

ON THE
GREEN
AGENDA



RESEARCH AND
DEVELOPMENT
DRIVING **INNOVATION**

The NGC Group collaborates with
The University of Trinidad and Tobago (UTT)
and The University of the West Indies (The UWI)



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NGC and its subsidiaries have acknowledged the significant value that research and development (R&D) can add to climate change mitigation strategies across The Group, as well as broader national plans.

Innovation drives economic development, and a strong relationship between academia and industry remains the cornerstone for future development. The latter is at the core of The NGC Group's green agenda endeavours. NGC and its subsidiaries have acknowledged the significant value that research and development (R&D) can add to climate change mitigation strategies across The Group, as well as broader national plans.

The March 2021 issue of *GASCO News* profiled The NGC Group's partnership with The University of Trinidad and Tobago (UTT) on a three-year Climate Change Mitigation Project. The predominantly research-based project establishes a strong scientific basis to aid Trinidad and Tobago in achieving its emissions reduction commitments.

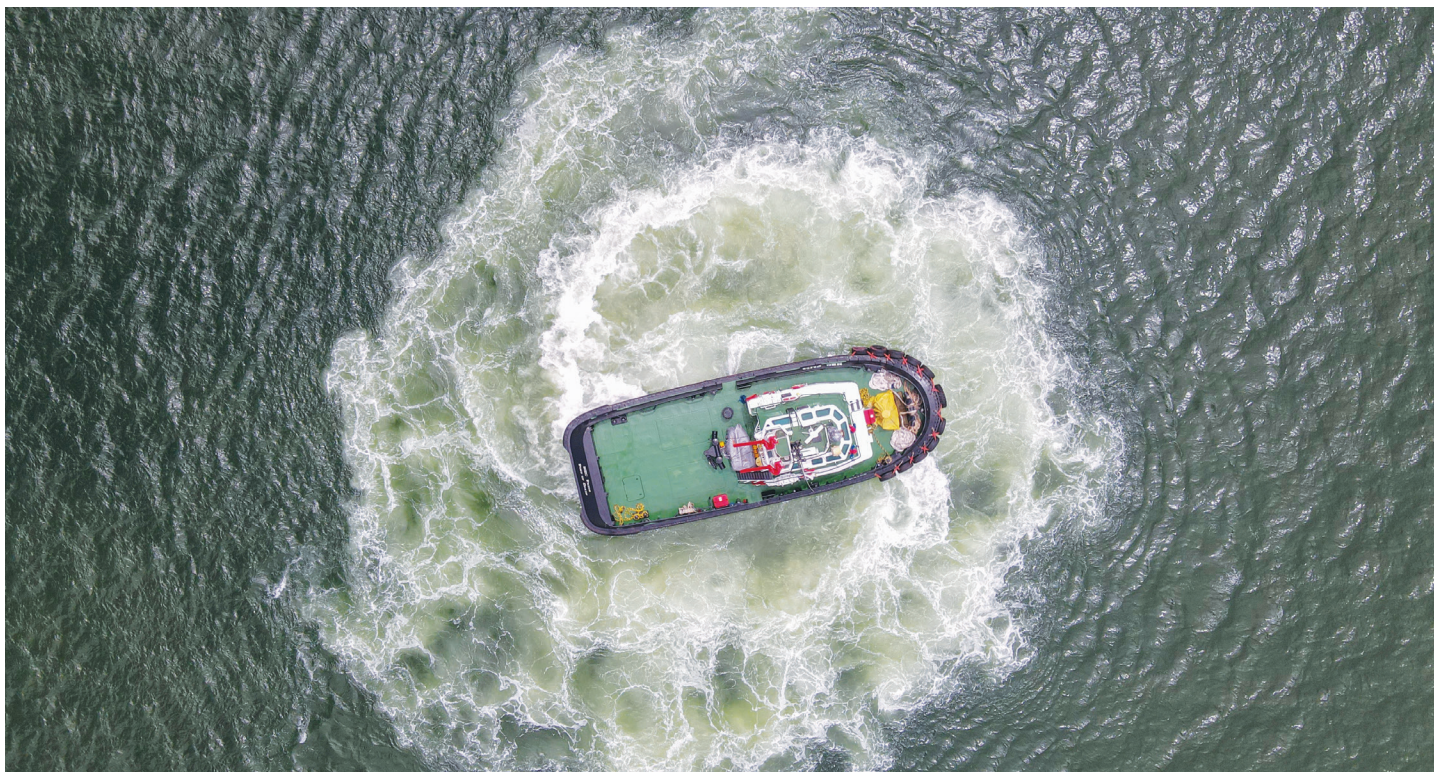
NGC subsidiaries National Energy and NGC CNG Company Limited are now looking to undertake other collaborative research and development projects with both UTT and The UWI between 2021 and 2023. This article gives an overview of the

scope and potential impact of those projects.

RESEARCH AND DEVELOPMENT PROJECTS: UTT, NATIONAL ENERGY AND NGC CNG

Project 1 - To assess port and maritime emissions from marine assets owned by The NGC Group.

The general objective of the study is to develop a Greenhouse Gas (GHG) inventory model for shipping activity, energy use and GHG emissions from The NGC Group's marine assets. Quantifying emissions is key to developing targeted strategies for addressing port operations. This ensures compliance with Trinidad and Tobago's Nationally Determined Contributions (NDCs), which seek to achieve a reduction in overall emissions across the power generation, transportation and industrial sectors by 15% by 2030 from a Business-as-Usual (BAU) scenario. In absolute terms, this is equivalent to 103 million tonnes of CO₂e. Emission sources at ports include ocean-going vessels, harbour



THE GROUP IS LOOKING AT REDUCING EMISSIONS FROM OCEAN-GOING VESSELS. PICTURED IS ONE OF NATIONAL ENERGY'S TUGS.

vessels, cargo handling equipment and vehicles. The potential impact from this work can support data-driven decision-making regarding energy use by marine assets and increased energy efficiency of The Group's maritime operations.

Project 2 - To investigate the feasibility of solar-powered irrigation systems

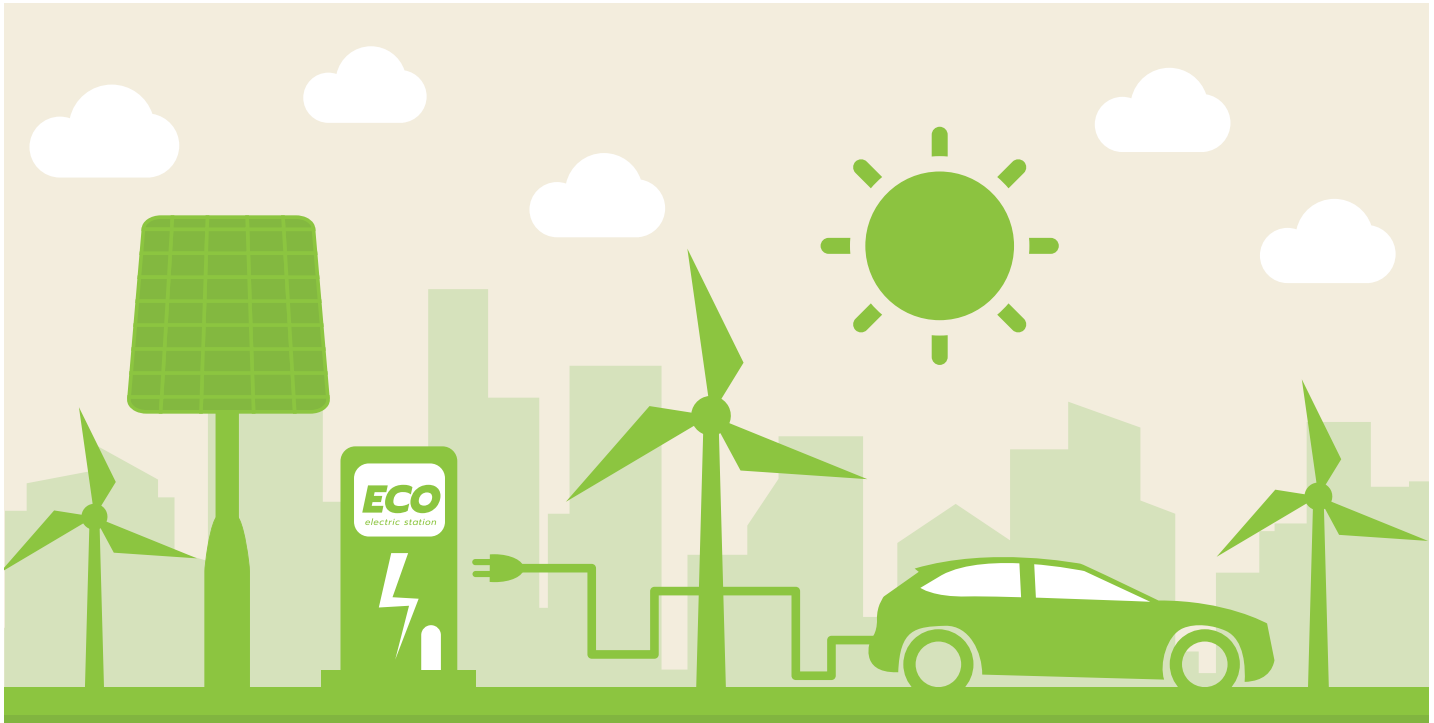
The NGC Group is always searching for opportunities to leverage the energy industry to develop other

sectors of the local economy. In that vein, a key project is exploring the feasibility of using solar technology to power pumps to support irrigation in the agricultural sector. Development of an application to size the solar power requirements for specific irrigation systems together with the design, development, and testing of a prototype for a smart, solar-powered irrigation system are also included as part of the project. The potential impact for this project is the introduction of new technologies into the local farming industry.

Project 3 - Design, Simulation and Optimisation of a Solar Photovoltaic (PV) System

The NGC Group, through National Energy, continues to implement solar PV technologies, with the latest project being the design, procurement, supply, delivery, installation, and commissioning of a 100-kilowatt solar photovoltaic (PV) rooftop mounted system at the Preysal Service Station. The aim of this study is to examine the optimisation of an installed solar





PV system by comparing actual performance results with existing design parameters.

Project 4 - The integration of PV-Wind Renewable Energy Sources into Electric Vehicle (EV) Charging Stations for Trinidad and Tobago

The Government of Trinidad and Tobago signalled that it is preparing for an increase in the penetration of EVs in keeping with the country’s NDCs. An Electric Mobility (e-mobility) Policy for Trinidad and Tobago is already at an advanced stage of development. This policy is being prepared with support from the Danish Technical University (DTU)/United Nations Environment Programme (UNEP).

In anticipation of that policy, a proposed project with UTT seeks to catalyse adoption of electric mobility through the utilisation of a 100% renewable energy system for EV charging. The major activity in this project will be an electric vehicle charging station which integrates solar photovoltaic power generation and/or wind energy utilisation

together with battery energy storage technology to support the implementation of highly efficient, green and energy-saving charging stations. This project will also examine the impact of electrification in the transport sector on the power curve and the integration of renewable energy into the power systems of Trinidad and Tobago. It will include analysis of different charging regulation models for the electric vehicles which will be derived using a computer model for energy systems analysis.

Project 5 - Assessment of Vehicular Mass Emission Rates Applicable to Trinidad and Tobago

Over the years, developed countries have placed emphasis on various vehicle emission reduction strategies primarily because of associated health risks. In Trinidad and Tobago, there is no database of emission levels and testing procedures for vehicular emissions are limited to visible vapours only. There are no policies or incentives available for the removal of older or less efficient vehicles from the nation’s roadways.

The fuel intake systems for existing models are either carburettor or fuel injection types with the combustion systems being either naturally aspirated or force-induction with an assortment of available fuel types that include Super and Premium unleaded gasoline, CNG and diesel.

The NGC Group is therefore undertaking a research project to assess the actual level of vehicular emissions and develop a low-cost method for the determination of “real world” vehicle mass emission rates, using an on-board gas analyser and data extracted from the vehicle’s electronic control unit (ECU). The study will involve the gathering of sample data on vehicles, with the intention of assessing the current state of on-road emissions from vehicles and an evaluation against various international standards. Vehicles will be sampled and classified according to make, model year of manufacture, application, fuel type, type of intake system, and overall mileage.



THE GROUP IS UNDERTAKING RESEARCH TO HELP REDUCE EMISSIONS FROM THE TRANSPORTATION SECTOR.

The pollutant species of interest will be carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxide (NO_x), total hydrocarbons and particulate matter. The built database will be reflective of the current vehicle sector and results will be evaluated with comparison to international standards for vehicle emissions. This inventory has the potential to assist Government agencies in the development of standards appropriate to Trinidad and Tobago.

Project 6 - A Well-to-Wheel Analysis of Compressed Natural Gas (CNG) for Trinidad and Tobago

This project seeks to quantify the overall emissions and energy usage associated with the use of CNG as a transportation fuel. The study will include a direct comparison with established Well-to-Wheel results for diesel and gasoline. The results of the study will serve as a direct guide for national stakeholders in determining the emissions and energy associated with each liquid transportation fuel pathway and inform policy decisions that would be efficacious towards meeting the country's international climate change commitments of 30% reduction in public transportation emissions by 2030.

Project 7 - Automated and real time vehicle emissions data collection and analysis

To meet climate change commitments, understanding, monitoring and assessing emissions associated with fleet vehicles is critical. This project seeks to determine emissions associated with fleet vehicles that use diesel, gasoline and CNG. It will help in the estimation of overall national vehicle emissions, and can inform policy changes to reduce emissions in the transportation sector.

RESEARCH AND DEVELOPMENT PROJECTS: THE UWI, NATIONAL ENERGY AND NGC CNG

National Energy and The UWI's Department of Chemical Engineering explored two research projects at the undergraduate level which examined:

1. The comparison of blue hydrogen and green hydrogen to determine which offered the best fit for Trinidad and Tobago's transition toward a sustainable petrochemical sector.
2. Opportunities for the repurposing of natural gas infrastructure to support a hydrogen economy in Trinidad and Tobago.

The results of these undergraduate studies will be considered as part of The Group's strategy and approach towards development of the hydrogen economy.

Additionally, there are discussions to form a joint NGC CNG and Regional Transport Authority comprising Barbados, Grenada, Antigua, St. Vincent, St. Lucia, and Trinidad and Tobago, with the headquarters for the Secretariat to be located in Trinidad and Tobago. A Memorandum of Understanding (MOU) is also currently being explored for the creation of a regional Energy Centre of Excellence for Sustainable and Future Energy Technologies.

CONCLUSION

The NGC Group recognises that innovation through research drives development. Partnerships between industry and academia will therefore be integral to the transition to a more sustainable future, and The Group will continue to pursue that outcome.

References

1. The University of Trinidad and Tobago's 'Concept Notes-Research Agenda-Green Economy' ■