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**BEING
THE
CHANGE**



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PRESIDENT'S MESSAGE

Creating Waves of Our Own

IN the past few years, disruption has upended the energy sector, and the national economy has been squeezed as a result. In order to steady our country on its course for growth, the NGC Group, as the primary driver of development, has asked the question – what should we do differently? What will help the country emerge from this economic slump? Clearly, business as usual is not an option.

"Being the change" speaks to our intent to do what is required to return to growth. In some cases, it means adapting. In others, it means creating waves of our own.

Our Strategic Pillars have informed a defiant response to prevailing industry challenges. We continued to secure supply, although 2018 was challenging – several negotiations, both upstream and downstream, took place in parallel at a time when the acquisition cost of gas was higher and the industry faced a fundamental reset. Nevertheless, we progressed, and also advanced the streamlining of internal processes and structures to strengthen our organisation. Diversification of our business is also underway with commodity trading, specifically in LNG cargoes, being a promising income stream and Group-wide renewables investments cutting new paths for energy. This work brings us closer to our goal of becoming an integrated gas player, as do the other game-changing initiatives profiled in this issue of GASCO News.

Changing tools

There are many uncertainties around the future, but one thing is clear – technology will continue to drive change. For this reason, it is imperative that we establish the necessary platforms upon which future technology can build. The pace of technological evolution suggests that if we do not lay the foundation today, we will struggle to catch up.

At NGC, we have begun to implement an array of upgrades and are exploring applications for innovative technology tools. One of these is virtual reality and we have found there is real value to capture from this technology.

At the same time, we remain wary of the risks that come with embracing the digital age. Security has assumed a new dimension and is treated as a strategic priority area as part of NGC's risk management focus.

Changing tactic

To achieve growth, we have realised that we must break with models that no longer ensure profitability.



Mark Loquan, President, NGC

NGC is actively exploring all avenues to diversify from its core business as a merchant buying and selling gas. Through our subsidiaries, we are finding novel ways to generate value in this period of challenged pricing. National Energy is expanding its service portfolio and in the past year, has achieved several firsts that signal new directions for its business. PPGPL has made strides in its internationalisation thrust, partnering actively with the Ghana National Gas Company following the execution of a TSA in 2018.

We recognise that energy cannot be the sole breadwinner for Trinidad and Tobago, and that our country needs investment to develop other sectors of our economy. National Energy has therefore taken the lead on a critical project that will simplify the process for new investors to do business with our country.

Changing energy

All the while, clean energy and our carbon footprint remain top of mind, as evidenced by a number of projects. NGC CNG is constructing a flagship station at the Couva/Preysal Interchange which will push compressed natural gas (CNG) to the public and will innovatively make use of solar power. NGC recently concluded a study on the carbon sequestration potential of our large-scale reforestation project and the results have important implications for carbon mitigation efforts. In addition, dialogue is underway with key stakeholders to expedite our national clean energy agenda and we have assigned teams to spearhead efficiency initiatives of our own.

If the NGC Group is to continue being a driver of development, we must lead through change. Our work programme declares our intent to do so and is proof of our unwavering commitment to deliver for our country. ■

Mark Loquan, President



Impacting

Control the Controllable

THOUGHTS
ON ACHIEVING
NATIONAL
GROWTH





Prof. Gerry C. Brooks was the feature speaker at AMCHAM T&T's Economic Outlook 2019

To the extent that economic growth continues to be led by gas-based development, the NGC Group's business approach over the coming period will be transformative, thoughtful and solution-oriented.

For this reason, and for his status as a thought leader in Trinidad and Tobago, NGC Group Chairman Professor Gerry C. Brooks was invited to deliver the feature presentation at The American Chamber of Commerce of Trinidad and Tobago's (AMCHAM T&T's) Economic Outlook 2019. Highlights of his presentation are synthesised below.

THE WORLD IN 2019

THE world is interconnected in complex ways, such that the policies and politics of one country can have knock-on effects across continents and globally. Any attempt to project an economic outlook for Trinidad and Tobago must therefore be prefaced by an overview of global markets and geopolitical dynamics.

Global growth is projected by the International Monetary Fund (IMF) to continue at 3.7% in 2019, though at a less vigorous pace than the previous year. The deceleration is due to a slowdown in global trade and investment flows, fanned primarily by an escalation of trade tensions, most noticeably between the US and China.



As it stands, energy is leading fiscal rebound, largely on account of gas-based development.

Flare at Point Lisas Industrial Estate

In addition, concerns around BREXIT have stoked trade uncertainty and the potential exists for disruption of long-standing supply chains between the UK and Europe. Regionally, growth is estimated at 4.4% in 2018 and forecast at 3.7% in 2019. Much of this growth is due to hurricane reconstruction activity and IMF stimulus. Further and significant change is imminent as erstwhile energy importers Grenada, Jamaica and Guyana are mobilising to enter the market, with the latter also grappling with electoral challenges. Across the Gulf, Venezuela is roiled by political and social disturbances with direct impact on Trinidad and Tobago as thousands seek asylum.

Taken as a whole, these international turbulences disrupt supply, demand and multilateral relations, and Trinidad and Tobago is not immune from these effects. While some have greater impact than others, the fact remains that the country is a price taker when it comes to its major exports and its economic fortunes are influenced by exogenous factors.

CONTROL THE CONTROLLABLE

That said, the country still has agency within its borders to direct its growth by controlling what is within its control.

As it stands, the energy sector is leading fiscal rebound, largely on account of gas-based development. The non-energy sector is not expected to grow, but the rate of decline has slowed. There is need for targeted intervention in these two sectors to ensure the country can remain buoyant amid international developments.

Gas supply

Firstly, natural gas continues to carry our economy, and all avenues must be pursued to build the profitability and sustainability of this industry. This includes increasing domestic production, pursuing external supply sources and tightening consumption to eke maximum value out of our gas molecules.



There is no question that the energy sector must continue to thrive, but we must seek to cultivate alongside it a healthy non-energy sector. Entrepreneurship must be encouraged, but as presently configured, the business ecosystem is not cohesive.

Progress has been heartening. Upstream suppliers have been implementing aggressive strategies to bring more gas to market, and while we have not and will not in the near future return to full capacity, the past three years of work have seen volumes increase from 3.35 to a projected 3.79 bcf/d for 2019 (per the Ministry of Finance estimates). This signals movement in the right direction.

In addition, NGC continues to explore cross-border gas through deals – at various stages of development – with Grenada and Venezuela. The political sensitivities in Venezuela notwithstanding, Trinidad and Tobago's government has stood by the Dragon deal, for which a Heads of Agreement and Term Sheet have been signed.

Energy efficiency

These increasing volumes are attended by a simultaneous push on the downstream side to liberate as many molecules from industrial use as possible, with the power sector being the primary target. The rationale is that if the demand for power is reduced, some of the gas currently budgeted for electricity can be diverted to export-oriented production.

Energy efficiency is low-hanging fruit in that it can require relatively little upfront capital outlay in domestic and small business applications, and what is expended can be amortised with savings from energy consumption. To drive action, NGC is partnering with various stakeholders on an education campaign as well as energy optimisation to raise awareness around the value to country in using less power.

For larger customers whose overheads may be more appreciable in making the transition to energy-efficient systems, the NGC Group, through National Energy, is working on implementing a Super ESCO pilot project. The pilot project will target select light industrial and commercial consumers and lend investment support to aid in greening their operations.

Oil legacy

The decision by the government to re-engineer Petrotrin and restructure the oil industry was a necessary one



Hurricane reconstruction efforts (pictured here in Haiti) are a driver of regional growth

in light of the company's too-long-overlooked revenue haemorrhage. It is important that Trinidad and Tobago stand behind the government in this decision and support its work to revive the profitability of this legacy industry.

Non-energy entrepreneurship

There is no question that the energy sector must continue to thrive, but we must seek to cultivate alongside it a healthy non-energy sector. Entrepreneurship must be encouraged, but as presently configured, the business ecosystem is not cohesive.

Individuals with ideas are often stymied by a system that does not adequately mother entrepreneurs. Stakeholders such as ministries, universities, chambers and regulatory bodies should be brought into alignment to facilitate progression through ideation, prototyping, certification, investment financing, and eventual export and marketing of products. If the system were to function as it should, more young people must be encouraged into business after leaving school, which would give a necessary boost and breadth to the economy.

DIGITISATION IS NOT AN OPTION

Trinidad and Tobago is in danger of missing the boat when it comes to digitisation – a defining moment in our generation and an imperative for survival in 'the new normal'. New technologies exist to make our processes more efficient, to save us time and money and to improve our quality of life. Technology must take a seat at the table.



Blockchain technology is changing commerce

If we do not upgrade, we risk losing competitive advantage. Artificial intelligence, predictive analytics and blockchain technology are changing commerce; augmented reality is changing business capability in the construction and energy sectors; the strongest businesses have strong online presence.

At the NGC Group, we have already begun to embrace technology. We are investing in smarter software, drones and virtual reality, social platforms to help our people work together and more efficiently, just to name a few. We recognise that for our business, as indeed for Trinidad and Tobago, digitisation is not an *option*, but the only way forward.

1+1=3

Collaboration is one of the most effective ways to maximise our output as a nation. If we seek synergies, we will find we can achieve more than the sum of our parts. Consider, for instance, if the Ministry of Energy and Energy Industries, the Ministry of Finance, the NGC Group and other state energy enterprises were to share a back office and data platform – business processes would be expedited and streamlined, and operational costs shaved.

In the same vein of consolidation, stimulating investment in our country can be a function of making it easier to do business in Trinidad and Tobago, by bringing all the relevant approval agencies into a singular portal. National Energy has been spearheading a game-changing

initiative called ttEngage that will create a single point of contact for any investor interested in bringing business to Trinidad and Tobago.¹ This will significantly reduce the time and hassle to get new business off the ground, which will in turn greatly improve our jurisdictional competitiveness.

Profitable collaboration is also possible in the course of the NGC Group's forays abroad. The Group is actively pursuing business opportunities in Africa, South America and the Caribbean, and the intention is to open avenues for local suppliers and service providers to access those markets. By approaching our international pursuits as collaborative undertakings, we can offer a wider range of services to our potential partners and have a better chance of winning business. This will ultimately redound to the benefit of the country in the form of increased revenue from NGC and increased economic capacity of the suppliers and service providers.

Concluding thoughts

Trinidad and Tobago needs to be mindful of the power it wields to direct its own course of growth, even as international factors escalate and threaten. The more secure a platform we can build, the less vulnerable we will be to external risk. This means looking thoughtfully at ways to build our competitive advantage and seizing every opportunity to push forward for the benefit of our country and people. ■

¹ See p 14 for more details on ttEngage



Impacting

Trappings of Success

NGC'S TREES MAKE CARBON INROADS



MANY an apocalyptic film departs from the premise that mankind has brought the planet to the brink of an extinction event. In 2017, one satellite still of the Atlantic basin brought such cinema to mind – three deadly hurricanes moving through the Caribbean in a single frame. That real life could bear semblance to a doomsday film is unsettling, but it is a reality we must brace for as climate change threatens worse to come.

Many countries have joined the mounting global offensive against climate change by committing to address their respective contributions to the problem. The main culprit – carbon-based emissions – is being targeted in a number of ways, from industrial capture and storage mechanisms, to cap and trade systems, to energy efficiency and green energy initiatives. In Trinidad and Tobago, one company has proven the effectiveness of a different approach as part of its broader programme of combative actions.

Reforestation

Trees accumulate or sequester substantial reservoirs of carbon in their biomass. When forests cleared, their capacity to absorb carbon is lost and a considerable proportion of what they have stored is released back into the atmosphere. In fact, deforestation and forest degradation account for approximately 17% of global carbon emissions, more than the entire global transportation sector and second only to the energy sector¹. For this reason, reforestation is considered a valuable mitigation measure.

¹ <https://www.unredd.net/about/what-is-redd-plus.html>

NGC's large-scale reforestation exercise, launched in 2005, had as its main objective, to replant an area of forest equivalent to that cleared for the development of the Cross-Island Pipeline, Beachfield Upstream Development and Union Industrial Estate. This reforestation project was aligned to the Company's policy of achieving 'no net loss' from business operations. A secondary objective was to create a carbon sink to enhance the sequestration capacity of forest reserves in South Trinidad. Specifically, the programme aimed to replant 348 hectares in reserves identified by the Forestry Division, over seven phases and using 17 species of fruit and tropical hardwood trees. In total, over 100,000 trees were planted, with an estimated 85% survival rate at project sites.

Although the carbon benefit of trees was one of the reasons why reforestation was deemed necessary from the outset, it was not until 2018 that NGC learned the true carbon potential of this project.

In July 2018, NGC contracted the Office of Research Development and Knowledge Transfer (now the Centre for Innovation and Entrepreneurship) at The University of the West Indies (The UWI), St. Augustine, led by Professor John Agard, to carry out a carbon sequestration study to determine:

1. How many tons of carbon have been sequestered by the NGC reforestation sites from 2005-2018;
2. How many tons of carbon are projected to be sequestered by the reforested sites from 2019-2030;
3. The approximate value of the tons of carbon sequestered based on market prices.



The study was completed in December 2018 and the results have important implications for mitigation efforts.

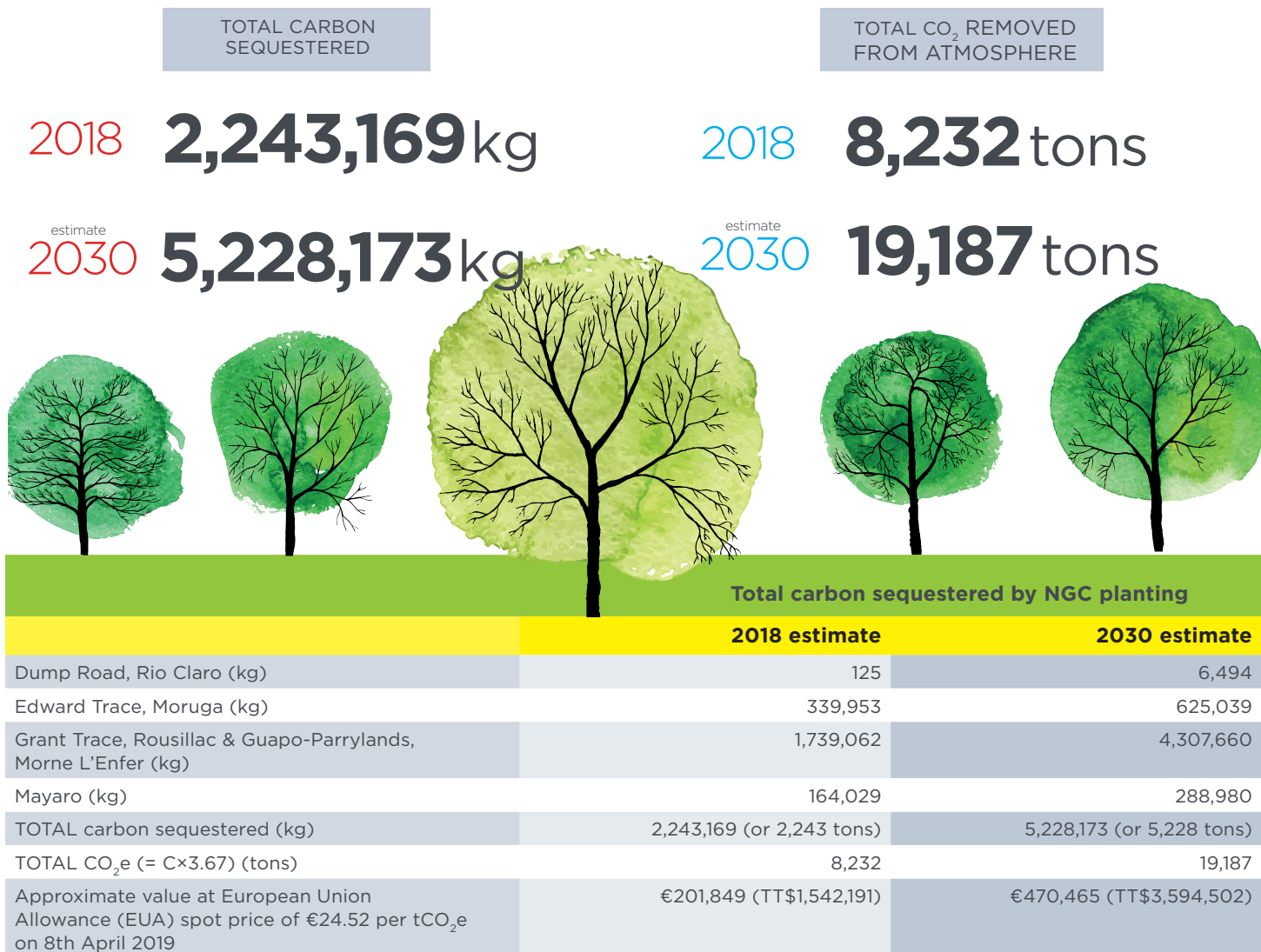
Testing was conducted at four main sites. Due to the impracticality of analysing every planted specimen, the team focused on random sample plots at the project sites.

standard height (diameter at breast height – 1.37m). This represents the majority of the biomass stored in the tree. The biomass in the roots and branches was estimated based on the species of the tree as they can vary greatly across tree type. Wood core samples were also taken and the carbon-to-biomass ratios determined.

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Once the investigation was concluded, the results were tabulated. The table that follows shows summary data from the team's final report, which speaks to carbon sequestered only by NGC-planted trees.



TAKEAWAYS

NGC is contributing to national emissions targets

In February 2018, Trinidad and Tobago ratified the Paris Agreement, formally committing to target a reduction in greenhouse gas emissions by a cumulative 15% from industry, power generation and the transport sector by 2030 from a business-as-usual baseline. The country more concretely committed to reduce emissions from the transportation sector by 30% or 1,700,000 tons CO₂e, compared to 2013 levels by December 31, 2030.

When stacked against these figures, the carbon that will have been sequestered by NGC's trees by the year 2030 amounts to at least 1% of the CO₂ tonnage the country

aims to cut from the transportation sector by that year. However, this figure is necessarily conservative because of study limitations – the actual amount of carbon sequestered could be considerably higher.

For instance, some newly planted areas in NGC's programme could not be sampled because the seedlings were not yet sufficiently matured. The contribution of these trees will bump sequestration figures upward. The UWI's report also noted that it did not (and could not) account for any new trees that NGC may plant between 2018 and 2030 as a continuation of its reforestation programme.

Whatever the quantum, the bottom line is that NGC's project will bring the country steps closer to achieving its target.



The true value of this project is multiples higher than the study results indicate

The social value of this reforestation project should not be overlooked. Since the start of the programme, NGC has enlisted the support of community groups in the planting and maintenance phases, providing much needed employment in these areas. In the process, participants were exposed to both formal and on-the-job training in plant husbandry, account keeping, safety practices, finance and project management – skills which could land them other employment opportunities when project cycles are complete. In other words, adjunct benefits of NGC's reforestation initiative include empowerment and capacity building in project site communities.

Added to these benefits is the unquantifiable enrichment of our local expertise in the assessment of carbon sequestration. The UWI team led by Professor Agard was ably supported by students at the university, who will have engaged first-hand with the study's methodology and data analysis. This invaluable field experience will have equipped them to participate in and potentially lead similar studies in the future. Measurement will be extremely important as our country maps its progress toward its NDC, so there is great value in widening the pool of professionals capable of capturing and assessing the necessary data.

A third consideration not quantified in this report is the social cost of carbon. Carbon-driven climate change is responsible for extreme weather events and a host of related issues such as flooding, infrastructural damage, food insecurity and health risks. The economic impact of these consequences of global warming is considered the social cost of carbon. It is expressed as the dollar value of the total damages caused by emitting one ton of carbon dioxide into the atmosphere, and experts calculate this figure to be roughly US\$40 per ton². In truth, there are debates as to whether this number adequately captures the economic impact, so the real value could be even higher. By this metric, in addition to sequestering over TT\$3.5 million dollars' worth of carbon by 2030, NGC's project will have prevented millions of dollars' worth of damages associated with carbon emissions.

This study establishes an important frame of reference for future carbon-driven reforestation projects locally and abroad

Back in 2005, NGC did not set about selecting tree species for its reforestation effort based on carbon trapping potential, but rather other exigencies such as restoring species diversity to project sites. However, one major benefit of the carbon sequestration study was that it generated reference data for how much carbon particular tree species can trap in their early years under specific conditions. This means that future reforestation projects can be designed to maximise carbon capture by using an optimal mix of 'high-performing' trees.

The potential also exists for this study to inform international projects. In fact, the study has already attracted attention from as far afield as Fiji. The

International Development Bank and the National Aeronautics and Space Administration (NASA) have even made contact with The UWI team to discuss lessons learned as they try to develop a project along similar lines to measure blue carbon (i.e., coastal mangrove sequestration in the Caribbean).

This study makes a case for further investigation into total sequestration of national forest stock

In the recent past, Trinidad and Tobago has been named one of the world leaders in carbon emissions per capita, ranking in the top 10 in 2016 in the company of energy gluttons such as Kuwait, Qatar and the UAE (in 2014, it held a top five spot on the International Energy Agency's list)³. The statistics that led to this assessment, however, ignore an important emissions offset that could improve our standing.

Professor Agard points out that a significant percentage of Trinidad and Tobago's landmass lies under forest. If NGC's project is any indication of sequestration potential, naturally occurring forest is bound to be a vast carbon sink, counterbalancing emissions in some measure. Having a sense of the volume of carbon sequestered by national forest stocks will help generate a more accurate picture of the country's net carbon footprint and help temper our reputation as a profligate emitter.

We should plant more trees – and cedar is a useful option to consider

Since carbon is stored in biomass, trees tend to accumulate more carbon as they are growing as opposed to when they are mature. For this reason, planting new trees is widely touted as a useful carbon-trapping measure.

The study found that of the tree varieties planted, cedar was one of the fastest-growing species. This means that cedar saplings can sequester carbon in a shorter period than species that are slower to mature. While large-scale monoculture is not advisable for any species, cedar is a good option for small-scale initiatives, such as backyard tree-planting exercises. Time is short for our planet to rein in climate change, so it is important that we seek maximum impact from even the smallest interventions.

Concluding comments

Mankind is moving toward a low-carbon future, and indeed *must* do so to sidestep more severe punishment from a warming planet. Any undertaking that helps the cause of carbon mitigation ultimately helps pull the world back from the brink of irreparable damage. In that regard, NGC's reforestation programme, though a humble effort in the global fight, has returned and promises to continue delivering valuable results. Importantly, it testifies to what the carbon fight can gain from collaborating with nature. ■


² <https://www.edf.org/true-cost-carbon-pollution>

³ <https://webstore.iea.org/co2-emissions-from-fuel-combustion-2018-highlights>



Impacting

ttEngage: A National Effort for Investment Facilitation



NATIONAL Energy officially launched ttEngage on December 20, 2018 at a meeting of stakeholders from a cross-section of state agencies. Described as "A National Effort for Investment Facilitation", the initiative is aimed at revolutionising the investment experience in Trinidad and Tobago by integrating and streamlining the processes of the pertinent State agencies, from conceptualisation to implementation.

Over 15 State organisations were represented at the launch, including the Ministry of Energy and Energy Industries (MEEI), the Trinidad and Tobago Bureau of Standards (TTBS), the Environmental Management Authority (EMA), Town and Country Planning Division (TCPD) and eteck. Attendees enthusiastically received the initiative and commended National Energy for addressing this long-outstanding issue, which affects the country's global competitiveness as an investment destination.

What is ttEngage?

ttEngage is an integrated approach to investment facilitation comprising three major elements:

1. Enhanced and continuous engagement and collaboration among State agencies;
2. Mapping and streamlining of the current investment process to reduce inefficiencies in the system; and
3. Creation of an online investment facilitation portal.

The investment portal is being developed in two phases. Phase 1, which is expected to go live in July 2019, will see the launch of several modules – Project Development, Project Promotion and Approvals Management. Features will include new project concepts, projects under development, as well as expressions of interest, which will be promoted. A static approvals map, collaboration tools and publications will also be implemented in Phase 1. Phase 2 will include an interactive Approvals Management Module, which is expected to become functional in Q3 2019.

How will ttEngage benefit Trinidad and Tobago?

At the launch event, Chairman of National Energy, Professor Gerry C. Brooks, informed the audience that ttEngage is expected to facilitate an estimated US\$5 billion in foreign direct investment (FDI) and the creation of approximately 3,000 jobs over the next seven years. The initiative is similar to the Sri Lankan Single Window Investment Facilitation Task Force (SWIFT) which was launched in May 2018 in a bid to attract US\$3 billion in FDI by 2020.

ttEngage will not only make the investment facilitation process more efficient, it will also make the process more transparent, as information will be shared among stakeholders at every stage, thereby boosting the country's international reputation.

Update on ttEngage

The rollout of ttEngage is moving apace towards the launch of Phase 1 of the online portal by July 2019. Since launching ttEngage, National Energy has formed a cross-functional working team which is supported by NGC's ICT Division and the Office of Strategic Management. To date, the team has developed a high-level map of the statutory approval



ttEngage stakeholder meeting

process for energy and downstream projects. Some of the agencies involved in the approval process include the MEEI, TCPD, EMA, T&TEC, WASA and NGC, among others.

The second meeting of stakeholders was held on March 14, 2019 at National Energy to update stakeholders on the initiative and engage them in a working session to refine the map. Stakeholder engagement is continuing on a more detailed level as the team seeks to chart the internal approval processes of key agencies to identify areas for improvement and realignment.

Addressing the challenges

During highly interactive discussions at the second stakeholder meeting, all parties expressed their support for the initiative. However, based on agencies' experience with previous attempts to develop similar projects, concerns were raised regarding the project delivery timeline. The necessity for a new online portal was also questioned, given the existence of similar platforms, such as TTBizLink and DevelopTT.

National Energy's Manager, Investment Facilitation, Marcia Maynard, addressed the concerns. She explained: "ttEngage is a digital solution which facilitates the entire business development process for energy sector projects, from conceptualisation, through promotion, project development and statutory approvals. While there are other online portals that cater to digitising

statutory approvals within Trinidad and Tobago, there will be no duplication of effort. Instead, ttEngage will be directly integrated with TTBizLink and DevelopTT, to support their Approvals Management Module." She also noted that due to the scale and complexity of energy investments, there are even some niche approvals which ttEngage would handle, which are not supported by other portals.

Regarding the project timeline, she informed attendees: "The team is working assiduously with all stakeholders to deliver the initiative on schedule." Inter-agency collaboration, a major tenet of ttEngage, has started and will continue, to ensure buy-in for the initiative and incorporation of feedback in the operational phase. Memoranda of cooperation have been issued to relevant stakeholders to formalise the commitment to work together for the delivery of ttEngage.

For many agencies, including National Energy, ttEngage will challenge our approach to doing business and engaging potential customers. The migration from paper-based to technology-based processes will force us to become more responsive to customer needs as we seek to develop energy investment opportunities. National Energy is confident that with cooperation and determination, we can accelerate the modernisation of the investment facilitation process in Trinidad and Tobago to achieve the objectives of ttEngage. ■



Strengthening

The Real Value in Virtual Tech



Prime Minister Dr. Keith C. Rowley trials VR gear at the NGC Group's exhibition booth at the 2019 Trinidad and Tobago Energy Conference

CONSIDER this scenario. A delegation has come calling from an international energy company to meet with Trinidad and Tobago's Ministry of Energy and Energy Industries on matters of mutual interest. Their three-day agenda is tight with meetings and greetings, but they are very interested in touring our gas infrastructure, specifically our epicentral Beachfield facility at Guayaguayare. The request should be accommodated and at minimal cost. With brief schedule windows and transit time along congested roadways making a worthwhile facility tour infeasible, the challenge presents: how can we help our visitors meet their trip objectives while sparing them a counterproductive, time-consuming commute? The answer lies with technology.

VR to the rescue

The term 'virtual reality' (VR) may bring to mind the escapist pursuits of video gamers, but this technology is carving a niche for itself in commercial, industrial and even medical spaces. In fact, VR falls under the umbrella

of 'extended reality' (XR), which subsumes a number of environments generated by computer technologies and wearables, all with wide-ranging applications. These environments include 'augmented reality' (AR), which overlays computer-generated images on a real-world space (such as the animations you can use to embellish your 'selfies'), and 'mixed reality' (MR) which goes a step further and allows for manipulation of and interaction with these superimposed digital objects.

VR, however, is a wholly synthetic environment, that immerses the user in a 3D virtual space with a 360-degree interface. This means that with VR gear, a user can be 'transported' to an entirely different location and reality and be able to visually explore the space by moving and turning naturally as he/she would in a real-world environment. VR worlds can be artificial, created with computer-generated BIM and 3D models, or can be constructed from high-definition scans of real-world locations to create virtual versions of actual places. While the entertainment factor of this tech makes it attractive for recreational use, VR can be an extremely useful tool for companies like NGC.



The Real Value in Virtual Tech | CONTINUED



Screenshot from VR simulation of Union Gas Receiving Facility, La Brea

Circling back to our hypothetical scenario, VR technology would allow NGC to take the visitors on a virtual walk-through of the Beachfield facility and even our infrastructure in Tobago, which they will certainly not have found time to visit. Produced using high-definition photos and point cloud data sets, the VR product replicates the facilities with enough precision to make the virtual experience a more-than-satisfactory proxy for physical presence on site. Visitors appeased and duly impressed.

The prospects for VR at NGC

The scenario above is just one possible application for XR technologies in NGC's line of business. The Geospatial Information Services Department (GISD) was the first to identify innovative ways in which XR, specifically VR at the outset, could be of value to the Company and subsidiaries in the NGC Group.

One of these applications is training and education. If NGC's network and Group facilities were mapped with VR technology, onboarding new field staff would take a fraction of the time. Emergency drills could be simulated at minimal cost and response protocols

for more elaborate scenarios tested. Domestic and international visitors could be virtually introduced to the Group's infrastructure, eliminating risks associated with external parties entering the various facilities, and the encumbrance of securing the clearances and protective clothing necessary for access. Additionally, the Company would be able to facilitate many more requests for study tours and educational trips if the matter of working around facility availability were no longer a factor.

VR could also allow NGC to showcase inaccessible infrastructure, such as the subsea pipelines connecting Trinidad to Tobago. This impressive segment of the network would ordinarily be impossible to tour, but with VR technology, viewers could take an underwater journey along that pipeline corridor.

Of course, VR can be equally useful for modelling infrastructure that is yet to be constructed. Navigable 3D blueprints of office buildings or CNG stations, for instance, could help refine design and detect and correct flaws that could otherwise lead to cost overruns during construction. Moreover, 3D models can actuate investment decision by helping decision-makers visualise in a way that 2D schematics simply cannot.

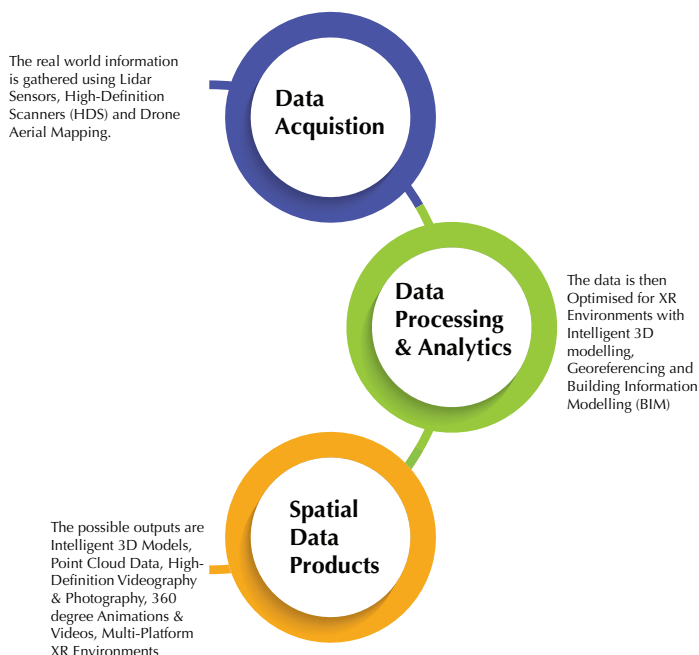


The Real Value in Virtual Tech | CONTINUED



In truth, the prospective applications for VR and XR as a whole abound, and with exciting and versatile new technology incubating daily, having a foundational XR system will stand the Company in line to capitalise early on future opportunity. That said, extracting maximum value from this technology requires due investment.

How a VR simulation is built



Getting VR off the ground

For its part, the GISD is determined to integrate XR into workflows at NGC. Spearheading the effort have been Naieem Mohammed, Assistant Manager GIS; and Jesse Rajoo, CAD Technician II. Together, the team trialled using VR goggles, high-definition imagery and point cloud data sets, and rendering software to develop virtual models of select NGC Group facilities. The videos were showcased at the Group's exhibition booth at the Trinidad and Tobago Energy Conference 2019.

To the GIS team's credit, while the technology in itself is not a novelty in the industry, NGC was the first company to produce VR simulations in-house. The intent is to cultivate this skillset that would normally cost tens of thousands to contract externally, and build it into a bankable product that the Company can market to global business partners. They have plotted a three-year implementation programme that involves acquisition of necessary hardware (such as high-definition scanners, drones and VR goggles), requisite software licences and staff training.

With the right implementation framework in place and the resolve to make it work, it is only a matter of time before the NGC Group starts mining real value from virtual tech. ■



Strengthening



Reconfiguring for Efficiency

BACKGROUND

OPTIMISING the use of hydrocarbon resources in Trinidad and Tobago is critical. The energy sector is responsible for 36.1% of gross domestic product (GDP) and approximately 77% of export revenues. However, the sector can be described as mature, with long-term declines in oil production and plateauing gas output. Moreover, Trinidad and Tobago has been ranked within the top three most energy-intensive countries per GDP in the world, with the amount of energy used domestically to produce one unit of economic output considerably higher than world averages.¹

In October 2018, *GASCO News*, Vol 28., No. 3, NGC highlighted the challenges affecting the gas model which has been the traditional engine for the country's economic growth and overall development. Current merchant market challenges and the long-term outlook for dynamic and volatile commodity markets point to the need to adopt principles linked to energy conservation (EC) and energy efficiency (EE) to sustain the NGC Group, especially given the natural gas scenario in Trinidad and Tobago.

¹ <https://worldinfigures.com/rankings/index/162>



Mark Loquan, NGC President, has been increasingly vocal about placing a national spotlight on EE

The article “Learning the True Value of Energy Conservation,”² indicated that the days of cheap, abundant natural gas are coming to an end. For this reason, emphasis must be placed on an aggressive programme of molecular optimisation to ensure that maximum economic value can be derived from our natural gas resource. NGC, as the aggregator supplying natural gas to the power generation and downstream sectors, with preference given to power, is experiencing first-hand the difficulty of maintaining the status quo in the domestic market. As of Q1 2019, supply challenges are compounded by higher acquisition costs from upstream suppliers and expired downstream contracts which customers expect to be renegotiated at prices that favour their profitability.

Pathways recommended for navigating towards sustainable arrangements involve addressing supply and demand issues. For energy, that involves reducing demand for natural gas for electricity generation and improving the efficiency of gas utilisation. While this seems logical, several factors militate against the implementation of comprehensive energy efficiency. Factors responsible for the poor uptake of EE and EC in Trinidad and Tobago include the following:

- A very low level of retail energy prices, with substantial government subsidies;
- Low levels of public awareness;
- Low political support and institutional capacity on EE issues;

- A lack of a legislative framework for instituting energy efficiency reforms; and
- A lack of financial support required for capital intensive investment.

Consequently, there are several changes that must be made to expand EE within the local landscape.

Initiating the process of change

Mark Loquan, NGC President, has been increasingly vocal about placing a national spotlight on EE, especially given the EE success stories experienced on a global and regional level. The switch in resource fortunes has ignited much-required change at NGC.

The Company is moving away from just merchandising gas to becoming more customer-focused and collaborative with stakeholders throughout the natural gas value chain, encouraging energy-efficient practices. As a whole, the NGC Group is also focusing on diversifying its traditional business portfolio to include sustainable and clean energy ventures.

Shifting from conversation to action internally, within the Commercial Group at NGC, the Manufacturing Industries and Energy Efficiency (MI&EE) division evolved from the LIC and Other Industries division to drive continuous improvement in EE within our existing customer base. The division’s mandate includes:

- 1) Strengthening national contribution by working collaboratively with stakeholders to shape the development of national policies and laws related to

² GASCO News, Vol 28., No. 3, page 19 (<https://ngc.co.tt/wp-content/uploads/2018/11/gasco-news-october-2018-vol28-no3-v2.pdf>)



Reconfiguring for Efficiency | CONTINUED

EE, while supporting the implementation of projects that will minimise or reduce energy usage, and raise public awareness of the benefits of EE and EC;

- 2) Securing current business by influencing behavioural changes among NGC customers through promoting and monitoring the effectiveness of EE and EC programmes targeting energy-saving opportunities; and
- 3) Shaping the organisational culture as it relates to sustainable energy competencies, which will support renewable energy and EE activities.

WHAT WE ARE DOING

Stakeholder engagement

Work has commenced with meetings with the relevant stakeholders, such as the Ministry of Energy and Energy Industries, Ministry of Public Utilities, Regulated Industries Commission, Trinidad and Tobago Electricity Commission and the Trinidad and Tobago Energy Chamber to develop an integrated strategy that considers shared and aligned interest for promoting EE and EC locally within the power generation and petrochemical space.

The intention is to foster synergies for EE and EC activities related to policy development and joint projects. In the first quarter of 2019, a workshop on energy efficiency was facilitated by the High Commission of Canada and the Energy Chamber at the 2019 Energy Conference. It highlighted the reality that Trinidad and Tobago is at an energy crossroads and that consideration must be made to harness the potential energy-saving opportunities that exist locally. It also addressed the hurdles to be overcome in the process. Stakeholders agreed that collaboration is a must as the issue is a national one.

Group movements

In 2018, at NGC's Light Industrial and Commercial (LIC) customer forum organised by the MI&EE team, LIC customers were made aware of National Energy's focus on enhancing the economic feasibility of EE through a Super Energy Services Company (ESCO) programme.

Phase one of the Super ESCO programme has commenced and involves energy audits being conducted on eight LIC customers. The purpose is to identify measures for improving energy efficiency where applicable in natural gas and electricity usage, as well as potential energy bill savings. The intention is that the pilot project will eventually evolve into a new norm for NGC Group customers to improve energy utilisation and will become a value-added service within the portfolio of solutions promoting sustainable business practices.



The LIC Forum held in 2018 was used to start the EE conversation with downstream customers

In addition, an integrated NGC Group strategy focusing on sustainable energy opportunities is being developed to assist with charting the course for clean energy and energy efficiency ventures. This will assist the Group in entering a new business space.

The way ahead

Moving forward, there will be efforts to expand the Super ESCO to support EE exercises among petrochemical customers, with one potential pilot project already identified and under discussion. In addition, a conversation must take place around the development of a stakeholder-focused power plan that will include quantifying the natural gas being used inefficiently for power generation and trade-offs for efficiency gains.

Secondly, further capacity-building for development of internal ESCO capabilities will be ongoing as knowledge transfer is expected to occur from the pilot study with National Energy.

Preparation is underway by the MI&EE team with a local ESCO for coordinating an internal energy audit exercise for the NGC Head Office in order to identify energy saving opportunities. The intent is to use the practical exercise to educate staff on EE and EC measures, and how to adapt them to their own lives and develop a corporate policy on energy management.

Other initiatives for educating staff include an EE week that will include guest lectures, internal learnings and showcases of EE products, while utilising internal communication media such as Yammer, podcasts and videos to promote EE and EC.

Finally, research has already been sanctioned for developing a national EE app that will be made available to the public. The approach encourages the utilisation of a technology platform for sharing EE and EC principles to foster domestic behavioural changes. ■



Strengthening



IT Security Thrust

STRENGTHENING THE WEAKEST LINK

FOR the NGC Group, the strategy of expanding services beyond Trinidad and Tobago has both rewards and risks. For one thing, competing for global business raises profile and visibility, and consequently vulnerability to threats. The threat of cybercrimes against businesses is particularly acute and some are known to be sanctioned by nation states or paid for by businesses to gain a competitive edge.

Cybercrime, which refers to criminal activities carried out against entities through connected networks (the Internet), malware or through social engineering, is a real risk in the modern era. The World Economic Forum report on the Global Risk Landscape for 2019 names cyberattacks a major concern of world economic leaders, just behind climate change issues.¹

In this context, NGC has implemented measures to guard against threats to its critical information assets and encourage judiciousness in information disclosure.

People hold the key

While the upsides of advancing technology are unquestionable, it also introduces new threats and vulnerabilities. NGC adopted a risk-based approach to determine likelihood and impact of cyberthreats and what controls to implement. In the assessment, people were seen as a key line of defence.

In the information era, information is power, and the people who control it must understand their role in protecting this asset. Given that employee negligence

¹ http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf



can expose the Company to data theft or cyberattacks, an important prong of NGC's cybersecurity strategy hinges on awareness and sensitisation of the employee body.

Encouraging data classification

NGC is an organisation not averse to adopting new technologies. The Company has embraced cloud technologies because of the benefits of reduced operating cost, agility, high availability and efficiency. Cloud computing could also facilitate a more mobile workforce.

As a result of cloud technologies, information no longer resides solely with the data centre, but moves with our people. Protecting company information wherever it may reside requires a paradigm shift in information security. Company data can be stored on mobile devices like phones, tablets or laptops. It can even be stored on public cloud storage systems like Dropbox, iCloud or Google Drive. This poses a risk of data loss or the possibility of sensitive information being inadvertently exposed.

To counter this threat, NGC implemented an information classification solution, so that security may be affixed to documents wherever they may reside. Information classification is the process whereby users determine the level of security that should be applied to documents and tag or classify them accordingly. Based on the classification, different security features are enabled for the documents. For example, there is no security restriction on documents designated for 'public' use, but features such as restricted access, encryption and automatic removal from devices after a predetermined time are activated on 'highly confidential' documents.

The responsibility of classifying information, however, rests with employees. This means that staff managing documents and data have a major part to play in ensuring sensitive and confidential information is not accessible to anyone other than the intended audience. For this reason, NGC's Information Security and Risk Management department sought to educate employees on how to classify documents and the importance of doing so via workshops and a communications campaign. Hearteningly, the response to and use of this new security mechanism have been positive.

Attack the employee

Phishing is the act of trying to trick someone into giving up his or her security credentials. Instead of attempting the circumvention of security technologies in place to gain access or a foothold into an organisation's network, this strategy targets the company's weakest link – its employees.



Banners are part of an internal awareness campaign

Phishing attacks are generally mounted through email because it is relatively cheap and reaches millions of potential targets. Many businesses are continuously bombarded by such emails and NGC is no exception. Admittedly, phishing works and it continues to be a challenge in this operating environment. Even with the different layers of phishing protection in place and awareness notices distributed to staff, users still manage to get caught in the scam, albeit with less frequency.

To combat the high likelihood and high risk of phishing threats, the Information Security and Risk Management department designed and launched a covert (but sanctioned) campaign in February to attack employees. Using attackers' tools of social engineering and seemingly innocuous phishing tactics, this department managed to entrap unsuspecting employees and successfully bring home the point of NGC's susceptibility to cyberattacks.

These benign attacks reinforced awareness of potential assault tactics and the correct procedures to follow in those scenarios. Proactive and engaging methods such as these will continue to be implemented at NGC in order to build and maintain a security-conscious culture. ■



Design of new CNG station



Expanding

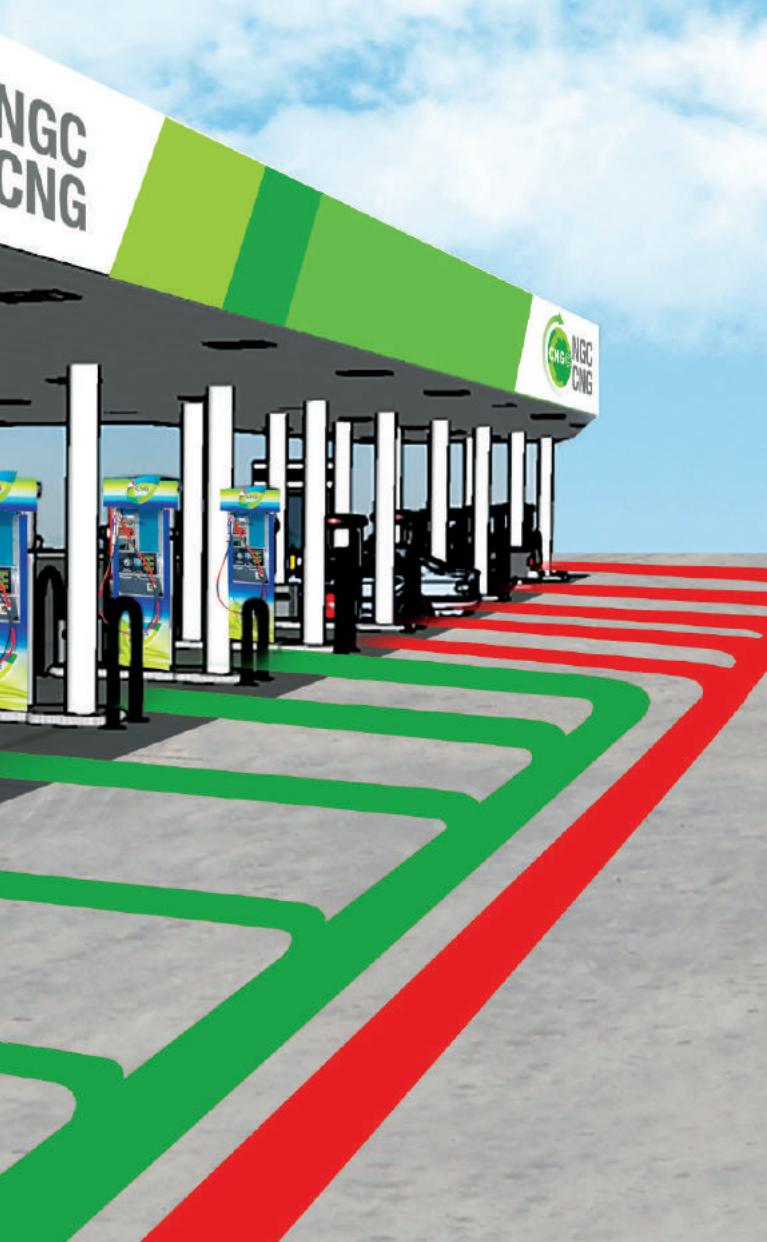
Refill and Refresh

Flagship CNG Station coming soon to Couva/Preysal Interchange

IT'S the perfect storm. An accident has clogged the highway and noon traffic is backed up from Tarouba to Chaguanas. You are stuck midway on your commute up north with the tank near empty, forced to forgo the air conditioning to conserve gas. Instead, to survive the searing midday heat, you've guzzled two bottles of tepid water which have since run their course and are making you shift uncomfortably in your seat. Desperation sets in and you start to weigh up the most civilised ways out of your predicament, when you inch

over the crest of highway on the approach to Couva and see salvation up ahead.

A massive canopy overhangs rows of orderly gas pumps, while the happy neon lights of a convenience complex flicker behind, beckoning passers-by to food, cold drinks and public restrooms. You pull onto the shoulder, floor the pedal and within 10 minutes, you've been relieved on all fronts.



The sod has been turned for construction to officially begin on a new CNG station at the Couva/Preysal Interchange. The conceptualisation, design and construction of the station are outcomes of a unique collaboration among three state entities: NGC, its subsidiary NGC CNG and fuel marketer Trinidad and Tobago National Petroleum Marketing Company (NP).

Scheduled to be completed this year, the newest station in the expanding CNG network will be a flagship facility. It has been designed with one of the largest canopies in the Caribbean and will dispense fuel in 20 filling lanes. CNG customers – which currently include over 6,000 private vehicles, maxis, taxis, buses, light and heavy-duty trucks – will be served at 10 dispensers, while a further 10 will cater to vehicles running conventional liquid fuels.

This station will be easily accessible from both north- and south-bound lanes of the highway via the Couva/Preysal flyover exits and will give welcome respite to motorists, especially CNG customers whose only other filling

options along this route can involve circuitous detours off the highway. This will greatly enhance the motoring experience along this major artery. Think, for instance, of how many vehicles stall on the highway due to flat tyres, overheating engines, low levels of lubricant or insufficient fuel to rally to an off-route gas station. A refuelling station positioned at this strategic midpoint of the north-south highway will serve as a convenient facility for motorists to address issues that may arise en route.

In addition to serving as a filling station, the new Couva/Preysal facility has been designed to be an inclusive rest stop. An NP “QuikShoppe” is to be opened behind the filling lanes, and will offer food and beverage items, an ATM machine, as well as other consumer goods typically found in gas station convenience stores. In subsequent phases of the project, after these initial priority facilities have been constructed and commissioned, other service spaces will be opened. These are expected to include food outlets, a coffee shop, a car wash and public restrooms.

Already more impressive than your average gas station, the flagship CNG facility will provide some unique services to the public. One of the innovations that NGC CNG is seeking to introduce is a cashless system for CNG users whereby vehicles tagged with a radio frequency identification (RFID) tag can simply fill up without having to go to a cashier to pay. This will make for even greater convenience and faster service.

Another innovation is the incorporation of solar panels into the station’s design. Cleaner fuelling technology is NGC CNG’s business, but CNG is just one of the alternatives to liquid fuels. Globally, electric vehicles are carving a niche in the market, and although penetration is still very low in Trinidad and Tobago, the provision has been made at this facility for electric charging stations that will be powered by solar energy. The solar panels will also help power the facility’s operations, making it the greenest fuelling station in the country and an example of thoughtful, forward-thinking design.

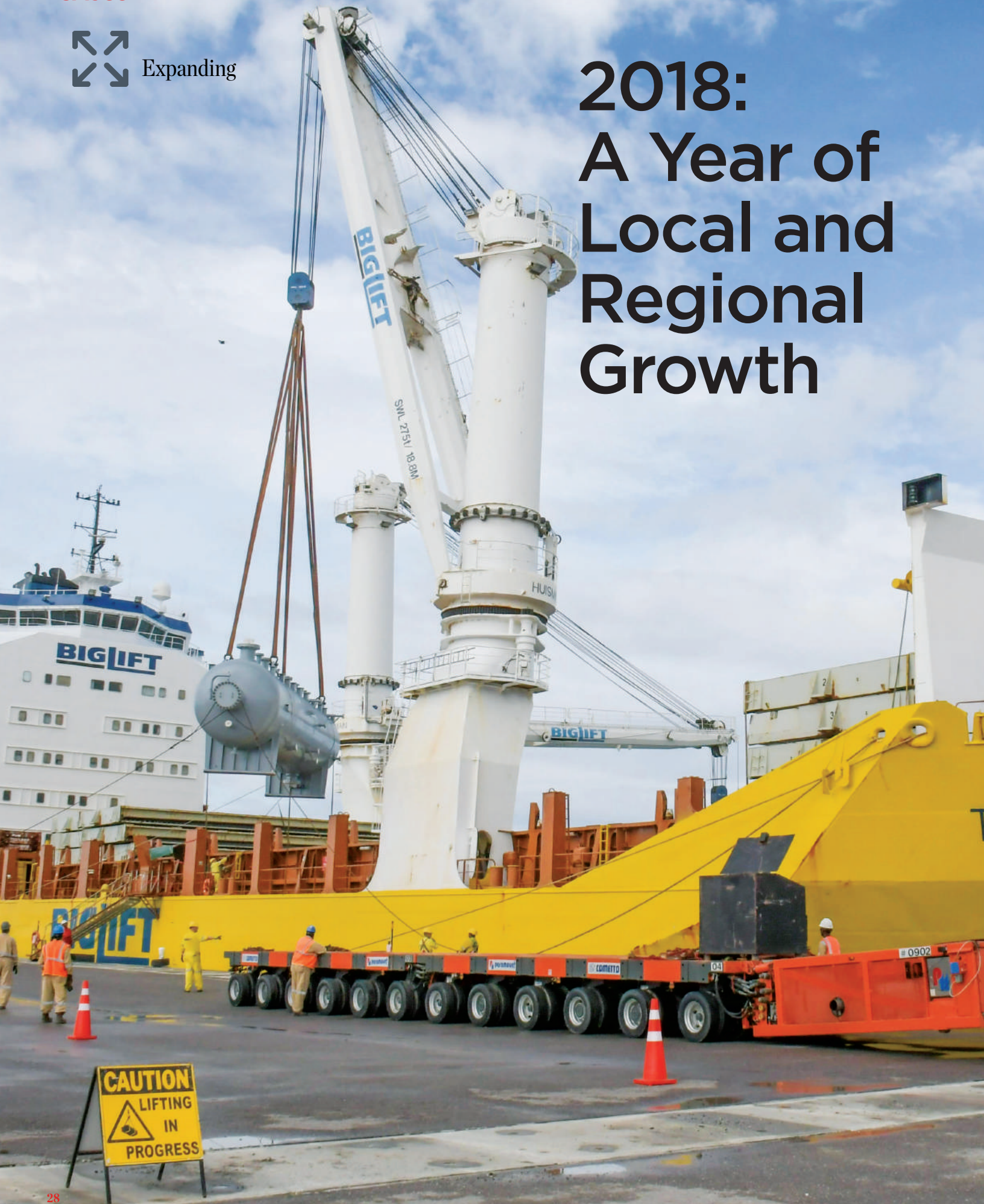
Besides the obvious draws for motorists, this new station will also greatly benefit the surrounding communities by generating employment and creating a commercial hub that will boost economic activity in the area. Indeed, at a public consultation held in January, residents expressed delight at the project’s initiation, understanding its implications for their communities.

Add to these benefits the fact that CNG will continue to be the most affordable fuel, priced at \$1.00 per litre of gasoline equivalent (compared to diesel at \$3.41/litre, super at \$4.97/litre and premium \$5.75/litre) and it becomes clear that the flagship CNG station now under construction at the Couva/Preysal Interchange heralds the future of fuelling. ■



Expanding

2018: A Year of Local and Regional Growth



Heavy lift operation successfully
completed at the Port of Galeota

“In the middle of every difficulty lies opportunity.”

Albert Einstein

IN 2018, National Energy embodied these words, finding new business opportunities even in the persistent challenging economic environment. Throughout the year, the company either developed new opportunities itself or facilitated the development of new business in the country. Led by the innovative and industrious Commercial team, National Energy ended the year with a 12.5% profit after tax, and added 11 new clients to its towage service listing, 10 new users of the Port of Galeota and 11 new users at the Iron and Steel Company of Trinidad and Tobago (ISCOTT) Dock facility.

From the first quarter of 2018, new contracts were signed with a major logistics provider for use of the Port of Galeota and the Port of Brighton facilities. These contracts will support works for BPTT's Galeota Terminal upgrade project, as well as the increased exploration and production activity in the East Coast Marine Area. Shipping agents also utilised National Energy's towage services for berthing and unberthing vessels in support of the arrival of Caribbean Gas Chemical Limited's (CGCL's) modules at the Port of Brighton.

During the year, ISCOTT Dock was used by local, regional and international shipping agents for fuel bunkering services. These new revenue sources were realised as a result of the efforts of the Commercial Division, who worked assiduously to sign new customers at ISCOTT Dock since the closure of ArcelorMittal's steel plant in 2016.

Additionally, the Port of Galeota continued to establish its position as a logistical hub on the southeastern peninsula with the successful unloading in May 2018 of the separator modules for the first stage of BPTT's terminal upgrade project. At a weight of 111 MT each, these modules are the heaviest single items to be lifted at the facility to date. The sensitive operation required coordination of multiple activities — from berthing of the specialised 'big lift' vessel, *MV Tracer*, the largest vessel to berth at the port to date; engagement of Paramount's high-tech SPMT; supervision of the experienced heavy lift stevedoring crew; to transportation of the components to BPTT's project site.

The story of business 'firsts' continued into the third quarter when Well Services' Rig 110 was installed at De Novo's Iguana Field in Block 1 (a) off the west coast of Trinidad. National Energy and La Brea Industrial Development Company Limited (LABIDCO) played critical roles in enabling this historic national achievement. Rig 110 had been repaired at Berth 3, Port of Brighton while National Energy's tugs ensured the safe transport of the rig to its offshore destination. This accomplishment is significant as



De Novo rig move

Iguana is the first marginal gas field to be developed in Trinidad and Tobago and will produce the first gas to be developed off Trinidad's west coast.

The Port of Galeota participated in yet another 'first' on July 9th 2018 when the *MV Industrial Courage* berthed at the port during its maiden voyage from China, making its first stop to discharge cargo, including heavy lift items, at Galeota. The berthing operation was supported by National Energy's tug, the *NEC Spirit*.

Construction of the CGCL Natural Gas to Petrochemicals Plant continued in 2018, enabled by the infrastructure provided by National Energy, including the reconstructed Berth 2 at the Port of Brighton. Throughout the year, the port facilitated the safe unloading, storage and assembly of modules and other components for the plant. As a result of constant coordination between CGCL, LABIDCO and the tenants of the La Brea Industrial Estate, modules for the plant were transported along the newly reconstructed Estate Corridor to the plant site at Union Industrial Estate with minimal disruption of traffic on the Southern Main Road and La Brea Industrial Estate.

In 2019, National Energy has continued to unearth opportunities for growth. During the Trinidad and Tobago Energy Conference in February 2019, National

Energy and KTK Tugs of Curaçao signed an agreement for the lease of tugs. Resulting from the agreement, *Tug Mero* arrived from Curaçao in March 2019 and was put into service following inspections. This arrangement is bolstering National Energy's ability to provide vessels on demand to meet our customers' needs.

In alignment with the Group strategic pillar to 'Grow Locally and Internationally', the Company has also embarked on a regional expansion drive. In the first quarter of 2019, the Port of Brighton facilitated logistics for Total, based in French Guiana. The facility is also being utilised for transshipment of technical rig components to support Saipem's activities in Guyana. Following the first shipment which was received on February 15th 2019, shipments have been sent to Guyana and the works are expected to last for approximately eight months.

Additionally, the Company's fast crew supply vessel, the *National Energy Explorer*, arrived in Suriname on March 3rd 2019 with a cargo of offshore containers from the Port of Brighton. Following drydocking in Suriname, the vessel charter began on March 25th 2019 for a period of six months in the first instance. The vessel is being used to transport crew and offshore equipment from the Kuldipsingh Port at Paramaribo River to offshore installations in Suriname. ■



One Moment Please

**TO REFLECT ON THE BEAUTY
THAT SURROUNDS US HERE IN
TRINIDAD AND TOBAGO**

The sun climbs over the pines at Cascade in this photo by Shaun Rambaran.



THE NGC GROUP OF COMPANIES
