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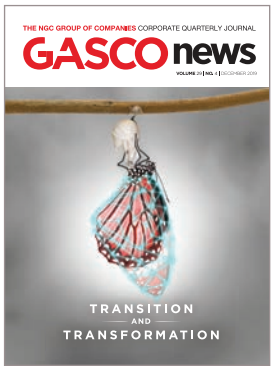
TRANSITION AND TRANSFORMATION



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PRESIDENT'S MESSAGE

PRESIDENT'S MESSAGE

Business model change an exciting new challenge

DEPENDING on your outlook and your appetite for risk, the idea of transformation can either be an exhilarating or daunting prospect. In either case, moving away from the tried and true in favour of new methods and in pursuit of new goals is not an easy task. However, when circumstances demand change, change you must.

For us at The National Gas Company of Trinidad and Tobago Limited (NGC) and indeed the Group, we see the opportunity to transform our business into a better version of itself as an exciting new challenge. The upheavals in our industry have been testing, but we have emerged with renewed vigour and resolve. We understand that our survival is a matter of national consequence, and we are prepared to do what we must to remain relevant – and indeed thrive – in a new age of energy.

NEW STRATEGIES

Before setting out on any journey, you must first agree the route to travel. How will you get to your destination? In order for NGC and the Group to develop into the integrated global energy business that we intend to become, we must revise our strategies to map a clear path to increased profits, international competitiveness and global brand recognition.

High on our agenda has been our commercial strategy – how we propose to shore up revenues from current business and expand our portfolio to generate income from alternative sources. In recalibrating this particular strategy, we have kept a keen eye on the principle of 'value for country', recognising that there is an important difference between more money and increased value.

In today's business environment, technology must be an essential component of any growth strategy. NGC has therefore put together an ambitious plan for bringing our operations and processes into stride with developments in the energy and ICT sectors.

We have also acknowledged the shift across all industries towards more civic-minded and Earth-conscious business operations, in line with the UN Sustainable Development Goals. Accordingly, we have begun to transition towards a model of Corporate Social Responsibility that hinges on the more encompassing concept of Corporate Sustainability.

Mark Loquan, President, NGC

PLAN TO ACTION

New strategies look nice on paper, but we are already progressing several planned initiatives off the page. In furtherance of our Commercial strategy to internationalise our business, we have now established a concrete presence on the ground in Guyana through our subsidiary, National Energy. Through this office, we intend to participate directly in that country's energy-based development.

With respect to technology, we have achieved significant process improvements with the introduction of interactive digital maps into the operations function. More are expected as the technology is refined and extended.

As far as sustainability is concerned, energy efficiency remains a front-burner focus for us. For this reason, we decided to engage an energy service company to conduct an energy audit of our Head Office building to proactively gauge and streamline our energy consumption.

ON THE ROAD TO TRANSFORMATION

The stories in this issue offer just a glimpse into the journey that NGC and its subsidiaries have embarked upon on the road to transformation. That road may be long and the weather unpredictable, but of greatest importance is that we are well on our way. ■

Mark Loquan

Mark Loquan
President

Revising Strategy

In pursuit of Corporate Sustainability

In pursuit of Corporate Sustainability | CONTINUED

AT the turn of the century, the United Nations appealed for a global commitment to reduce the economic, health and social vulnerabilities of the world's poor and disadvantaged, through the elaboration of eight Millennium Development Goals (MDGs). In 2015, these MDGs were succeeded by a more ambitious and comprehensive agenda for global growth and prosperity anchored by 17 Sustainable Development Goals (SDGs). By 2030, nations are expected to achieve these SDGs which tackle a broad range of development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urban growth and social justice.

Whereas in prior decades 'development' was largely the province of certain governments, multilateral institutions and philanthropic non-governmental organisations (NGOs), the MDGs and current SDGs shared responsibility for development among states, civil society and corporations.

THE RISE OF CORPORATE SUSTAINABILITY

The idea that corporations should play an active and pivotal role in building a better world gained ground in the year 2000 when the UN Global Compact was launched alongside the MDGs, following a call by the UN Secretary-General for the global business community to 'unite for good'.[1] The Global Compact represented a commitment by businesses around the world to respect human rights, support fair labour, practise environmental responsibility and support anti-corruption initiatives. It also represented the 'start of a global corporate sustainability movement'.[2]

Corporate sustainability is an approach to doing business that considers people, planet and profits, commonly referred to as the triple bottom line. In essence, it is a future-minded business strategy that allows a company to generate value for itself and its shareholders in a socially responsible way, seeking to improve – or at the very least not jeopardise – the environment and welfare of stakeholders in the course of its activities. In other words, it ensures the compatibility of business with sustainable development.

In its early years, corporate sustainability was a principle embraced by a fraction of the global business community. Today, worldwide acceptance of and subscription to the UN SDGs have transformed it into a sine qua non of successful business. Consumers do not tolerate business activities that obstruct the achievement of the SDGs, and they reward businesses that assist in their realisation. Accordingly, since corporate sustainability is a condition for business success, and since it is inextricably bound with the SDGs, companies are looking to align their policies and operational targets with those global goals.

[1] *https://www.unglobalcompact.org/docs/publications/UN-Global-Compact-20th-Anniversary-Campaign-Infosheet.pdf*

[2] *Ibid*

NGC TRANSITIONS

Well before the Global Compact brought corporate sustainability to the fore, NGC had been proactively seeking to support development in Trinidad and Tobago. The Company had been engaging with communities, sponsoring initiatives in sport, culture, education and empowerment through a diverse corporate social responsibility (CSR) programme. Today, however, the Company's approach to CSR is changing in line with the global focus on sustainability.

On the one hand, the Company has moved away from a culture of grants and donations, engaging in partnerships that are increasingly geared towards 'teaching beneficiaries to fish'. That is, NGC is intent on not just giving financial support to groups and communities, but on equipping its CSR partners with skills and tools to sustain themselves beyond the term of NGC's sponsorship.

At the same time, NGC is now acknowledging that its traditional CSR portfolio of investments is just one aspect of corporate sustainability. That is, corporate sustainability is not just a function of how much is invested in social causes outside the regular remit of NGC's business, but how its internal business operations are themselves aligned with the SDGs – how they are contributing to (or impeding) the achievement of those goals.

NGC has begun to reflect and report on its corporate sustainability, and the holistic impact of its business on the SDGs, within the framework of sustainability reporting.

INVESTIGATING IMPACT

Sustainability reporting is a mechanism of account that enables companies to share information on their economic, governance, environmental and social performance in a given year, relative to the SDGs and their associated targets. Pegged to the SDGs, guidelines for such reporting ask companies to interrogate and share how their business affects their value chain, the environment and their stakeholders, both positively and negatively. The outcome document, a Sustainability Report, consequently gives an honest and holistic picture of a company's impact in its space of operation, and on the global development targets.

So far, by way of the Company's first two Sustainability Reports, NGC has been able to identify and report to stakeholders how the work of specific business units dialogues with the SDGs. The rigours of the reporting process also highlighted areas of impact that were not being properly evaluated. The Company is therefore paying closer attention to those corporate sustainability metrics moving forward.

That said, NGC has made commendable strides in aligning its business with the SDGs. The table on the following pages gives just a few examples of the targets supported.

In pursuit of Corporate Sustainability | CONTINUED

TABLE 1: NGC SUPPORTS SDG TARGETS

4

QUALITY EDUCATION

TARGET 4.4

By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

TARGET 4.6

By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy

8

DECENT WORK AND ECONOMIC GROWTH

TARGET 8.1

Sustain per capita economic growth in accordance with national circumstances

TARGET 8.2

Achieve higher levels of economic productivity through diversification, technological upgrading and innovation

TARGET 8.8

Protect labour rights and promote safe and secure working environments for all workers

7

AFFORDABLE AND CLEAN ENERGY

TARGET 7.3

By 2030, double the global rate of improvement in energy efficiency

TARGET 7.A

By 2030, enhance international co-operation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

9

INDUSTRY, INNOVATION AND INFRASTRUCTURE

TARGET 9.4

By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

In pursuit of Corporate Sustainability | CONTINUED

TABLE 1: NGC SUPPORTS SDG TARGETS

11

SUSTAINABLE CITIES AND COMMUNITIES

TARGET 11.4

Strengthen efforts to protect and safeguard the world's cultural and natural heritage

13

CLIMATE ACTION

TARGET 13.3

Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

12

RESPONSIBLE PRODUCTION AND CONSUMPTION

TARGET 12.5

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

TARGET 12.C

Rationalise inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist

15

LIFE ON LAND

TARGET 15.2

By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

In pursuit of Corporate Sustainability | CONTINUED

TABLE 1: NGC SUPPORTS SDG TARGETS

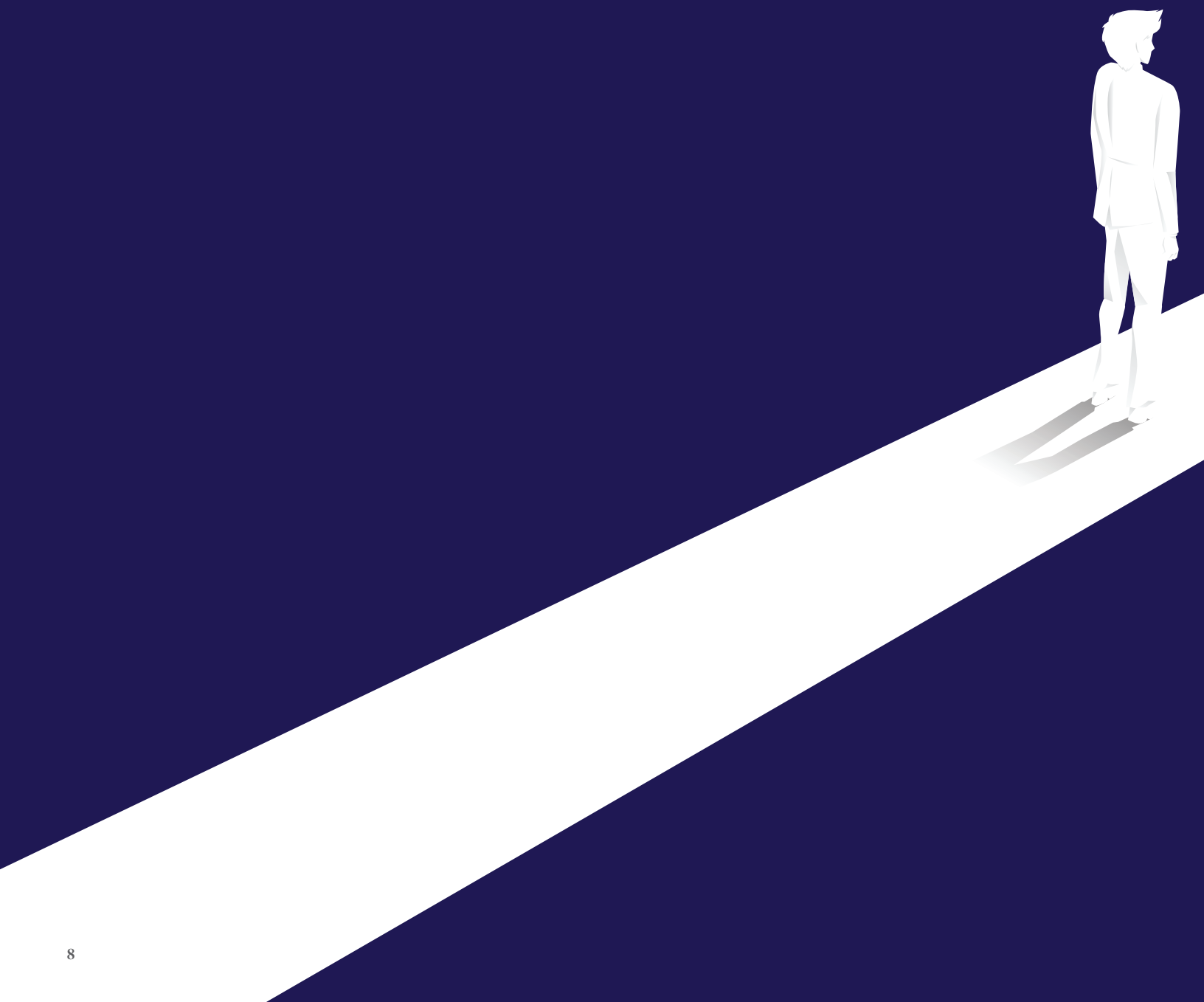
16
PEACE, JUSTICE AND STRONG INSTITUTIONS
TARGET 16.6
Develop effective, accountable and transparent institutions at all levels

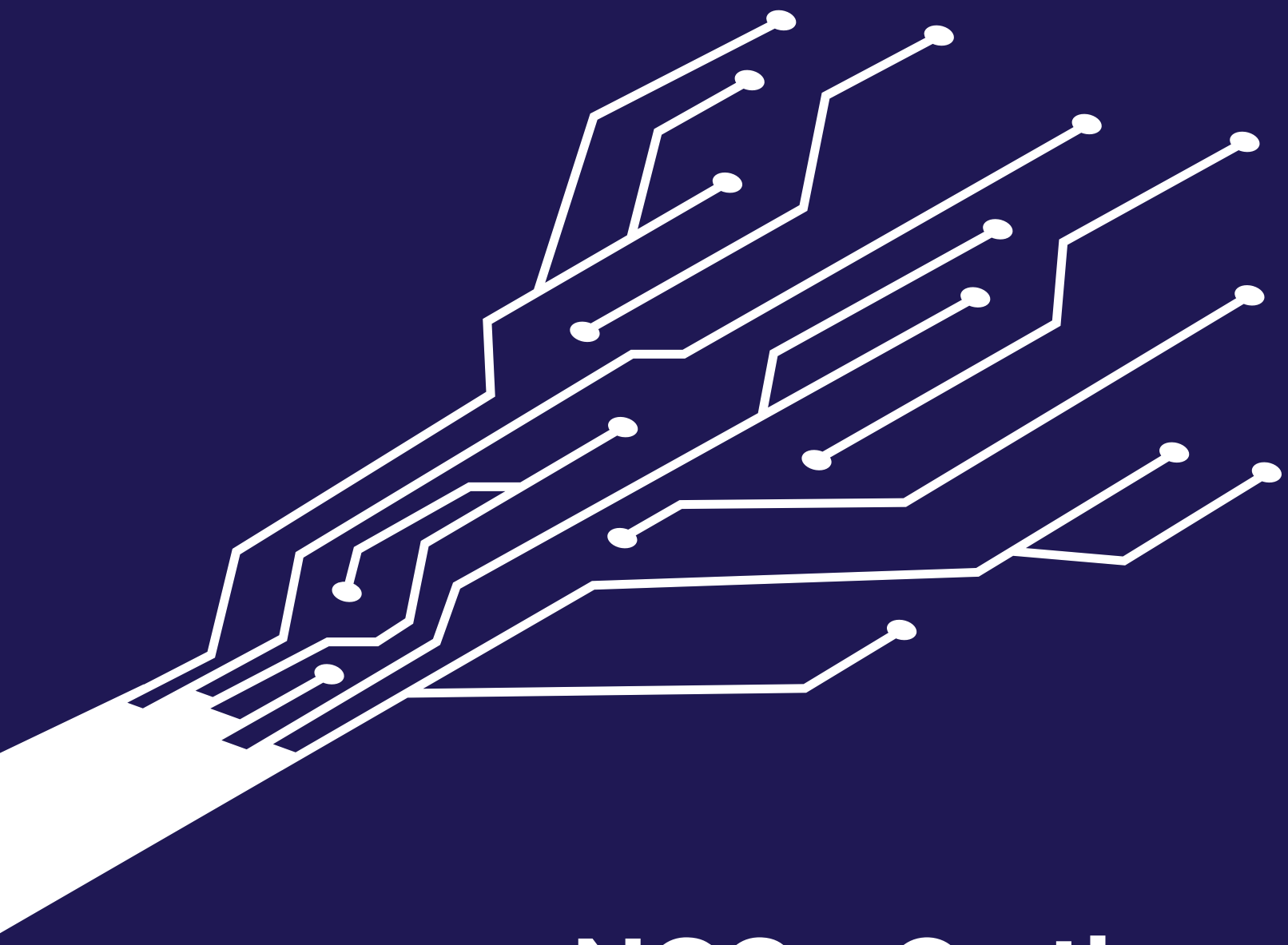
*Some target descriptions abridged

THE ROAD AHEAD

On the approach to 2030, the thinking is that every business unit within NGC should begin to frame the work done in terms of impact on the SDGs. No decision or strategy should be implemented without thought to potential externalities, and long-term and broad-scale impact. Transforming the corporate mentality in this way will ensure that the Company's business and growth remain responsible, thoughtful and above all, sustainable for years to come.

Revising Strategy





NGC – On the road to digital transformation

THE 'Fourth Industrial Revolution' has been on a path of disruption for many years now. The term was first coined by the founder of the World Economic Forum, Professor Klaus Schwab, in 2016. He described this revolution as one that will merge or blur the lines between the physical, digital and biological spheres.

This has indeed happened with the advent of disruptive technology such as Artificial Intelligence (AI), Internet of Things (IoT), Robotics and Drones, Cloud, Wearable technology, 3D Printing, Mobile Technology, Big Data, Collaboration and Social Tools, and Blockchain Technology. These technologies are being ingrained in our everyday lives, sending individuals and industries in a frenzy as they try to understand, adapt and change. NGC, however, has embraced the disruption and the accompanying change, and is on the path to digital transformation.

Digital transformation is the transformation of the business by redefining business strategy, business models and culture using technology and innovation. NGC's vision for digital transformation is formalised in its Technology Strategy. Where will this Technology Strategy and digital transformation journey take NGC?

Where is NGC on the journey?

The President of NGC, Mr. Mark Loquan, believes that technology will continue to drive change and that technology is essential for sustainability and business transformation. As he says,

"The pace of technological evolution suggests that if we do not lay the foundation today, we will struggle to catch up."

Under Mr. Loquan's leadership, NGC embarked on the path to transform the business by leveraging existing technology and by exploring emerging and disruptive technology.

Drones
Travelling back to 2016, the company first utilised drones for monitoring and surveying. Over the past few years, they have been used to acquire aerial imagery for use on Infrastructure, Major Projects and Asset Integrity inspections. In addition to the advanced, high-quality, aerial imagery received, cost savings were also realised.

E-Auctions
On the road to digital transformation, NGC embarked on an analysis of some of its key business processes. Opportunities for collaboration, integration and cost savings across the NGC Group of Companies were discovered. Some processes were not only redefined with the NGC Group perspective but also automated, as in the case of the tendering process. Online, real-time, reverse auctioning for the NGC Group via the SAP Ariba platform has produced substantial savings since the first e-auction in May 2019. At present, NGC is one of the few local companies routinely utilising e-auctions for procurement.

Dashboards and Data Analytics
At NGC, data is collected at different points in every process. Various teams across the organisation have successfully utilised Business Intelligence analysis and reporting tools to query and present some of this data. In doing so, they have created enterprise reports and dashboards, allowing decision-makers to visualise and interrogate their data and to make decisions based on data. The next step will be the development of a framework for Data Management and Analytics.

Cyber Security
Securing data is also critical for digital transformation. NGC's cyber security strategy employs multiple industry best practice tools and solutions, in securing the organisation's data, both on-site and on the cloud repositories. It ensures that data centres have multiple layers of protection, maintain compliance with internationally accepted standards and certifications while being monitored 24/7 (internally and externally) for any cyberthreats or exposed vulnerabilities.

Results obtained from a recent covert, simulated phishing attack on employees across the NGC Group illustrated how employee behaviour can compromise a company's data. As a result, other initiatives, as well as frequent security awareness sessions for employees, will be facilitated to change company culture and ensure that NGC's data is less at risk from the human and social side.

Where is NGC going next?

Having laid a foundation for technology-driven growth with these strategies and tools, NGC is looking to continue building and improving, making use of both mainstream and novel technological innovations.

Next-Generation ERP

As part of the digital transformation journey, NGC will be veering away from its traditional model Enterprise Resourcing and Planning (ERP) software, to one that is 'next generation', cloud-based and capable of capturing and interpreting varied and newer data streams, such as the IoT data stream. This is an essential step, as the success of digital transformation relies not only on data and effective data capture and analysis methods but on the availability of real-time data. Having real-time data on key aspects of the business, such as customers, supply chain, finance and operations, is critical for decision making.

More Drones

Safety in NGC's core business will continue to be enabled with technology. Drone usage has expanded since 2016 to asset integrity inspections, live streaming and Rights of Way (ROW) surveillance.

Drone utilisation for ROW surveillance reduces the risk of personal injury to staff and increases access to locations that were previously limited or inaccessible. Plans to use Light Detection & Ranging (LiDAR) sensors with the drones present further use cases in terms of site selection, landslip detection, generation of 3D models and animations of proposed and as-built projects. There is also a cost-saving factor and improved workflow factor when using airborne LiDAR sensors.

Submersible drones will be used to conduct non-destructive examination (NDE) inspections on NGC's assets as part of NGC's asset integrity improvement initiatives. For non-hydrocarbon tanks (e.g. firewater tanks), the submersible drones can be equipped with sensors, cameras and other tools to capture conditions inside the tanks and possible anomalies.

Integrated Access Control

Physical security will also be taking a high-tech approach on this journey with an upgraded, integrated Access Control, CCTV and Time and Attendance system, to monitor our people, property and assets. The system will effectively deal with issues such as various types of intrusion and tampering with assets at remote sites. The system will feature the use of IP-based cameras that produce forensic quality images and feeds, face recognition and data analytics to support decision making. In cases of emergency, the integrated system will facilitate mass notification to employees and the capability to geo-fence areas in order to issue mandatory alerts to personnel via their mobile devices.

NGC – On the Road to Digital Transformation | CONTINUED

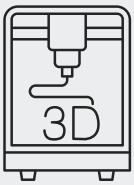
Industrial IoT and Robotic Crawlers

In addition to drone utilisation, the Asset Integrity function will integrate the Industrial IoT (IIoT) and robotics along this journey of digital transformation.

With the IIoT, the intent is to determine and use appropriate devices to collect data on NGC's assets for operational improvements and asset integrity assurance. These devices will be used on vessels and piping, and will be capable of collecting and providing data on degradation mechanisms such as corrosion and other damage mechanisms.

Robotic crawlers could soon enable the inspection of pressure vessels on NGC's installed assets. For the pressured vessels, these ultrasonic robotic crawlers will be used to conduct non-destructive evaluation (NDE) inspections systematically, covering a larger surface area. They will be used to record the wall thickness across the vessels' surface areas. Afterwards, the data can be analysed.

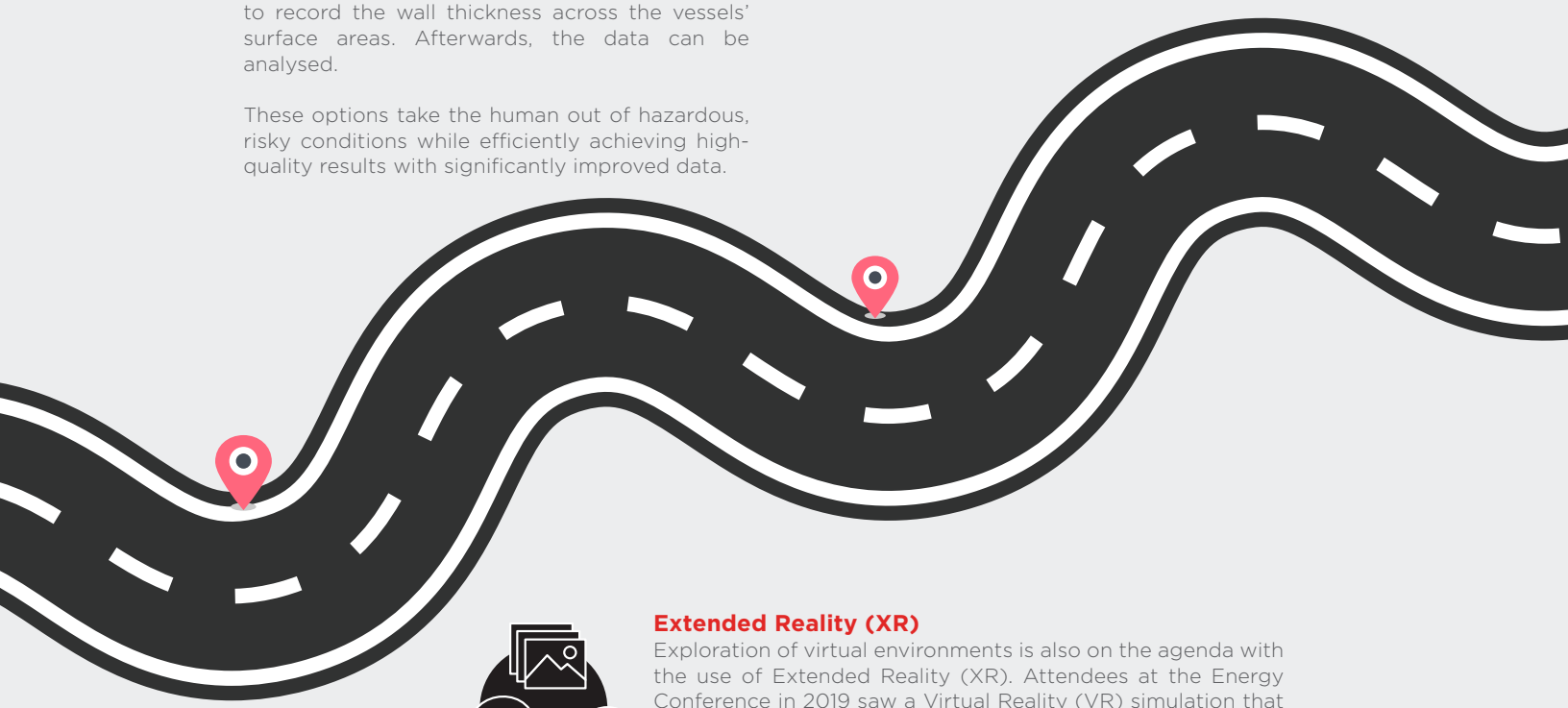
These options take the human out of hazardous, risky conditions while efficiently achieving high-quality results with significantly improved data.



3D Printing

3D printing is also on the horizon. 3D printing or additive manufacturing is the process of making a three-dimensional solid object from a Computer-Aided Design model. The 3D object is formed as material is added layer by layer. The Geospatial Information Services (GIS) team at NGC intends to utilise this technology internally to provide 3D prints of topographical features, conceptual designs, stations and facilities (proposed and existing) and spare parts, among other things.

3D Printing can be done quickly, is affordable and helps to mitigate risks. Each print is a test prototype (e.g. spare part) that can be evaluated for suitability and changed if necessary, before any investments are made. 3D Printing will assist teams in planning and decision making.



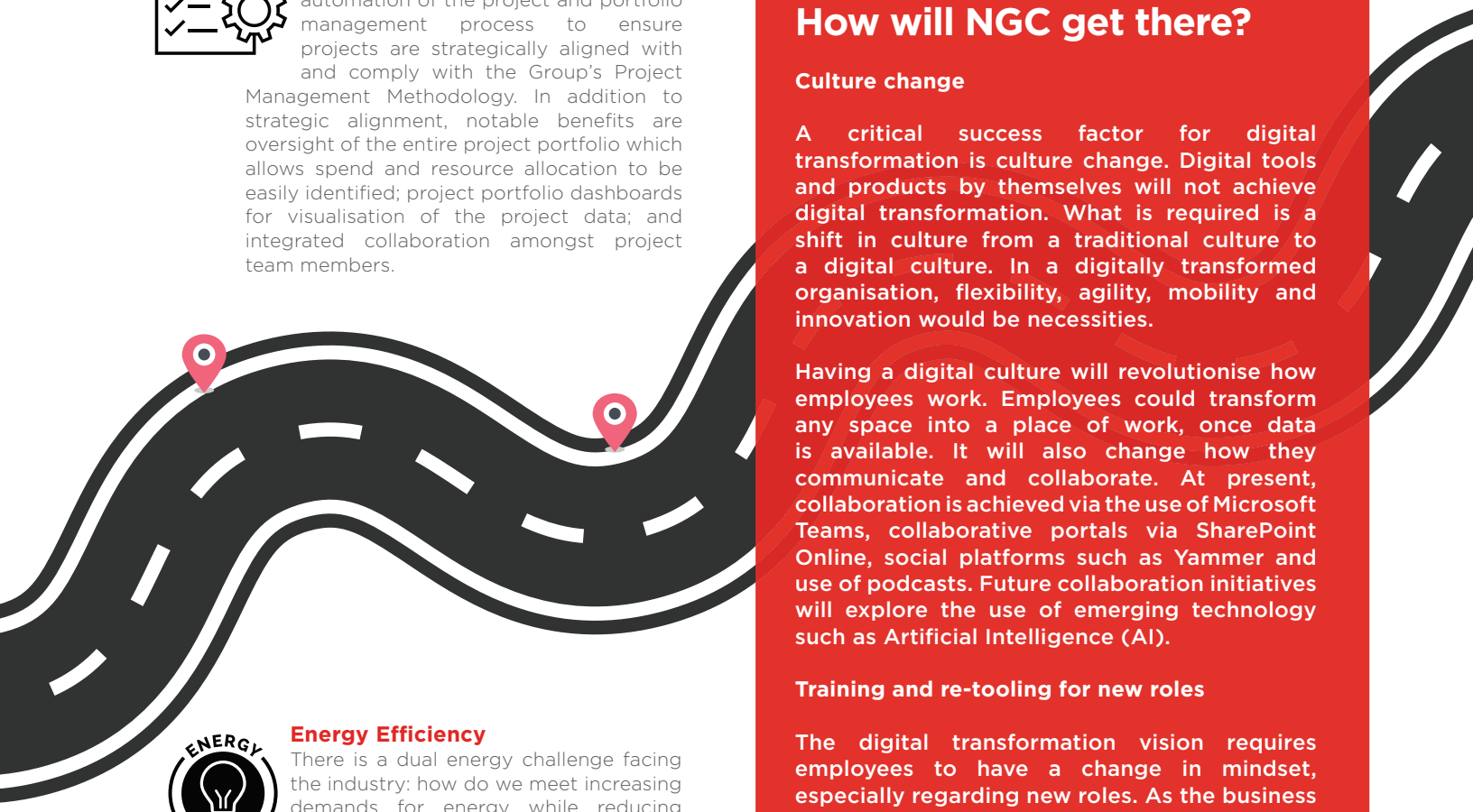
Extended Reality (XR)

Exploration of virtual environments is also on the agenda with the use of Extended Reality (XR). Attendees at the Energy Conference in 2019 saw a Virtual Reality (VR) simulation that was produced in-house at NGC. XR encompasses VR as well as Augmented Reality (AR) and Mixed Reality (MR). The latter two go further than VR, which only puts the individual in a virtual environment, allowing them to see but not interact with the space. AR and MR allow for interaction between the real entity and the virtual entities. As with VR, persons use wearable devices to access the computer-generated, virtual realm. Participants can then practise and work efficiently in a safe, low-risk space.

XR technology will be used for the execution of training, drills, planning and risk assessments as it allows one to learn the effect and consequence of operational actions without being physically affected.

Project and Portfolio Management

The transformation vision also includes automation of the project and portfolio management process to ensure projects are strategically aligned with and comply with the Group's Project Management Methodology. In addition to strategic alignment, notable benefits are oversight of the entire project portfolio which allows spend and resource allocation to be easily identified; project portfolio dashboards for visualisation of the project data; and integrated collaboration amongst project team members.



Energy Efficiency

There is a dual energy challenge facing the industry: how do we meet increasing demands for energy while reducing emissions of greenhouse gases?

NGC has been actively reducing its carbon footprint with initiatives such as large-scale reforestation. Carbon sequestration data from this project in particular shows that NGC is contributing to the national target for lower greenhouse gas emissions. However, NGC is also focusing on energy conservation and it is at this point that energy efficiency initiatives will join the digital transformation journey.

Technology will be leveraged to promote and encourage energy efficiency.

In development is a national mobile app that will seek to promote energy efficiency by educating its users on energy conservation. The app will allow users to learn about appliance energy demands, calculate their energy use and access energy conservation resources. It will demonstrate how one can benefit financially, and otherwise, by making simple energy-conscious choices. The mobile app will utilise Trinidad and Tobago's electricity rates as the basis for calculations, making it more relevant to the local public than other such apps in existence.

How will NGC get there?

Culture change

A critical success factor for digital transformation is culture change. Digital tools and products by themselves will not achieve digital transformation. What is required is a shift in culture from a traditional culture to a digital culture. In a digitally transformed organisation, flexibility, agility, mobility and innovation would be necessities.

Having a digital culture will revolutionise how employees work. Employees could transform any space into a place of work, once data is available. It will also change how they communicate and collaborate. At present, collaboration is achieved via the use of Microsoft Teams, collaborative portals via SharePoint Online, social platforms such as Yammer and use of podcasts. Future collaboration initiatives will explore the use of emerging technology such as Artificial Intelligence (AI).

Training and re-tooling for new roles

The digital transformation vision requires employees to have a change in mindset, especially regarding new roles. As the business is transformed on this journey, new roles, new jobs and changed jobs will emerge. As such, training, re-skilling and re-tooling are important in order to stay relevant and deliver these new functions. It is important to see technology not as a threat, but rather as a means to do work differently.

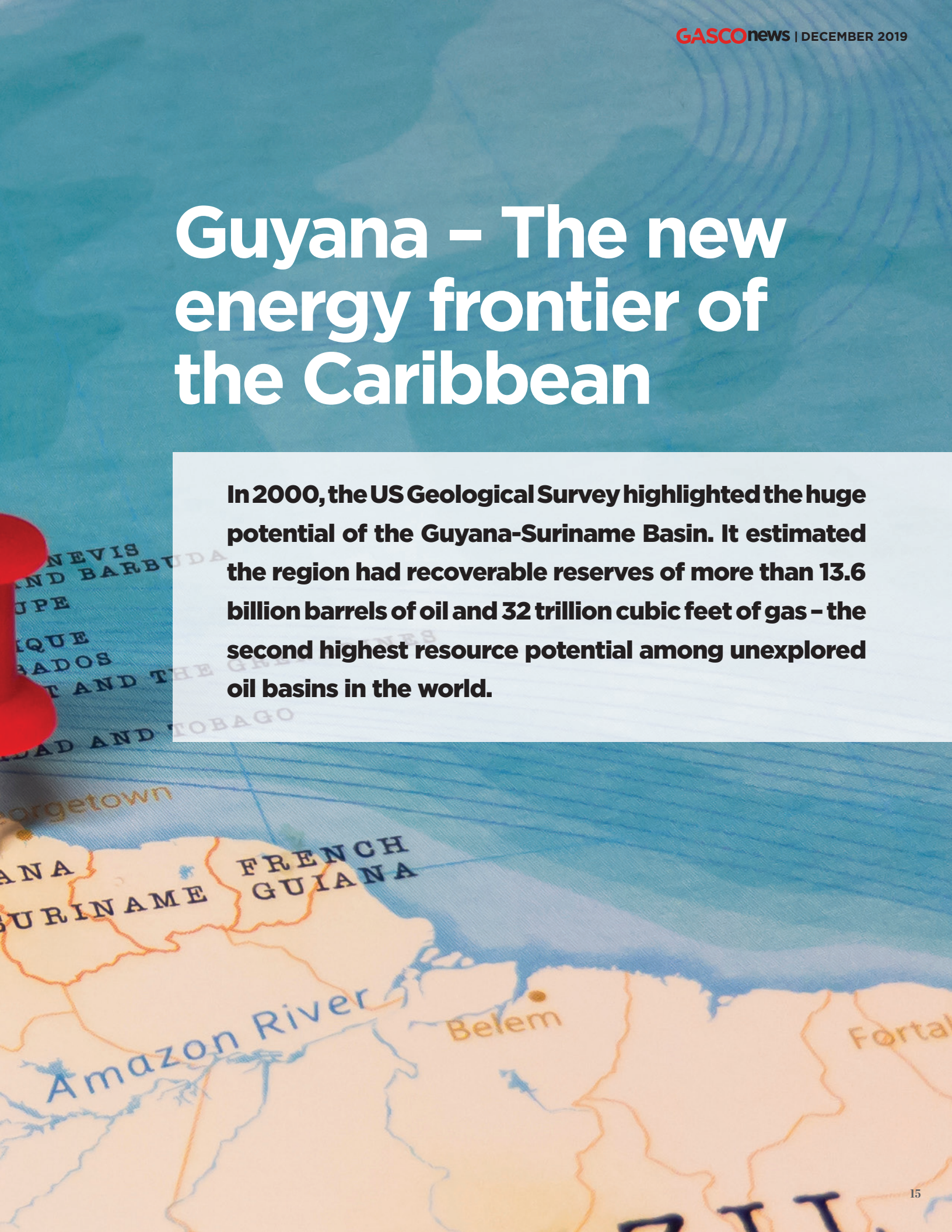
At NGC, this entire process of transformation will see the traditional Information Technology (IT) function evolved to serve in a new role of Technology and Innovation Business Partner, to support the organisation in achieving its strategic goals.

The Fourth Industrial Revolution is here and as this technology tornado moves closer, NGC stands ready to embrace what it brings. ■

Plan to Action

Guyana – The new energy frontier of the Caribbean

In 2000, the US Geological Survey highlighted the huge potential of the Guyana-Suriname Basin. It estimated the region had recoverable reserves of more than 13.6 billion barrels of oil and 32 trillion cubic feet of gas – the second highest resource potential among unexplored oil basins in the world.



First Board Meeting of National Energy (Guyana) Inc.

Guyana rising

In 2015, ExxonMobil made the first major oil discovery in Guyana at the Liza-1 Well in the offshore Stabroek Block. There the company encountered more than 295 feet (90 metres) of high-quality oil-bearing sandstone reservoirs. Since then, 14 other major oil discoveries were made (as at December 2019), propelling Guyana into the global energy arena.

In December 2019, Guyana joined the league of petroleum-producing nations with the official start of oil production in the Liza Phase 1 Development, which is expected to earn $300 million annually from daily production of 120,000 barrels.

The latest discovery on the Stabroek Block at the Mako-1 Well southeast of the Liza field (also in December 2019) adds to the current gross recoverable resource estimate of more than 6 billion barrels of oil equivalent. According to reports, production from the Liza Phase 2 startup is expected in mid-2022 and will develop approximately 600 million barrels of oil a year, or 220,000 barrels of oil per day. This figure is expected to rise to 750,000 barrels a day by 2025.

Guyana currently has at least eight active offshore blocks in exploration and production (E&P) development phases which include Stabroek, Kaiteur and Canje. To date, there are a total of 14 E&P companies with working interests including ExxonMobil, Tullow Oil, Hess, Repsol, Chevron and Qatar Petroleum.

Against this backdrop, the energy sector is set to become the key growth factor for Guyana. In recent years, Guyana's economy had moderate growth largely based on agriculture and extractive industries. According to the IMF, Guyana's economy grew 3.4% in 2018 and is expected to grow by 4.8% in 2019. However, with the entry of oil, growth is expected to be 86% in 2020 driven by stronger economic activity (construction and services sector) as private and public investment increases. The current US Ambassador to Guyana has said GDP could increase by 1000% by 2025 thanks to oil and gas. It is anticipated that Guyana's oil sector will represent approximately 40% of the economy within the next five years with annual GDP expanding to US$15 billion by 2024. This presents unprecedented potential for Guyana and its people given the current GDP of less than US$4 billion.

In essence, Guyana is poised to undergo significant transformation over the coming decade and is attracting major worldwide interest in exploring opportunities for investment across all major economic sectors. This opens an opportunity for the NGC Group of Companies as it strives to achieve growth beyond Trinidad and Tobago.

National Energy (Guyana) Inc.

Enter the NGC Group

The NGC Group, after years of robust profitability relative to a strong commodity market, finds itself operating in a market with shifting supply, demand, infrastructure, economics, and international competition. The shale revolution in the US injects a new and hard-to-predict dynamic into gas and natural gas liquids (NGL) markets. At the same time, the strong domestic position of the NGC Group has been challenged with maturing basins, rising costs and uncertainty around future discoveries.

In light of these factors, the NGC Group's aspiration to diversify its revenue base and build an international, integrated energy company has become even more crucial. To enable such growth, aggressive efforts have been made to capture international opportunities along the entire energy value chain.

Guyana, at the dawn of a new age given the discoveries of oil, is fast becoming a magnet for increased investment and trade. According to Rystad Energy, Guyana's government is taking steps towards developing the country's institutional capacity to manage its newfound oil wealth. It has established a sovereign wealth fund and is joining the Extractive Industries Transparency Initiative (EITI). It also intends to implement a balanced economic policy programme that will ensure equitable development for the entire country.

Given Trinidad and Tobago's more than 100 years of experience in the oil and gas sector as well as its relationship with Guyana, there are undoubtedly many mutually beneficial opportunities for both countries to work together.

In this regard, Trinidad and Tobago has been increasing its linkages with Guyana. On 21st September 2018, the President of Guyana, David Granger and Prime Minister of Trinidad and Tobago, Dr. Keith C. Rowley, signed a Memorandum of Understanding (MoU) proposing areas of collaboration which include:

- sharing of technical assistance in exploration and production;
- exchange of information on public policies regarding administration and sovereign management of resources;
- training and capacity building; and
- any assistance related to projects that may support the development of the hydrocarbon value chain.

The MoU enables both countries to strengthen their relations in furtherance of the advancement of Guyana's energy sector. Accordingly, in 2019, the Board of National Energy approved the opening of an office in Guyana to accelerate new market growth. This office would enable the NGC Group to engage more effectively with key stakeholders in Guyana to promote its services and acquire new business. As Guyana is on the path to significantly improve its business environment and infrastructure, services and knowledge transfer from the NGC Group can assist in bridging the gap.

Potential opportunities for collaboration include:

- Provision of technical advisory services related to project development for monetising resources (conceptualisation, promotion and development of new energy-based industries, assessment and review of projects – project feasibility studies)
- Provision of technical and advisory services for the development of energy infrastructure (e.g. identification, design and construction of new industrial estates and associated deepwater ports, operation of marine assets, design and construction of pipelines, advice on gas processing facilities including LPG)
- Provision of port and marine services to support logistics providers (use of ports, vessels, warehouses, laydown and open storage areas, welding and fabrication, and waste management)
- Joint ventures or partnerships with local Guyanese companies
- Partnership with educational institutions to build the skillsets needed in the budding oil and gas sector in Guyana
- Provision of scholarships and grants to Guyanese locals to build capacity

Guyana – The New Energy Frontier of the Caribbean | CONTINUED

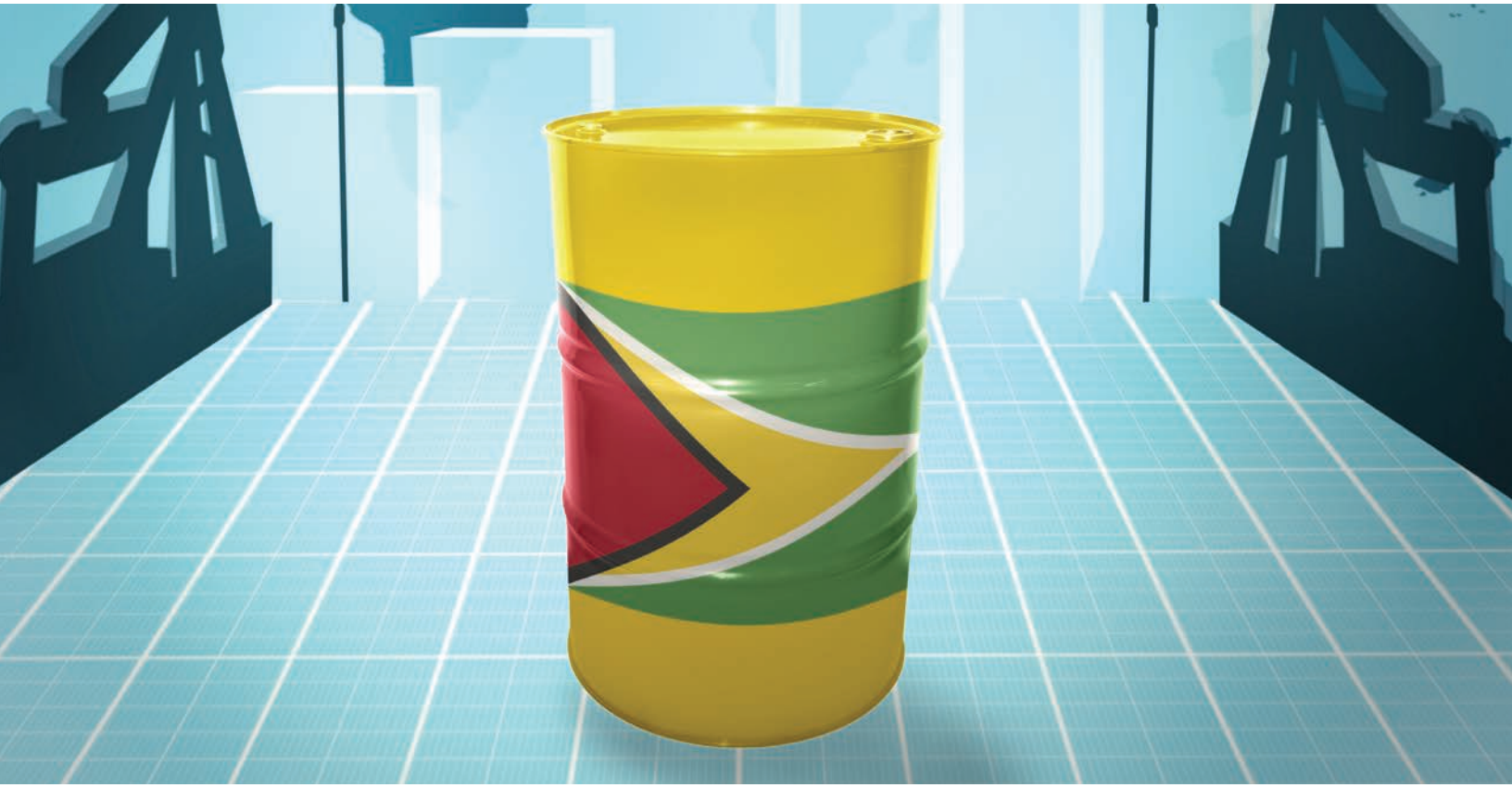
Additionally, investors in energy require a unique set of services which are currently being developed in Guyana. The NGC Group can work collaboratively with GoInvest in Guyana to advance this initiative.

In 2019, National Energy incorporated the office in Guyana and held its first Board Meeting in December. The expected impact of the office includes:

(i) improved awareness of Guyana's developmental needs;
(ii) enhanced corporate profile and brand recognition;
(iii) greater business and investment opportunities with both private and public sectors;
(iv) opening of avenues for other regional opportunities;
(v) execution of commercial arrangements for economic growth.

Establishing a strong presence in Guyana will benefit the NGC Group by enhancing its brand and international recognition. It will provide the opportunity for developing relationships with crucial stakeholders, as well as help forge win-win partnerships which will result in financial growth while supporting the burgeoning energy sector in Guyana.

Underpinning all of this, a stronger focus will be placed on leveraging the expertise of our people and advancing productivity through innovation and the execution of our technology strategy to the mutual benefit of both countries.■



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Plan to Action

Working smarter with digital maps

Working Smarter with Digital Maps | CONTINUED

To present-day Google mappers and GPS-guided drivers, static paper maps have quickly become unwieldy artefacts that we can marvel at ever having used with ease. Indeed, the comparative utility of modern digital maps can be attested by anyone who has ever had cause to pull aside en route to a destination, open an app, and scroll along a digital roadway to determine what on Earth could be holding up traffic, or where the nearest bathroom might be.

Inasmuch as technology is making us smarter, better equipped and more efficient in our personal lives, it should follow that the same new tools can radically improve how we work as well. This is certainly the belief held by NGC's Geospatial Information Services Department (GISD), which is driving innovation at the State-owned company. Having already introduced drones and virtual reality into work processes with great success, the GISD has now transformed its core functional area of mapping using available technology.

Mapping at NGC

NGC's pipeline system spans more than 1,000 km, running some metres underfoot of roadways, farmland, housing settlements, rivers and forests. At strategic junctions, the Company's network is punctuated by metering and odoriser stations, control rooms and office buildings. While gas flow and pressure through the network are monitored electronically using a computerised SCADA system, inspections and maintenance of the infrastructure must be carried out manually by teams in the field.

Traditionally, these teams would rely on paper maps in the course of their operations. Before conducting work on any given segment of the network, field crews would request printed maps to guide planning and execution. Maps are also utilised by project teams ahead of new construction works for site selection and project planning, among other things.

Working Smarter with Digital Maps | CONTINUED

In all instances, maps help address such questions as: are there land features along the Right of Way (ROW) that might necessitate use of special equipment? Does the segment pass through communities that would need advance notice of works? Are there any hazards in the area to be worked?

Unfortunately, as land use and settlement patterns change, and topographical features evolve naturally, paper maps quickly lose relevance. Updating prints can be costly and time-consuming, not to mention environmentally unfriendly.

With all this in mind, in August 2018, after a period of self-initiated and self-directed training with new software and mapping tools, the GISD introduced an interactive digital map into the field.

New territory

The foundation of GISD's map is a standard electronically navigable map of Trinidad and Tobago, similar to those offered by Google and other mapping platforms. This map shows settlements, road networks and geographical features, and allows users to zoom in to particular areas for greater detail.

Atop this baseline scalable image, the GISD has essentially overlaid a skeleton map of NGC's entire system, including its pipeline network and all other infrastructure. Data has been embedded for all lines and facilities, and can be accessed by simply tapping or clicking the asset on the map. For instance, map users could learn the length and carrying capacity of a line, the age of a facility or even its operating crew through the map's interface.

Functionality has also been built in for users to share information directly to the map, as can be done with popular traffic apps. Hazards can be flagged, potential encroachments on the ROW can be registered and tracked. Moreover, the baseline map is routinely updated using satellite imagery and information from integrated web platforms so map users can easily monitor changes around NGC's network. Data from drone flights along the pipeline corridor supplement satellite updates, allowing the GISD to insert information of more direct relevance to NGC's infrastructure, such as land movements in the vicinity of pipelines.

Map in action

As expected, for the 50-odd users who have been accessing the digital map on their mobile devices since the launch in 2018, the map has offered a great many advantages over its paper equivalents.

In the first place, it is much easier to handle. Out in the field, it is considerably more practical to refer to phones or tablets than battle the elements with oversized sheets of paper. In instances where multiple print maps might have been needed to show different degrees of detail, users can now simply zoom in or out from the site on the digital map.

Importantly, users can now have sight of the entire system at any given time, where before printed maps were limited in scope. This literal 'big picture' view, combined with the additional data points that have been included about NGC's infrastructure, can facilitate quick decision-making in the field.

For example, in the past, before going on a site visit for a new project, an engineer would have had to anticipate all possible factors that could inform site suitability and commission a map (or perhaps multiple) to capture all of these – distance from watercourses, communities in the blast zone, nearest NGC pipeline and so on. Questions that would come up on site regarding the location would have had to be recorded and researched in office. Now, most pertinent information can be accessed as questions arise. The full-system view of NGC's network could even give unexpected insights relative to the site that fixed-range printed maps could not.

The collaborative feature of the new digital map whereby users can input information is another useful element. During field inspections, teams might discover temporary hazards that would not ordinarily be recorded on maps, such as insect swarms near the pipeline corridor, or flooded fissures on the road that could damage vehicles. By flagging such hazards on the map, other employees in the field would be made aware and take the necessary precautions to avoid an incident. This makes the map customisable and much more relevant to those using it.

Of course, accessibility of the digital map is an important time-saving benefit, as employees can retrieve it from the field or office at any time. Users do not need to rely on the GISD to generate maps on demand but can independently seek whatever information they require.

Possibilities abound

At present, only a fixed number of employees have access to the map, but the numbers are set to increase following the initial trial period. Hardware such as tablets will be procured to enable more field teams to take advantage of the tool.

Besides increasing the userbase, the GISD will also be looking to expand the features currently available. Among these could be the integration of 3D building models and Extended Reality functionality to allow users to virtually tour the network through the map platform.

With technology constantly on the march, the future of mapping is ripe with possibility. Whatever that future might hold, the GISD will continue to work at keeping NGC abreast of the industry, modern and mobilised. ■

Plan to Action

Investigating efficiency – NGC undertakes energy audit

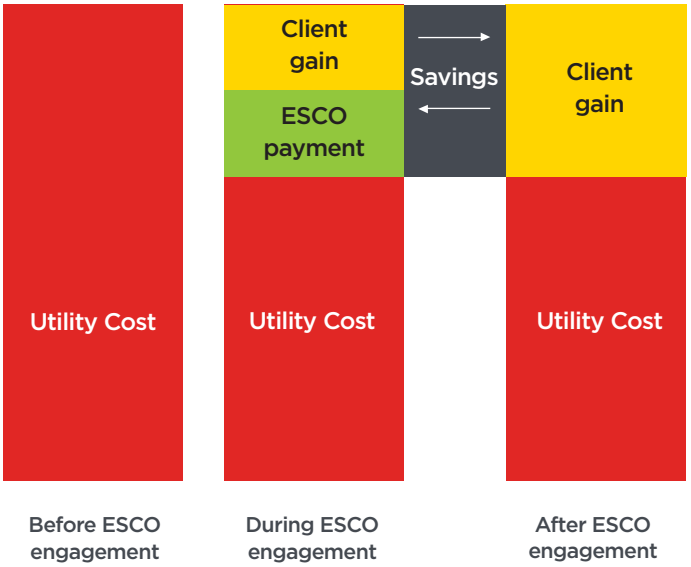
Investigating Efficiency – NGC Undertakes Energy Audit | CONTINUED

In pursuit of emissions reduction targets outlined in the Paris Agreement, countries are undertaking to modify their energy diets and reduce fossil fuel consumption. Renewable energy has been headlining this transition, but equally important has been (and will be) better management of energy consumption through more efficient energy use.

For Trinidad and Tobago, the latter option has greater probability of success in the short term given the gestation period and inevitable growing pains of utility-scale renewable projects. Moreover, the country has great potential for gains in the area of efficiency considering that it ranks among the most energy-intensive economies in the world, utilising more energy to generate a unit of GDP than most other countries.

Improving energy efficiency (EE) would require changes to consumer behaviours and habits, replacement of inefficient energy-consuming hardware and devices with greener equivalents, and thoughtful building design, among other things. Before this can happen, however, consumers need to be aware of where there are improvements to be made. For small domestic consumers, this can be assessed and addressed fairly easily (with some professional guidance), but for businesses and industrial consumers, the process can require more involved energy auditing.

As one of the champions of the EE lobby in Trinidad and Tobago, NGC decided to engage an energy service company (ESCO) to conduct an audit of its Head Office in Point Lisas, to determine how it could improve on its energy efficiency rating.



What is energy auditing?

Energy auditing is a process of systematic inspection and analysis of energy use within a system (e.g. a building, plant or industrial process). The audit evaluates how energy is consumed and reveals opportunities available for streamlining and reducing consumption.

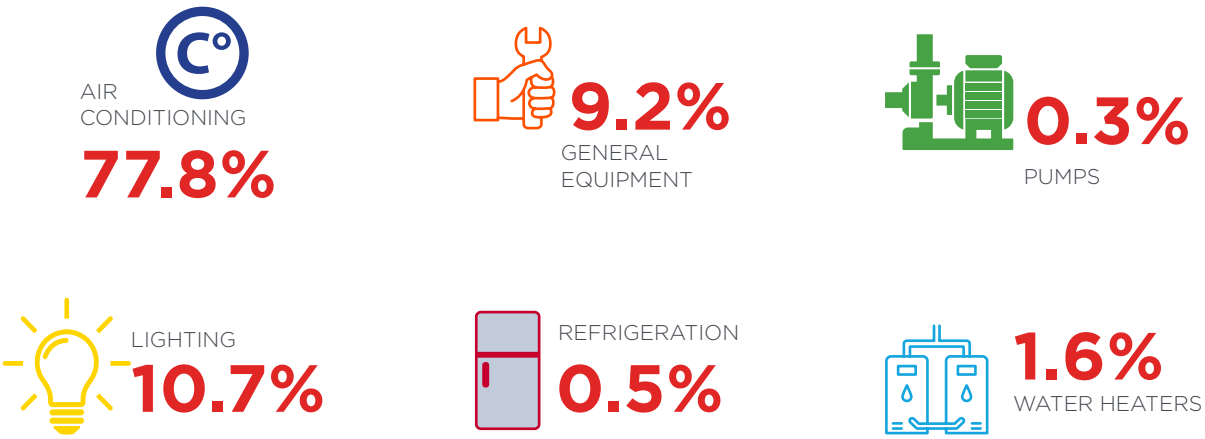
With regard to buildings, such as NGC's Head Office, there are several factors to consider when auditing energy use.

Firstly, the machines and equipment that utilise energy must be assessed in terms of their load capacity ratings and duration of use. In the case of some machines – such as appliances – the model and date of manufacture can also have bearing on the amount of energy they consume, as older technology is generally less efficient. Where machines are operated using automated controls (e.g. fans or air-conditioners regulated by thermostats), these controls must themselves be assessed to ensure they are in working order.

Audits also take into account more permanent features such as building location, orientation and shape, as well as the condition of the building 'envelope', which is the physical barrier between the conditioned and non-conditioned environment of a building (comprising roof, floor, walls, windows and doors). The reason for this angle of inspection is that these features impact the lighting and cooling/heating needs of a building, which account for a large fraction of total energy consumption. For

Investigating Efficiency – NGC Undertakes Energy Audit | CONTINUED

Breakdown of energy use at NGC Head Office



example, if a building is fronted by glass that is not tinted or windows without awnings, the interior could heat up quickly and demand more of the air-conditioning system. The same can be said of buildings with offices facing east or west that have no tree line or other defence against the sun. Such spaces may, however, require less artificial lighting. Understanding how building design dialogues with energy use can therefore go a long way to help reduce energy consumption.

It is also important to consider how the building is used, when and by whom. Even if the majority of employees occupy an office building for a standard eight-hour period, lights and air-conditioning are often kept at maximum levels throughout the day. In some cases, spaces that are rarely used are nevertheless kept cooled and lit, resulting in unnecessary energy expenditure. While the comfort of building occupants should inform lighting and cooling needs, that comfort is sometimes overlooked – in many businesses and offices across Trinidad and Tobago, for example, occupants wear jackets to keep out the cold of the air-conditioning. The fit between internal environmental conditions and user needs is consequently another audit consideration.

Once the building is evaluated according to these and other relevant efficiency indicators, recommendations can be made for improvement. Auditors usually establish baseline energy consumption figures from utility bills and through the use of specialist equipment on site. That figure can then be used to track the effectiveness of retrofits or other energy management initiatives implemented after the audit. In this way building proprietors can also assess utility cost savings. Many ESCOs finance energy audits and support implementation of remedial measures out of pocket, then recover payment for their services from the client's post-audit savings.

Audit at NGC

For its own audit, NGC engaged ESCO Energy Dynamics Limited (EDL), who completed their assessment in in December 2019.

The exercise revealed that the facility's energy consumption was equal to 651 kWh/m^{2}yr. According to EDL, energy efficient buildings usually consume less than 180 kWh/m^{2}yr. This result, attributable to the age of the building and certain inefficiencies in internal design configuration, signals that there is considerable opportunity for improvement.

Based on its energy consumption, the audit also calculated the building's average annual CO_2 emissions as approximately 3,215 tonnes.

NGC is determined to address the issues raised by this audit, both by looking at possible design modifications and by changing mindsets and behaviours concerning energy use. It is also envisioned that this exercise be undertaken across all NGC facilities to get a more holistic picture of the Company's overall energy consumption and carbon footprint.

Once appropriate action is taken, the Company will continue to monitor and track its progress towards greater efficiency. ■

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

Caiman lounging at the Wild Fowl Trust.
Photo by Sherwin Williams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