub-sector and T&TEC. This may require the formulation of a long-term policy for electricity pricing and tariffs to various classes of customers.

- Identification and development of new industrial sites.
- Expansion of the domestic market for natural gas to include non-traditional uses.
- Develop transitional arrangements for the creation of a liberalised gas market.
- Ensure that Trinidad and Tobago becomes a secure, feasible, and stable energy supplier (in terms of pricing) to the Eastern Caribbean.

Electricity

The electricity system should:

- Provide 99% penetration by the year 2020.
- Continue to re-engineer the transmission and distribution architecture and expand the use of live-line work to significantly reduce, if

not eliminate, planned maintenance outages.

- Extend the underground distribution network to improve overall system reliability, particularly in premium power parks.

Health & Safety

The State apparatus for monitoring health and safety conditions in the energy sector is no longer adequate for the sector's needs, having been designed to supervise residential and light industrial activities.

There is therefore a need to establish a single co-ordinating entity (e.g. a statutory agency) equipped with the required technical and human resources to ensure best practices in health and safety services in the sector.

Environment

The following needs to be addressed:

- Planning and zoning of industrial development to minimise and mitigate of possible negative environmental risks.
- Appropriate mechanisms and resources for the detailed evaluation of industrial plant technology, new and old,

in relation to the risks it may introduce.

- The enactment and enforcement of environmental and occupational health and safety laws, rules and regulations in accordance with international best practice.
- Increasing awareness about health safety and environment among the

workforce in the industry through the adoption, by all energy sector companies, of ISO14001 and other environment management standards.

- Comprehensive research to determine environmental carrying capacities in regions and zones targeted for industrial expansion

CONCLUSIONS

IN SUMMARY

The most critical requirements of the strategy for sustainable development are:

- Flexibility of response.
- Diversification of product mix.
- Maximum participation of nationals.
- Prioritising of targets, goals and objectives:
 - Communication and feedback are vital for success.
 - Trinidad and Tobago must accept leadership responsibilities in the Caribbean and Hemisphere.

TIME FOR BLUNT TALK

The energy sector in Trinidad and Tobago is undergoing significant expansion which has placed the country clearly

on the global map as one of the most important gas-producing and exporting countries in the Western Hemisphere. A significant contributor to this status has been its demonstrated history of innovation in gas monetisation and utilisation.

Wide consultation among stakeholders has thrown into relief the need for further work to ensure that the traditional linkages between the oil and gas sector and other sectors in the economy are rapidly strengthened. This is critical if Trinidad and Tobago and indeed the region are to maximise the benefits that will accrue from the exploitation of its very large resources of oil and natural gas. To do so, a defined, well-planned and properly executed strategy of sustainable development will be paramount.

Trinidad and Tobago now has an opportunity to transform itself from a small oil-dependent economy susceptible to wide swings in its economic fortunes to a stable and expanding diversified one, enjoying standards of living significantly higher than ever envisaged.

Such a scenario would create an increased number of quality jobs in manufacturing, production and in a much-expanded services sector, especially in finance, entertainment, recreation, maritime, education and tourism. The national knowledge base in a range of global activities will be substantially enhanced by the expansion of commercial and business opportunities based on the key oil, gas, electricity and chemicals sub-sectors.

CONCLUSIONS

One of the most important tools in creating long-term economic sustainability is the dynamic management of the country's portfolio of assets, in tune with and capable of rapid response to emerging global issues.

These issues are not limited to oil and gas but would extend to all aspects of energy that are also critical to future world growth and stability. The three most critical requirements for the country would be:

- Flexibility of response, thereby creating a diversity of options in respect of the producers of oil and gas.
- Promoting a diverse range of products which are manufactured in and exported from Trinidad and Tobago.

- The involvement of as many nationals as is possible in the sector.

It is important to note, however, an inherent conflict in this situation. The wider and faster the expansion of the energy sector, the greater the likelihood that national stakeholders will face difficulty in achieving the deeper and more meaningful participation that they seek.

The optimum mix of the capital requirements for the energy sector will, in the foreseeable future, require considerable injection from the international capital markets. Nevertheless, effective national participation in all aspects of the sector, both in Trinidad and Tobago and overseas, would demand extensive use of domestic capital.

Traditionally, given the size of energy investments, the

Government has been the only source of capital, but it is now necessary to encourage participation by including many sources of domestic capital, especially from the local private sector. This will necessarily demand less government control and more transparency in the private sector.

A critical determinant for the future of the country will be the rate of expansion of oil and gas production. The expansion of this sub-sector, which is very high risk in terms of exploration activities, will depend very much on the rate of allocation of acreage. This will also impact on the rate of market expansion, a key factor in the growth of this sub-sector as demonstrated by the LNG experience at the turn of this century.

CONCLUSIONS

The success of LNG in Trinidad and Tobago has further introduced demand-pull factors in the context of U.S. gas needs that may extend well into the next decade. To optimise this arguably small window of opportunity, Trinidad and Tobago must employ strategies that recognise the USA's well-established policy and need for diversified energy sources, such diversity to include supply source location and the form in which energy is produced and consumed.

With its established reputation as a competitive and innovative supplier of energy and energy-based products, Trinidad and Tobago is well placed to provide the U.S. market with natural gas processed from regional sources. This carries the proviso that the country maintains a mix of policies

and strategies that provide value to its neighbours and alliance partners.

Perhaps the greatest constraint on national economic transformation is the extent to which nationals and local corporations can participate at every level of the value chain and in all aspects of the energy business. Several factors have contributed to the gap between popular aspirations to participate in the sector and actual capabilities for doing so in the context of the very rapid expansion of all the sub-sectors in energy.

These include a history of low public awareness of the importance of energy to the country's economic life; a very low level of scientifically trained technicians and graduates at the tertiary level; and an even greater shortage of

commercial and business skills. In this context, a critical requirement for the future will be an effective mix of personnel from our alliance and neighbouring partners in combinations which create partnerships for expansion while managing the expectations of aspiring nationals.

There will be need for an enlarged support services sector with a larger and more efficient infrastructure to meet the demands of such expansion in the energy sector. Diversifying and widening the already complex sector output will require further supporting services such as shipping, logistics and trade while further deepening of the sub-sector, with both forward and backward linkages, will add yet another dimension of demand.

CONCLUSIONS

Managing the complexities of regional leadership within the context of both technological and geopolitical changes will demand unparalleled negotiating skills and governance capabilities. Specialised training in these rapidly evolving disciplines will be essential in order to expand the talent pool. Thus, the need for prioritising targets, goals and objectives within a small economy is an imperative. Failure to make choices in favour of non-confrontational, politically correct strategies will only serve to destroy the opportunities now available to the country.

A fundamental requirement for success is the

communication of established priorities and management of the many other desirable demands. Equally important would be to gauge the feedback from the general populace as the expansion proceeds apace. The importance of ensuring public participation and public understanding of the Vision 2020 initiative must therefore require the support of a robust and over-arching communication strategy developed around the results of the efforts of the core sectoral groups and the implementation plan which follows from it.

It is now clear that preparing the citizens of Trinidad and Tobago for participating in a rapidly growing economy

with an increased requirement for the number of people who have sound technical, commercial and negotiating skills is critical. This must be seen in the context of an inflow into the country of a widening number of personnel from outside of its small land mass. Effectively managing the inevitable tensions and challenges that will arise in these circumstances, particularly those that threaten security and safety, will be crucial. Preparing the country for accepting and shouldering its regional and Western Hemispheric responsibilities may well be the touchstone in the demand list of leadership issues.



APPENDICES

PREPARATION OF A STRATEGIC DEVELOPMENT PLAN FOR TRINIDAD AND TOBAGO TO ACHIEVE DEVELOPED NATION STATUS BY 2020

Terms Of Reference For Sub-Committee Of The Multisectoral Group

Energy

INTRODUCTION

- The Government has a vision for Trinidad and Tobago to become a developed nation by the year 2020. Vision 2020 is multisectoral and multifaceted in scope. By 2020, Trinidad and Tobago is envisioned as a fully developed nation in every sense, inclusive of the strength of the economy, the level of human development and the standard of living enjoyed by the population, the social, legal and institutional structures, the quality of governance at both the national and sub-national levels as well as the state

of the natural environment. In order to realise Vision 2020, the Government has focused attention on the preparation of a Strategic Development Plan. Such plans have had a pivotal role in the development progress of developed countries such as Norway, Iceland and Singapore, states within the USA, and emerging developing countries including Costa Rica.

- A multisectoral group, comprising persons from key sectors including government ministries/agencies and leaders from the private and non-governmental sector, has

been established by Cabinet to effectively implement the process of developing the Strategic Development Plan. A Technical Secretariat comprising staff of the Ministries of Planning and Development and Social Development is assisting the group.

- The multisectoral group is required to report on a regular basis to a team of Ministers, chaired by the Prime Minister, to ensure that the Government's input is taken into account and that Cabinet is kept abreast of the progress on the 2020 Plan. The entire exercise will have oversight from

APPENDIX I

a joint select committee of Parliament.

- The strategy for developing the plan involves the establishment of a range of sub-committees in sectors/areas including: macroeconomy and finance; energy; agriculture; tourism; industry and entrepreneurship; national security, public safety and legal administration; administration of justice; infrastructure and public utilities; human resource development; health; housing; environment; poverty alleviation and social services; science and technology; governance and institutional structures for development; international relations and trade; regional development and

sustainable communities; population; employment and social security; gender in development and HIV/AIDS.

- The Prime Minister has mandated that the implementation of actions to achieve developed nation status must commence within the next fiscal year. As such, the sub-committees will have a period of eight weeks to complete their work in order to inform the preparation of the 2003-2004 Budget. The reports of the sub-committees will be submitted to the multisectoral group which will coordinate and integrate the inputs into a holistic Strategic Development Plan.

OVERALL OBJECTIVE

- The overall objective of the Vision 2020 exercise is to prepare a Strategic Development Plan that will position Trinidad and Tobago to achieve developed country status by 2020.

SPECIFIC OBJECTIVE

- At the sub-committee level, the specific objective is to develop a strategic plan for the sector/area that will provide the following:
 - A situational and needs analysis.
 - A vision for the sector/area.
 - Overall policy objectives that provide quantifiable targets for achievement by the year 2020.

APPENDIX I

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| <ul style="list-style-type: none"> – Specific objectives that provide quantifiable targets for achievement within the periods 2004-2006 and 2007-2009. – The strategies that should be pursued for 2004-2006 and 2007-2009 in order to achieve the stated objectives. – The indicators/ performance milestones, related to the overall policy objectives, at the end of every three-year period commencing in 2006. – A detailed Action Plan that contains a prioritised matrix of activities for the public and private sectors and communities, an intervention timetable and estimates of implementation cost for the first three years. – The most critical activities that should be undertaken as well as | <p>those activities that can be implemented easily.</p> <ul style="list-style-type: none"> – The policy, legislative and institutional arrangements for the efficient implementation of the strategies and Action Plan and review of the achievement of milestones and targets. <p>STRATEGY</p> <ul style="list-style-type: none"> ▪ The work of each sub-committee will be coordinated by a designated chairperson who will be drawn from either the multisectoral group or from a key public or private agency functioning in the sector/area. The chairperson will report to the Chairman of the multisectoral group as required. | <ul style="list-style-type: none"> ▪ The membership of each sub-committee will comprise key stakeholders and interest groups at the public, private and community levels. The chairperson of each sub-committee will have the authority to co-opt other expertise as required. ▪ For the duration of the assignment each sub-committee will be assigned a full-time Technical Secretariat of two to three senior level officers who will be co-opted from the sector ministries/ departments. These officers will have considerable experience in a planning environment in the area of focus of the sub-committee. The Technical Secretariat will be required to: |
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- Provide research support for all the major tasks of the sub-committee. This will involve, inter alia:

- Sourcing and summarising key documents.
- Gathering and analysing data and information and presenting findings on critical issues.

- Detail the operational implications of the strategies defined by the sub-committee and present these in the form of an Action Plan for approval by the sub-committee.

- Prepare the reports of the sub-committee in collaboration with the chairperson of the subcommittee.

- The Technical Secretariat will also be responsible for making all

arrangements with respect to meetings of the sub-committee in collaboration with the chairperson of the sub-committee and for recording all discussions of the sub-committee.

BACKGROUND TO SECTOR/AREA

- The Trinidad and Tobago economy continues to be dependent on energy production. The energy sector adds an estimated 25% to GDP annually and is the dominant foreign exchange earner, accounting in 1999 for more than 73% of these earnings. Increasingly, the oil sector has been buttressed by growing and significant contributions from the natural gas sector and its petrochemicals

(methanol, ammonia, urea), and the metals sector. With an export capability of over 2.9 million tonnes of methanol per year and approximately 4.5 million tonnes of ammonia per year, this country is one of the largest exporters of these products. The development in the area of natural gas has been the coming on stream of the Liquefied Natural Gas plants—Train I in 1999, with Train II in 2002 and with Train III scheduled for completion in 2003.

As such, gas production, its enhanced output of condensate and oil and the downstream gas-based sector, is the new source of burgeoning revenues. Given the recent exploration success at finding new oil production sources

offshore the east coast of Trinidad, further expansion of the country's revenues from the energy sector may also be expected.

- The sector has always employed a small per cent (less than 10%) of the labour force, and has been highly susceptible to the volatility and fluctuations of international oil and petroleum product prices. It had also been experiencing steadily declining oil production since 1980 up to 2001. Currently, the sector is dominated by a larger number of firms that utilise gas mainly for the production of petrochemicals, and there is the absence of activities that add value downstream of the manufacture of "first

derivative" products such as methanol, urea and ammonia. The advent of Atlantic LNG Trains III and IV is expected to deplete reserves of gas at a faster rate.

- A significant amount of the resources and supplies to the energy sector is sourced externally. Currently, the local content or participation rate in the sector is estimated at less than 20%. Encouraging and developing the local content can be achieved by increasing local investment participation, and providing vendor development assistance in the manufacture of selected products used by the industry. Additional business opportunities exist in the provision of goods and technical services in oil and gas-

related activities such as upstream services and plant maintenance.

SCOPE OF WORK

The sub-committee will:

Undertake a review and analysis of the existing situation and identify the needs of the sector to the year 2020 at both the national and sub-national levels, inclusive of Tobago. This work should take account of (i) domestic conditions, including a review of key statistics, the policy environment, the legal, regulatory and institutional frameworks, all current and planned initiatives/investments; (ii) the international environment and (iii) a SWOT analysis. The overall assessment should also address where possible the following issues, including but not necessarily

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in order of priority nor limited to the following:

- The competitiveness of all aspects of the domestic energy sector.
- Depletion policy.
- Acreage allocation policy.
- Global and domestic conditions of energy demand and supply, regional energy issues.
- Data management.
- Measurement and macro-economic assessment issues.
- Energy efficiency.
- Alternative energy sources and renewable energy.
- Power generating, transmission and distribution capacity.
- Issues in the natural gas sub-sector.
- Tariffs, prices and economic issues in natural gas and power.
- Local content/vendor development.

- Creating value-added linkages with energy within the economy.
- Enhancing the role of domestic capital in the energy sector.
- Upstream and downstream development activities.
- Retail marketing and distribution and related pricing issues.
- Pricing, investment and taxation regime.
- Domestic production sharing agreements.
- Infrastructure maintenance and development.
- Environmental issues and minimising the negative effects of the sector on the physical environment.
- The human and socio-economic impact of developments in the sector.
- Cross-border issues with Venezuela.

- Human resource issues including the development of a domestic R&D capability and further specialist expertise.
- Energy security.
- Fuel diversification issues.

Undertake analyses of global and regional trends and make projections in order to identify opportunities and threats.

Identify the best practices that could be tailored to our circumstances, the pitfalls to be avoided, the opportunities to be pursued, and the critical success factors by reviewing the experiences of comparator countries.

Strategic Positioning of Sector/Area

- Articulate the vision for the sector/area.
- Define the overall objectives that provide quantifiable targets for achievement by the year 2020.
- Define the specific objectives that provide quantifiable targets for achievement over the periods 2004-2006 and 2007-2009 at the national and sub-national levels, inclusive of Tobago.
- Articulate the strategies that should be pursued for 2004–2006 and 2007–2009 at the national and sub-national levels, inclusive of Tobago. The strategies should also address cross-sectoral issues such as gender, human resource development, community development, science and technology, disaster-

preparedness, environment and linkages with other sectors of the economy.

Institutional Framework

- Identify the policy, legislative and institutional/organisational arrangements required to achieve the objectives for the sector/area.

Implementation

- Establish indicators/performance milestones and targets for each sub-sector/area to the year 2020. These indicators/performance milestones should be established for every four-year period beginning in 2006.
- Develop an action plan that contains a prioritised matrix of activities for the public and private sectors and communities, an

intervention timetable and estimates of implementation cost for the first three years. The action plan should also identify the most critical activities that should be undertaken as well as those activities that can be easily implemented.

Consultations/ Stakeholders' Participation

- Develop strategies in the most effective manner for ensuring the relevant stakeholder and public participation.

TIMEFRAME AND OUTPUT

The sub-committees will have a period of eight weeks commencing March 24, 2003 to complete their work. The expected deliverables are:

- By the end of the fourth week, a progress report

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presented to the multi-sectoral group by the chairperson of the sub-committee.

- By the end of the eighth week, an interim report that comprises:
 - A review and analysis of the existing situation as well as an analysis of the needs of the population at the national and sub-national levels, inclusive of Tobago. This analysis should be undertaken from both the domestic and international perspectives, and include trend analyses and projections related to international developments. This section should also identify the international best practices that could

be tailored to our circumstances, the risks and the critical success factors.

- The vision for development of the sector/area.
- Overall objectives that provide quantifiable targets for achievement by the year 2020.
- Specific objectives that provide quantifiable targets for achievement over the periods 2004-2006 and 2007-2009. The specific objectives should be set at the national and sub-national levels, inclusive of Tobago.
- Strategies for the sector/area and for addressing cross-sectoral issues. These strategies should be defined at the

national and sub-national levels, inclusive of Tobago.

- An action plan for the first three years. The action plans should also identify the most critical activities that should be undertaken, as well as those activities that can be easily implemented, and a timeline for implementation, financial and other resource requirements, the responsible agency(ies).
- Further Definition of THE WAY FORWARD.

VISION 2020**ENERGY SUB-COMMITTEE**

**Minutes of Workshop/Meeting held at 8:30 a.m. on
April 10, 2003 at Conference Room 3,
Petrotrin Learning Centre, Petrotrin, Pointe-a-Pierre**

Present

Trevor Boopsingh	—	Chairperson
Kermitt Walrond	—	Facilitator
Garth Chatoor	—	Power Generating Company of Trinidad and Tobago
Rampersad Motilal	—	Methanol Holdings
Frank Look Kin	—	NGC
Indarjit Singh	—	T&TEC
Andrew Jupiter	—	Ministry of Energy
Gregory McGuire	—	NGC
Glenford Hector	—	Ministry of Energy (Secretariat)
Keith Awong	—	NGC
Vernon De Silva	—	Ministry of Energy
Tensing Ramlakhan	—	Ministry of Energy(Secretariat)
Jamal Khan	—	SPE
Claude Taylor	—	Samury Ltd.
Paul Murphy	—	NPMC
Catherine Inkim	—	APETT
Rawlinson Agard	—	Petrotrin
Dennis Phillip	—	Kenesjay Systems Limited
Keith King	—	AIC Financial Group
Krishna Persad	—	Krishna Persad & Associates
Khalid Hassanali	—	Petrotrin
Clarence Mitchell	—	LABIDCO

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Tony Paul	—	GSTT
Lennox Persad	—	Lennox Petroleum
Denis Singh	—	T&TEC
Allen Clarke	—	T&TEC
Michael Derrick	—	NPMC
Wayne Punette	—	Ministry of Industry and Trade
Prakesh Saith	—	NGC
Harris Khan	—	TTIT
G.B. Maharaj	—	EMA
Errol Mc Leod	—	OWTU
Rawle Baddaloo	—	PLIPDECO
Amand Jackson	—	Ministry of Planning & Development (Secretariat)
Roger Bertrand	—	Petrotrin

OPENING REMARKS

The Workshop began at 8:30 a.m. and Mr. T. Boopsingh, Chairperson, introduced the Facilitator, Dr. Kermitt Walrond.

Dr. Walrond stated that his work was facilitating the process for defining the Vision 2020. He also shared the Ground Rules and invited the group to add or deduct from the rules, which were presented:

Ground Rules

- Be there.
- Stay on topic.
- No side conversations.
- Keep criticisms constructive.
- Everyone has a responsibility to contribute.
- Be honest and frank.
- Be brief.

During his remarks, Dr. Walrond spoke briefly on the following:

- Introductions
- Establishing/Owning the Ground Rules
- Assignment of Roles
 - Facilitator
 - Scribe
 - Timekeeper
- Work Group Categories
- Review of agenda

Dr. Walrond also mentioned two important rules in brainstorming:

- Do not criticize.
- Do not evaluate during brainstorming.

ASSIGNMENT OF ROLES

Dr. Walrond stated that the group was to be concerned with the content while the facilitator managed the process.

Mr. Roger Bertrand was assigned as the Timekeeper so as to alert the Facilitator of time overruns and whenever we needed to revisit the agenda.

WORK GROUP CATEGORIES

- The view from the Satellite:
 - The Trinidad and Tobago Gas environment in the context of the global Gas environment and along the entire value chain including power.
 - The Trinidad and Tobago Oil environment in the context of the global oil environment and along the entire value chain including power.
- The view from the trenches:
 - The local operating/ownership

APPENDIX 2

sector along the entire value chain including power.

- The local services/contracting sector along the entire value chain including power.
- Human, physical, social, community and economic infrastructure.

AGENDA

Dr. Walrond set out the Agenda as follows:

- Opening Remarks
- Touring the Four Room Apartment:
 - Contentment
 - Renewal
 - Denial
 - Confusion
- Defining the Current State (Prouds & Sorries)
- Envisioning the Future
- The Gap Analysis
- Meeting Assessment

For the breakout sessions one person to chair and another to report for the group.

These persons should be rotated.

DEFINING THE CURRENT STATE (EXERCISE 1)

The work group assignment:

- During the breakout session each work group will be expected to:
 - Appoint a spokesperson.
 - Identify for the current state a list of “prouds” and “sorries”.
- The deliverables back to the plenary session are the two (2) flip charts – “prouds” and “sorries” each clearly indicating the category of the current state addressed.

BREAKOUT SESSIONS

— 1

Group 1A — Frank Look Yin (presenter).

See attached Appendix 1A for “prouds” and “sorries”.

Group 1B — Jamal Khan (presenter)

See attached Appendix 1B for “prouds” and “sorries”.

Group 2A — Krishna Persad (presenter)

See attached Appendix 1C for “prouds” and “sorries”.

Group 2B — Allen Clarke (presenter)

See attached Appendix 1D for “prouds” and “sorries”.

Group 2C — Rawle Baddaloo (presenter)

See attached Appendix 1E for “prouds” and “sorries”.

Feedback from the group on each presentation was sought.

ENVISIONING THE FUTURE (EXERCISE 2)

The work group assignment:

- The year is 2020. You are a team of management consultants appointed by the Prime Minister of Petroland, a resource-rich developing country in the Caribbeads to develop a long-term Energy Strategic Plan.
- Your first step is to visit and benchmark the Republic of Trinidad and Tobago, a highly-developed country acclaimed worldwide for its amazing achievement of this status in a remarkably short time.
- During your visit you were given full access to interview, observe and research at all levels of private and public organisations, the energy sector.

- Brainstorm and flipchart what your team saw, heard, found during the visit with specific reference to the team's assigned category (not what they did to get where they are).
- The deliverables back to the plenary session are a flip chart of the team's discoveries.

BREAKOUT SESSION — 2 (Visioning)

Group 1A — Gregory McGuire (presenter)

See attached Appendix 2A.

Group 1B — Claude Taylor (presenter)

See attached Appendix 2B.

Group 2A — Dennis Phillip (presenter)

See attached Appendix 2C.

Group 2B — Wayne Purnette (presenter)

See attached Appendix 2D.

Group 2C — Errol McLeod (presenter)

See attached Appendix 2E.

Feedback from the group on the session was provided after lunch.

THE GAP ANALYSIS (EXERCISE 3)

The work group assignment:

- Compare current state and review against the 2020 Vision.
- The deliverables back to the plenary session are three actions or objectives that would facilitate the closing of that gap.

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BREAKOUT SESSION — 3 (GAP Analysis)

See Attached Appendices 3A–3E for the reported results.

FINAL PLENARY

The various groups presented on this session.

In summary, the groups all saw the need for an increased emphasis on the further development of the national/local sector activities, including institutions, business services, domestic capital and personnel in the context of an

expanding and efficient energy sector based in Trinidad and Tobago, but serving the region and the world. The need for appropriate regulatory systems to permit efficient and greater expansion of all aspects of energy-oil, gas and electricity was noted.

Some final comments included:

- The need to include Tobago in energy developments.
- The likely impact of the WTO and the FTAA on local content.
- The clear polarity which existed between the

human resource inadequacy and the desires to increase local-value-added activities.

- The need to prioritise some of the steps outlined so as to effect immediate action.

It was agreed that participants would, if they so chose, submit comments on their assessment of the Workshop to the facilitator via e-mail.

The Workshop ended at approximately 5:00 p.m.

2003, April 10

BREAKOUT NOTES

DEFINING THE CURRENT STATE

Trinidad and Tobago gas environment in context of global gas environment along entire value chain, including power.

PROUDS

NGC's role and performance:

- Pt. Lisas model/experiences/sophistication gas developed model although:
 - Small country; and
 - Reserves.
- Natural gas used in electric generation – 100%:
 - Environmentally friendly fuel; and
 - Competitive cost power (competitive price power).
- Reduced flaring of natural gas.
- Gas utilization portfolio – LNG, petrochemical fuels.

- Global leaders in gas-based industries - Methanol (MHTL):
 - NH₃;
 - LNG; and
 - LNG.
- Industrialised countries are dependent on Trinidad and Tobago.
- Favourable environment for gas exploration/production.
- Skilled manpower, infrastructure – attractive to foreign investors.
- Petroleum law (legal framework).
- Institution framework.
- Excellent safety record in gas industry.

SORRIES

- Ad hoc gas-based industrial development including power generation and distribution
- Growing core of LNG production.
- Historical flaring of gas.
- Being the leader in NH₃ and methanol production.
- Absence of petrochemical license.
- Absence of well developed regulatory structure for gas utilisation.
- Slow growth of LNG.
- Low local participation – entire value chain.
- Gas for Tobago and Caribbean.

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- | | | |
|---|--|---|
| <ul style="list-style-type: none">▪ Lack of free market for transaction: producer/consumers.▪ Gas royalty rate.▪ Gas price based on net back formula.▪ NGC's monopoly.▪ High gas price for electricity.▪ No major downstream investment for gas.▪ Gas from Venezuela (presently). | <ul style="list-style-type: none">▪ Other countries pricing gas less than market value.▪ Carbon emissions in Pt. Lisas.▪ Direct access to gas transmission system.▪ CNG gas piping to homes.▪ Clifton Hill Beach — environmental damage.▪ Move local companies in E&P business. | <ul style="list-style-type: none">▪ Insufficient income/revenues retained in Trinidad and Tobago.▪ Energy sector — too much of enclave (not at top end).▪ Level of skills — expertise in engineering, construction and operations (design, etc.).▪ Over reliance by the energy sector on the Government. |
|---|--|---|

The Trinidad and Tobago oil environment in context of the global oil environment and along the entire value chain, including power.

PROUDS

- Contribution to national development.
- Transparent/facilitative environment.
- Competitive advantage.
- Competitive bidding regime.
- Integrated value chain.
- Local (Internationally recognised) expertise.
- Stability (political, social, etc).
- Extensive energy infrastructure (pipelines, ports, facilities).
- Good legal/legislative/regulatory framework.

- Reserves: property of state.
- Secure (niche markets and marketing capability).

SORRIES

Inadequate infrastructure / utilities (roads, utilities, power, water):

- Rigid state control (state enterprises).
- Lack of indigenous R&D.
- Insignificant local private sector capital/participation.

- Regulatory structures (power, utility (water), liquids extraction).
- Significant environmental liability.
- Insufficient market penetration (extra-regional).
- Insufficient indigenous crude.
- Refinery configuration.
- Inadequate product development ex refinery.
- Over-reliance on the energy sector by the government.

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The local operating/ownership sector along the entire value chain, including power.

PROUDS

Upstream

- Skilled personnel
- Global Service sector:
 - Tucker
 - Gaffney
- Local independents:
 - Lease operations
 - Farm-outs
 - Other
- Manufacture/construction platforms
- Financing

Midstream

- NGC construction/operation/maintenance
- Power sector (100 Gas generators)
- Transport/distribution (100% local ownership)
- Powergen 50% ownership

Downstream

- Refinery (operation)
- Petrochemicals:
 - Operation 100% local
 - Ownership of operating company
 - Plant ownership significant
 - Gas pricing formula
 - Plant construction (world class)
 - Stake holder flexibility
- Metals:
 - Courage
 - Innovation
- Infrastructure:
 - Developing
 - Operating
 - Ownership
- Project development:
 - Coordination/distribution
 - World leader (ammonia/methalolex)

SORRIES

Upstream

- Marginal field ownership
- Marginal token local content:
 - Skills lost/never developed
 - Liberal work permit regime
 - Poor monitoring of permits
 - Design
 - Construction
 - Transport:
 - Tankers
 - Supply boats
 - Geophysical/Geo-technological services
 - Insurance
 - Financing

Midstream: Pipeline

- Domestic private sector
- Monopoly/bp line

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Power Sector

- Lack of renewable diversity
- Absence of domestic equity

Downstream:

Petrochemicals

- Exclusively commodity plants (including metals)
- No shipping ownership
- Limited trading

Oil

- No external retail marketing
- Leaded gasoline locally
- Sector framework.

The local services/contracting sector along the entire value chain, including power.

SERVICES / CONTRACTING

PROUDS

- History of world class
 - Drillers
 - Plant operators
 - Construction
 - Welders
- Good local service companies have evolved.
- Some expansion overseas even globally.
- All petrochemical plants capable of being built by local contractors.
- Ability of power sector to keep pace with growing demand.
- Active government support for gas industry.

- Long-term demand for services.
- Development of some technical training institutions, apprenticeship.

SORRIES

- Emigration of these skilled workers.
- Firms remain small.
- Low local content less than 20%.
- Limited local capability in power sector.
- Lack of knowledge of size and scope of available opportunities.

- Local engineering input into projects not developed.
- “Crumbs” — low local value on large project.
- No clear support by government for local service/contracting.
- No clearly articulated vision for S/C sector.
- Not well defined/enforced regulatory framework.
- No clear leadership or vision.
- Limited understanding and support of local financial sector.

Human, physical, social, community and economic infrastructure.

PROUDS

Human

- Considerable experience in energy.
- Rich history in human development (OWTU).
- Commitment and development of sector.
- Training/Adaptation (NESC, MIC, YTEPP, SERVOL).

Physical: Ports

- Plants and facilities of world class standards.
- Distribution of network.
- Utilities.

Social & Community

- Contribution to community via facilities, sports.
- Some sensitivity.

Economical

- Existing, established provide sustainable employment, national growth and development.
- Mechanism for some redistribution of economical gains.
- Good economic climate for investment.

SORRIES

Human

- No sustained programs worth building at all levels (craft).
- Limited business, R&D development.
- Not able to retain HR
- Training.

Physical

- Environment.
- Old plant and equipment and technology.

Social & Community

- Non-sustained programme.
- No transition programmes in keeping with changes in industry for at risk areas.
- Too PR-focused vice-versa direct support.

Economic

- Unable to participate in the international and global.
- Mismanagement of the economic benefits
- Risk averse (analysis paralysis).
- Distribution.
- Linkages.

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WE ARE NOT ANGOLA

- | | | |
|---|--|---|
| <ul style="list-style-type: none">▪ What defines “Value” for Trinidad and Tobago?▪ “Ad hoc” development.▪ Things are not always black & white.▪ “Enclaved” Industry/Lack of adequate public awareness. | <ul style="list-style-type: none">▪ Infrastructure & Human capability not keeping up with demand.▪ Refinery issues-sourcing crude/configuration, etc.▪ Local ownership not where it should be.▪ “Crumbs” diet for local service/contractor. | <ul style="list-style-type: none">▪ Lack of training/R&D/HR development.▪ Community death. |
|---|--|---|

BREAKOUT SESSION 2

VISIONING

TT 2020

UPSTREAM

- Local and imported gas.
- Multiple producers (largest 25%).
- International gas price
- RTP 30 years.

MIDSTREAM

- Open access pipeline.
- Cross border interconnected network.
- 6 BCF local ownership.

DOWNSTREAM

- Significant local equity.
- Energy companies on stock exchange.
- Fullest utilisation of gas as raw material.
- Ethylene

- New products
- LNG & LPG trading hub.
- Expanded boundaries.
- Electricity — mass transit.

- Leader in clean fuel production.
- Higher ratio of more valued product (petrochemicals) to clean fuels.

- Clean fuel consumer.

- Preferred supplier to regional/extra regional markets.

- Pristine surroundings.

- Local owners/ stakeholders of the entire oil value chain.

- Most services to sector are locally sourced.

- Trinidad and Tobago oil/service companies operate globally.

- Trinidad and Tobago oil industry used as standard to benchmark other companies.
- Low cost finder and producer of oil.
- Producer of technology.
- Design/finance/construct platforms and other facilities for local and international industries.
- Investments into R&D by local companies.
- Optimal use of local capital in oil industry.
- Internationally recognised technological innovations.
- Large influences on global policies.
- Less dependence on energy sector – diversified economy.
- High local content throughout oil value chain.

- Maximum use of all indigenous crude (greenfield refinery).

GNP>GDP

Net International OWS Services

- Dividend income
- Fees (financial/contracting)
- Education services
- Management consultant services

Ownership: Local and Private Sectors

- Stock exchange (national capital including government)
- Legal and administrative framework.

Regional Energy Hub Physical Infrastructure

- Gas pipeline grids (local/regional)
- Gas based industrial parks — producing

finished products (approx. 6), including 2 GTL plants, 100,000 BBLPD

- New refineries — 100,000 BBPDEA, zero fuel oil and sulphur
- Production infrastructure — oil products 250,000 BBPD — gas products of 2.5 BLFPD (rest imported)
- Housing

Regional Hub Operating & Transportation Infrastructure

- Training institutions: nurturing, innovation, entrep.
- Design institutions
 - Process invention
 - Plant and platform design
 - Ecological interpretation.
- Transportation network
 - Pipelines
 - Shipping (including tanker transport)
 - Air transportation

- Telecommunication
- World class training institutions leading in some niches (drilling).
- Efficient health care system (high quality).
- Internationally competitive services.
- Trinidad and Tobago recognized internationally as a hub for oil and gas services.
- Trinidad and Tobago is a trading center for gas and gas products.
- Trinidad and Tobago dominates regional energy market.
- World class infrastructure/state institutions.
- Local businesses are underpinned by world class skills, technologies, tools and processes.
- Trinidad and Tobago is the regional, financial centre/capital market.

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Human

- All human resource qualified and competent.
- Tertiary education is greater than 50%.
- Sustainable training programmes.
- Export training and skills
- Strong R&D focus.

Physical

- State-of-the-art, plant and equipment.
- Continuous refurbishment.
- In-house design and building capabilities.
- Utilities and transportation networks modern standards.

- Environmental Trinidad and Tobago in the world's benchmark (underground cables).
- Only environmentally friendly energy sources in use.

Social and Community

- Access to all levels of education.
- Sustainable programmes.
- Strong industry and community relationships (partnerships).
- Relocation programmes.
- Involvement in evolution.

Economic

- Strong involvement by local financial sector (funds available for local and international investment).
- Programmes for investment/reinvestment.
- Action-oriented sector.
- Planning for development.
- The oil business/refining
- National capital — private/public
- Local R&D capability
- Electricity — consumer profile and needs

BREAKOUT SESSION 3 - GAP ANALYSIS

UPSTREAM

- A limited number of suppliers with one dominant player.
- To multiple players, balance portfolio with significant local ownership/participation.

Steps

- Aggressive bid round for new acreages.
- Pursue cross border/regional suppliers.
- Facilitate local ownership and participation.
- Changes to regulatory framework to facilitate desired state.

MIDSTREAM

From

- Mid-sized local transmission system with

restricted access (implied tariff bundled service).

To

- Regional cross border interconnected network with open access and market-related tariff.
- Expand the infrastructure to link external sources (markets).
- Establish regulatory framework to facilitate open access & pricing.
- Bilateral treaties/negotiations.

DOWNSTREAM

From

- Limited first order derivative industries multiple higher valued products.

To

- Target industries such as ethylene, complex, melamine, formaldehyde resins, fertilizer solutions, and acetic acid.
- Encourage participation of local private sector/national authorities.

From

- (4 generating plants, 2 producers) selling into a single dist. / trans. grid.

To

- Moving to distributed generation to serve multiple industrialisation for increased reliability and robustness.
- Encourage additional producers/production locations.
- Importing power from external sources.

(Venezuela) and exporting to region.

GAP STATEMENT 1

Move From

- Sub-optimal refinery to optimal refinery sub-sector.

First Steps

- Feasibility (for 2020) >
 - Products
 - Markets
 - Demand
 - Technology
- Economic feasibility
 - Upgrade existing
 - Build new capacity
 - Indigenous/imported crude ratios: benefit cost analyses
- Attract investment: local/foreign private/state

GAP STATEMENT 2

Move From

- Low private/local sector to high private/local participation.

First Steps

- Increased early public awareness (opportunities, regulations).
- Reduce risk aversion.
- Improved access to capital.
- Improved regulatory framework.

GAP STATEMENT 3

Move From

- Current situation to pristine surroundings.

First Steps

- Rehabilitation/abandonments.
- Tax/financial concessions.

CURRENT STATE (SORRIES)

- Ownership, limited to local.
- Technology capability.
- Limited participation in V.C (diversification).
- Regulatory framework.

Limited Local Ownership

- National capital:
 - Local private sector.
 - Government – equity & leverage.
 - Joint venture (JV) — Government/multi-national/local private sector.
- Domestic private sector:
 - Privatisation.
 - Joint Venture with government/local private sector.
- Financial mobilisation:
 - Private equity funds.
 - Improve international credit rating.

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- Improve macroeconomic management.
- Improve private institution management.

Technical Capabilities

- Demand:
 - Mandate minimum local content % (including design).
 - Work permit improvement in system.
- Supply:
 - Quality firms and personnel to be attracted.
 - Training at all levels.

Limited Participation Along The Value Chain

Opportunities

- Electricity — domestic and international
- Shipping
- Pipelines
- Gasoline stations
- Regional private gas facilities.
- Commodity trading.

- Degasification and external distribution pipelines.

Regulatory/Infrastructure framework

Regulatory

- Petroleum Tax reform: SPT, gas royalty
- SEC legislation enactment
- Venture Capital act – modify
- Pension/insurance (liberalise insurance act)
- N.I.S. (liberalise act)
 - Allocation
 - Partially privatize investment function

Infrastructure

- National security
- Education
- Housing
- Health
- Utilities (public)
- Transport network
- Port infrastructure

LACK OF SUPPORT OF LOCAL SECTOR

Actions

- Awareness
 - Opportunities
 - Scale/Scope
 - Value
 - Challenges
 - Status Quo
 - Alternatives
 - Tobago vs. Trinidad
- Buy-in
 - Government
 - Leadership
 - Financial Institutes
 - Businesses (Including S&C)
 - Education Institutes
 - Entrepreneurs
 - Operators
- Support
 - Roles
 - Policy

Increasing The Level Of People Skills (Action)

- Demand/supply analysis.

- Development strategy and plan.
- Focus on increasing value-added skills (full value chain).
- Develop transferable skills (for end-game and diversification).
- Build institutions (NESC, UWI, UTT).
- Leverage finances.
- Retention/attraction.

Raising Enterprise

- People (strategic skills — analytic, commercial, leadership)
- Tools, processes, technology
- Leadership
- Enterprise
- Ownership control
- Governance
- Capital marketing
- Wealth creation
- Wealth distribution
- Stock market (governance)

**HUMAN –
DEPOLITICISING
INITIATIVES
GAP STATEMENT —
Unavailability of adequate
numbers of skilled people
at all levels**

First Steps

- Expanding institution capability (plant/programmes/HR).
- Strengthening the primary and secondary education.
- Decentralising location as you expand.
- Active industry involvement.

**PHYSICAL
GAP STATEMENT — We
are not meeting the
environmental standards**

First Steps

- Public awareness and education.
- Compliance and policing.
- Review and upgrade.

**SOCIAL AND
COMMUNITY
GAP STATEMENT —
Weak industrial and
community relationships**

First Steps

- Community partnering.
- Ongoing involvement in community affairs (sports, culture).
- Training/workshops/cooperatives.

APPENDIX 2

ECONOMIC GAP STATEMENT — Accessibility to development opportunities

First Steps

- Education levy.
- Fiscal incentives to companies (setting up technology institutes).

PLENARY GAP

- Tobago
 - Industrial park
 - Flexibility in pipelines
 - Special issues
 - Do they want to come on board?

- WTO/FTAA impact on local content
- Polarity – human resource inadequacy vs. local content
- Regulatory framework — a key gap
- Priorities.



FRAMEWORK FOR ACTION

FRAMEWORK FOR ACTION

VISION

To be an integrated and fully developed energy sector that is a key driver of a sustainable and flourishing local and regional economy while attaining global competitiveness in all of its sub-sectors by 2020.

- The energy industry will be sustainable, operating transparently with the full support of the Government (through effective governance) and the people of Trinidad and Tobago. It will include locally owned and managed energy-based companies that participate throughout the

complete value chain in projects and operations that are both local and global in scope and scale.

- Based on the successes of this industry, Trinidad and Tobago will be the regional financial and energy trading centre, supported by a strong and vibrant capital market, and world-renowned educational institutions which will support the development of highly skilled and competent personnel, and a technology hub that stimulates innovation and entrepreneurship, supported by a strong public-private sector partnership.

SUMMARY

The energy sector is the dominant sector of the national economy. The need to infuse the overall environment with sector best practices and thinking, and to increase the pace of economic diversification has become increasingly critical, given the changing structure of the domestic economy and international markets.

The fundamental challenge faced by T&T is to create the conditions for sustainable long-term growth and development of the energy sector, the wider economy, and the people of T&T.

GOAL 1: To optimise exploration and production of the hydrocarbon resource.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
1.1 To achieve a sustainable level and pace of upstream sector activity through the efficient management of the hydrocarbon asset.	<p>Level of upstream activity.</p> <p>Level of exploration expenditure.</p> <p>Level of development expenditure.</p> <p>Level of reserves.</p> <p>Production levels.</p> <p>Reserves to Production ratio.</p> <p>Finding rate.</p>	<p>1.1.1 Develop policies that would support strategic asset management and investment, addressing key issues, such as:</p> <ul style="list-style-type: none"> ▪ Definition of the optimal product mix and level of production. ▪ Industry use of best-practice production methods to optimise depletion rate and recovery. ▪ A long-term programme of competitive bid rounds to assist in ensuring better delineating of the resource base. 	P0 - P1	Ministry of Energy and Energy Industries (MEEI).	



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		1.1.2 Define metrics and establish targets to track upstream performance.	P0 -P1	MEEI	
		1.1.3 Establish firm mechanisms to ensure that necessary arrangements are made with Venezuela regarding cross-border field development and the commercialisation of reserves.	P0 -P1	MEEI	Ministry of Foreign Affairs. Operating companies.
		1.1.4 Facilitate the optimisation of existing and planned infrastructure and facilities.		MEEI	Operating companies.



GOAL 2:	To maximise wealth creation, capture and distribution.
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Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
2.1 To maximise levels of in-country expenditure/ activity.	Percentage of in-country expenditure for all third-party goods and services.	2.1.1 Establish and implement local content policy.	P0		Permanent Local Content Committee (PLCC).
	Level of local content of services.				
	Level of productivity of local operations. GDP/ GNP ratio.	2.1.2 Define targets (2004-2020) for percentage of in-country expenditure/ activity. 2.1.3 Identify and empower agencies responsible for policy implementation and monitoring.	P0 - P1 P1		Operating Companies.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
2.2 To maximise the level of local participation and equity ownership in the sector value chain ¹ .	Level of local content.	2.1.4 Establish processes and frameworks to enable transparent measurement, management and reporting on percentage expenditure/ local content.	P0 - P1		
	Value and percentage of new contracts issued to locally-owned companies. Profits retained locally. Level of local equity participation. Percentage of CAPEX/ OPEX spent in T&T.	2.2.1 Adopt and implement policy on local content and participation.	P0 - P1		

¹ Closely linked to Objective 7.2



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		2.2.2 Assess opportunities/feasibility for State and private sector investment within the value chain in and outside of T&T.	P1		
		2.2.3 Define targets for local participation in sub-sector activity.	P0 - P1		
		2.2.4 Introduce a base level requirement for local content in all service contracts.	P1 P3		
		2.2.5 Introduce a higher weighting for local content in all quotations and tender evaluations.	P1		



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
2.3 To optimise revenue capture	Level of Government revenues from energy – taxes, royalties.	2.2.6 Specify a target date when all engineering and fabrication projects are to be undertaken locally.	P0 P1	MEEI	Ministry of Finance. Law Administration – Law Reform Commission.
		2.3.1 Review taxation legislation and maintain relevance to changing sector needs.	P0 P1		
		2.3.1 Reassess the existing methodology and requirements for the collection and aggregation of data for natural gas accounting.	P1		
					Ministry of Planning & Development (MOPD).



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
2.4 To strengthen the contribution of the energy sector to the local capital market.	<p>Level of local financing of energy projects.</p> <p>Level of local participation in the energy sector.</p> <p>Level of investment in local energy companies operating domestically and abroad.</p> <p>Extent of transparency and accountability of public companies in the energy sector.</p>	<p>2.4.1 Review regulatory framework regarding investment in energy projects.</p> <p>2.4.2 Create incentives to encourage energy companies to pursue listing on the Stock Exchange.</p>	<p>P I</p> <p>P I</p>	<p>MEEI/ Ministry of Finance</p> <p>MEEI</p>	<p>Law Administration – Law Reform Commission.</p> <p>Ministry of Finance. Securities and Exchange Commission (SEC).</p>



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		2.4.3 Evaluate options and methods for the divestment of State holdings in energy companies.	P1	Ministry of Finance	MEEI. MOPD. PLCC.
		2.4.4 Provide opportunities for access to investment by individuals or small investors.	P1	Ministry of Finance	PLCC. SEC.
		2.4.5 Adopt policies to facilitate the retention of a percentage of ownership in new ventures for local private sector investment.	P1	MEEI	PLCC
		2.4.6 Develop a communication/marketing strategy to encourage public investment in listed energy companies.	P1	MEEI PLCC	SEC



GOAL 3: Enhanced development of human capital.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
3.1 To provide high quality, affordable, educational opportunities in a wide range of fields related to the sector, up to tertiary level.	Number of graduates eligible to pursue higher levels of training. Number of employable graduates. Level of demand for programme course offerings.	3.1.1 Include energy studies among course offerings in primary and secondary schools and undergraduate programmes ² .	P1	Ministry of Education	MEEI
		3.1.2 Upgrade physical plant and expand course offerings at COSTAATT, TTIT, UWI, UT&T ³ .	P1	Ministry of Science, Technology and Tertiary Education (MSTTE)	MEEI.

² Action owned by the Ministry of Education. Refer to Education FFA

³ Action owned by the Ministry of Science, Technology and Tertiary Education. See Tertiary Education FFA

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		3.1.3 Establish specialist schools, such as a drilling school and a college for marine and maritime studies. ¹	P0 - P1	MEEI	University of Trinidad and Tobago (UTT). MSTTE.
		3.1.4 Establish an “Education Fund”, from energy sector, Government revenue ⁴ .	P1	Ministry of Finance	MEEI.
3.2 To develop capabilities of TT nationals to enable their participation at all levels and in all parts of the value chain, anywhere in the world.	<p>Tracked by comparative indices, such as:</p> <ul style="list-style-type: none"> Ratio of nationals to non-nationals in energy sector employment. Ratio of nationals to non-nationals in value-added 	3.2.1 Develop and implement a country manpower plan.	P0 – P1	MEEI	Ministry of Labour (MOL). MSTTE. Ministry of Trade & Industry.

⁴ Action owned by the Ministry of Finance. Refer to Macro economy and Finance FFA

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
	<ul style="list-style-type: none"> ▪ work roles. ▪ % of foreign-based nationals in multinational companies. ▪ % of expatriates in locally-based companies. 	<p>3.2.2 Develop a targeted programme to ensure increased employment of nationals in energy sector projects, as well as high value-added positions in the value chain outside of T&T.</p>	P1	MEEI	<p>MOL. MSTTE. Ministry of Trade & Industry. PLCC.</p>



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		3.2.3 Formulate Government policy and create and implement mechanisms to track and evaluate the development of nationals in high value-added positions in multi-national and local companies.	P1	MEEI	PLCC.
		3.2.4 Develop an independent centre of excellence for energy education in T&T, offering training, research, innovation, analysis and consulting in technical, strategic, policy and commercial issues to private individuals, industry and Government.	P1 – P2	UTT	MSTTE. MEEI. Ministry of Trade & Industry. CEED.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		3.2.5 Further develop, prioritise and implement current initiatives toward the establishment of a national apprenticeship programme.	P1	UTT	MSTTE. Energy-sector companies.
3.3 To create strategic alliances between industry, businesses and educational institutions to deliver and support training and R&D initiatives.	Number of alliances created. Level of investment in R&D/training. Number of patents developed.	3.3.1 Establish policy to cause operators to partner with local institutions to develop training programmes and pursue research and development projects.	P1	MEEI	UTT Operating Companies



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
3.4 To create awareness within the country about the energy industry and evolving opportunities.	Widely available, current information.	3.4.1 Undertake a sustained energy sector public awareness and education programme highlighting existing and potential activity, career and business opportunities.	P1	NGOs. Professional bodies. Business Associations. UTT.	Ministry of Trade and Industry. MEEI. Ministry of Education. NALIS.
		3.4.2 Establish a mechanism for the public dissemination of and easy access to energy sector information.	P1	MEEI	NGOs. Professional bodies. NALIS. CEED.



GOAL 4: A robust & respected institutional and regulatory framework to manage the industry.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.1 Clear definition and distinction of roles, responsibilities and accountability of various State agencies, corporations and institutions.	Public statement defining the roles, responsibilities and accountabilities of all State agencies in the sector and mechanisms to manage overlap.	<p>4.1.1 Undertake an audit of the roles and functions of existing institutions to determine their appropriateness and fit.⁵</p> <p>4.1.2 Reform charters/ mandates of business development institutions to address the current needs of the country and the energy sector.⁶</p>	<p>P1</p> <p>P0 – P1</p>	<p>MOPD</p> <p>MEEI</p> <p>Ministry of Trade and Industry</p>	<p>Standing Committee on Energy (SCE)</p> <p>Prime Minister</p> <p>MEEI.</p> <p>Ministry of Finance.</p>

⁵ Action jointly owned by the Ministry of Planning and Development. Refer to Governance Action Plan.

⁶ Actions owned by the Ministry of Trade and Industry. Refer to Industry and Entrepreneurship Action Plan.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.2 To ensure clear, implementable, widely articulated and consistent policies on all aspects of the sector that impact national development.	Publicly-stated and widely available policies. Consistent application of policies.	4.2.1 Define focus areas for policy development. Priority areas include: <ul style="list-style-type: none"> Local content and sustainable development Asset portfolio management Electricity pricing and tariffs Human resource development 	P1	MEEI	MOPD Ministry of Public Utilities & the Environment (MPUE) MSTTE
		4.2.2 Identify key entity/ies that will be empowered to undertake the development and implementation of sector policies	P0 – P1	MEEI Ministry of Energy	MOPD



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.3 To establish a relevant and flexible regulatory framework.	Relevant governing legislation. Transparent bidding process. Increased number of local businesses operating in the upstream.	4.3.1 Revise the Petroleum Act and Regulations to reflect modern trends in asset management and data management.	P1	MEEI	Law Administration.
		4.3.2 Establish a transparent system of bid evaluation and contract allocation for sector assets and projects.	P1	MEEI	Law Administration. Central Tenders Board.
		4.3.3 Revise petroleum and tax legislation with respect to the impact on the onshore oil sector, marginal field development and cross-border gas issues.	P1	MEEI. Ministry of Finance.	Law Administration.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.4 To strengthen institutional capacity. Key areas of focus include: <ul style="list-style-type: none"> ▪ Sector planning and implementation. ▪ Measurement, monitoring and assessment. ▪ Classification and interpretation of economic data. 	High-quality and widely available information that supports public analysis and strategic Government and business decision-making.	4.3.4 Revise the tax regime to encourage wider involvement of local small and medium enterprises in the industry.	P1	MEEI. Ministry of Finance.	Law Administration
		4.4.1 Establish a permanent independent technical secretariat – Energy Intelligence Service (EIS)-which will conduct industry research and analysis and can function as an industry consulting group to the public and private sectors.	P1	Business/ Professional associations. Energy companies.	MEEI



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		4.4.2 Initiate regular and scheduled planning and review sessions between the Government and stakeholders regarding information transfer and capability building of local businesses and human resources.	P1	MEEI	MSTTE. Ministry of Education. CSO. Central Tenders Board.
		4.4.3 Revise existing methodologies for economic data reporting, as regards data classification, aggregation, analysis and timeliness of dissemination. ⁷	P1	Ministry of Finance	MEEI. CSO. Central Bank.

⁷ Actions owned by the Ministry of Finance. Refer to Macro economy and Finance Action Plan.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.5 To recruit, develop and retain highly competent human resources in energy-related, State institutions.	Turnover rate/ tenure of personnel. Level of expenditure on HR development.	4.4.4 Reassess the role of the CSO in the analysis and provision of energy-related economic data.	P1	Ministry of Finance	MEEI. CSO.
		4.5.1 Establish an overarching development and retention programme to “fast-track” the development of professional personnel within State sector agencies. Development schemes must be linked to the role of their respective agencies and expected deliverables.	P1	MEEI	State enterprises/ agencies.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
4.6 To enhance the business capability of energy-related State institutions.	<ul style="list-style-type: none"> • Level of profitability. • Level of operational efficiency. • Availability of information. 	<p>4.6.1 Create a secretariat in T&T (Market Intelligence Unit (MIU)) with a cadre of highly-skilled and motivated professionals, supported by the technical expertise and knowledge management systems to evaluate, negotiate and contract for new investments in T&T.</p> <p>4.6.2 Adopt best-in-class systems, tools and processes to support the business function.</p> <p>4.6.3 Establish a framework to facilitate collaboration and knowledge sharing across State energy agencies.</p>	<p>P1</p> <p>P1</p> <p>P1</p>	<p>MEEI</p> <p>MEEI</p> <p>MEEI</p>	<p>State enterprises/agencies. EIS.</p>



GOAL 5: Transparent governance of energy-related private and public sector institutions.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
5.1 To achieve transparency of governance, accounting and reporting in energy sector companies, local and international.	Code defined and implemented through an appropriate legal mechanism. Penalties for breach of Code to be included in contractual agreements.	5.1.1 Establish and adopt a “Code of Ethics” which reflects a common set of values aligned to national development and to which all participants in the industry will be required to adhere to. ⁸ 5.1.2 Link project contract penalties to breach of the “Code of Ethics”.	P1	Public Administration. MOPD.	MEEI. Central Tenders Board. State enterprises.
			P1	MEEI. State Enterprises.	Central Tenders Board.

⁸ Actions owned by the Ministry of Planning and Development. Refer to Governance Action Plan.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
5.2 To achieve transparency of accounting and reporting of State institutions in all matters relating to the industry where State resources are involved.	Standing committee created.	5.2.1 Establish a multi-party, standing committee of the Parliament to have oversight of all major policies, strategies and investment for the sector. ⁹	P1	Parliament	MEEL. Private sector. State enterprises.

⁹ Actions owned by the Parliament. Refer to Governance Action Plan.



GOAL 6: Development of competitive and sustainable local energy companies.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
6.1 To create a sustainable, world-class services sector which can compete locally and globally.	Level of local content.	6.1.1 Establish a certification process for local energy-based companies, goods and services.	P0 – P1	MEEI	Ministry of Trade and Industry.
	Level of global market penetration.	6.1.2 Formulate policy to encourage the continuous upgrading of plant/ facilities.	P1	MEEI	Energy companies.
6.2 To foster an enabling environment for local operators to invest in.	Percentage local content.	6.2.1 Develop and implement an independent framework to measure local content.	P0 – P1	PLCC	
		6.2.2 Develop an “audit system” for local content.	P1	PLCC	IMM.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
6.3 To foster investment in areas where the opportunities for value added are greatest.	Level of investment.	6.2.3 Energy companies to develop “Local Content/ Sustainable Development Charter”, which defines targets and strategies for increasing local content in projects and operations.	P1	Energy companies. PLCC	MEEI
		6.3.1 Identify and promote potential areas of investment, such as oil refining.	P1	MEEI. EIS. MIU.	
		6.3.2 Establish a special fund to support domestic investment in services that do not currently exist locally. ¹⁰	P1	Ministry of Finance.	

¹⁰ Actions owned by the Ministry of Finance. Refer to Macro economy and Finance Action Plan.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
6.4 To facilitate and encourage strategic partnering between local and international companies.		6.3.3 Create mechanisms to encourage further downstream development: gas (e.g. GTLs), shipping, marketing, distribution and trading.	P1	MEEI	Energy State agencies.
	Number of alliances created.	6.4.1 Introduce incentives to encourage joint ventures/ partnering, such as higher weightings in tender evaluations.	P1	PLCC	



GOAL 7: Significant industrial development and diversification to high value-add service industries.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
7.1 To efficiently develop, use and maintain reliable, affordable, infrastructure.		7.1.1 Establish a Physical Infrastructure Fund ¹¹ .	P1	Ministry of Finance	MEEI
		7.1.2 Undertake continued improvement and development of physical infrastructure, in the following areas:	P1 - P2		
		<ul style="list-style-type: none"> ▪ Power generation and distribution ▪ Industrial parks ▪ Ports ▪ Water 		T&TEC NEC/ MEEI NEC/ MEEI WASA	PLIPDECO, NEC PLIPDECO, NEC

¹¹ Actions owned by the Ministry of Finance. Refer to Macro economy and Finance Action Plan.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
7.2 To foster local and foreign private sector investment ¹² .	Level of Foreign Direct Investment. Level of local investment.	7.2.1 Develop policy and strategies to encourage investment in the energy sector.	P0	MEEI	NEC
7.3 To increase and improve the level of national innovation & technology adoption in the sector to developed world status.		7.3.1 Implement an incentive scheme to encourage company support for and involvement in R&D programmes. 7.3.2 Undertake continuous monitoring and assessment of technological developments.	P1 P1	MEEI UTT EIS	Energy companies Educational institutions. MSTTE.

¹² Closely linked to Objective 2.2.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
7.4 To leverage sectors' use of technology, infrastructure and skills to build support facilities, service providers, training institutions and businesses locally.	B2B platform implemented and utilised by private and public entities throughout the sector. KM portal implemented and utilised by private and public entities throughout the sector.	7.4.1 Build B2B (Business to Business) platform for sector transactions.	P1	MEEI	MSTTE. Public Administration – ICT Division. Law Administration. PIDCOTT. Energy companies. CEED.
		7.4.2 Build portal for sector knowledge sharing and data management.	P1		



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
7.5 To enhance industrial development by diversification and extension of sector services.		7.5.1 Explore opportunities and prioritise initiatives for cluster development around energy.	P1	E-TecK/ MEEI	Ministry of Trade and Industry. PLCC. Energy Companies. UTT, NEC, THA.
		7.5.2 Develop industrialisation strategies that target clusters to effect cross-sector transfers.	P1		
		7.5.3 Establish a task force to identify sites and opportunities for industrial development in Tobago, based on energy availability.	P1		



GOAL 8: Protection and enhancement of the natural environment.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
8.1 To develop an effective management and regulatory framework, that will inform local health, safety and environmental practices.	Robust and relevant environmental policies and regulations. Effective, independent regulatory agency. Compliance with international environmental commitments.	8.1.1 Establish, implement and enforce policy and standards regarding health, safety and environmental issues which conform to international best practice/ protocol ¹³ . 8.1.2 Review and define the role and responsibility of the EMA as pertains to the special needs of the energy industry.	P1	Ministry of Public Utilities and the Environment.	MEEI

¹³ Actions owned by the Ministry of Public Utilities and the Environment. Refer to Environment Action Plan.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
8.2 To ensure that all operators comply with and exceed local and international standards.	<ul style="list-style-type: none"> ▪ Lost time due to injury. ▪ Number of personnel days away from work due to injury. 	8.1.3 Establish a comprehensive environmental management system.	P1		MEEL. Energy companies.
		8.2.1 Establish a zero tolerance policy on all accidents/injuries to personnel.	P1		
		8.2.2 Establish a zero tolerance policy on all spills, discharges and net emissions to the natural environment.	P1		
		8.2.3 Develop monitoring programmes to enable regular environmental monitoring and research.	P1		



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
8.3 To minimise the negative impact of the siting of energy facilities and support infrastructure.		8.2.4 Create a mechanism to assess the use of new technologies for pollution potential and social risks. The evaluation should review: <ul style="list-style-type: none"> ■ Potential risks. ■ Proven vs. non-proven technology. 	P1	MOPD	MEEI
		8.2.5 Develop incentives to encourage companies to adopt environmental management standards.	P1		
		8.3.1 Develop a long-term strategy to inform the planning and zoning of industrial development.			



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
8.4 To enable ongoing environmental monitoring.		8.4.1 Develop a holistic monitoring programme which will: <ul style="list-style-type: none"> ▪ Track and model cumulative environmental impacts. ▪ Determine environmental carrying capacities. 	P1	Ministry of Public Utilities and the Environment.	MEEI. Energy companies.
		8.4.2 Undertake a baseline assessment of the West coast and the Gulf of Paria.	P1	IMA	
		8.4.3 Undertake a detailed vulnerability assessment of the coastal area.	P1	Ministry of Public Utilities and the Environment.	



GOAL 9: Sustainable investment in social capital.

Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
9.1 To improve community development by industry partnering.	Standards implemented and enforced. Level of investment in community, sport or cultural initiatives.	9.1.1 Develop policy, standards and guidelines to inform the sector's participation in social initiatives.	P1	Ministry of Community Development, Culture and Gender Affairs.	MEEI Energy companies.
		9.1.2 Develop an incentive scheme to encourage energy companies to engage in/ commit to community development activity.	P1	Ministry of Community Development, Culture and Gender Affairs.	MEEI Energy companies.



Objectives	Measures or Indicators	Actions	Time	Owner	Linkages
		9.1.3 Establish targets for encouraging company investment in social initiatives, such as the arts, sport, community and MSME development.	P1	Ministry of Community Development, Culture and Gender Affairs	MEEI Energy companies.



CRITICAL SUCCESS FACTORS

- Political will and leadership.
- Clarity, communication and consistent application of policy.
- Communication and feedback on implementation effort.

- Effective data collection and analysis.
- Maximum participation of locals.
- Empowered and effective oversight institutions.
- Collaboration and constancy of behaviour across State agencies.

ESSENTIAL PRE-CONDITIONS

- Clarity and consensus on the Vision.
- Commitment of agencies. (This is critical to implementation.)