THE POTENTIAL FOR WIND ENERGY IN TRINIDAD AND TOBAGO

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ON THE GREEN AGENDA

KEY TAKEAWAYS

There are various driving factors towards integration of wind energy technologies into Trinidad and Tobago's energy mix.

These factors include a high resource potential; a strong demand for green hydrogen; supporting industrial infrastructure; and a skilled energy workforce.

Some challenges will need to be overcome before wind can be harnessed, including legislative roadblocks and capital considerations.

As a signatory to the 2015 Paris Agreement, Trinidad and Tobago has made a commitment towards the world's efforts to limit global warming to 1.5°C or less compared to pre-industrial levels. To this end, the country aims to achieve a reduction in overall emissions from the power generation, transportation and industrial sectors, of 15% by 2030 compared to the 2013 base year. Achieving this target will require the incorporation of renewable energy sources into the country's energy mix. Effectively, Trinidad and Tobago's energy transition must be accelerated.

NGC is playing a critical role in advancing the energy transition through investments, strategic partnerships and collaboration for national policy, strategy and project development. The company is supporting Trinidad and Tobago's intended nationally determined contribution (iNDC) of 15% greenhouse (GHG) emissions reduction through its initiatives and investments. These include:

- Equity investment of 30% in Brechin Castle Solar Project;
- Formation of NGC Green to provide greater focus on the advancement of energy efficiency, renewable energy and alternative energy projects in Trinidad and Tobago, the Caribbean and internationally;
- Signing of a Letter of Intent with NewGen Energy Limited to accelerate a hydrogen start-up company in Trinidad and Tobago;
- Participation on the Cabinet-appointed Carbon Capture and Carbon Dioxide Enhanced Oil Recovery Steering Committee;
- Participation on the National Council for Sustainable Development.

WIND ENERGY: A CATALYST FOR GREEN HYDROGEN

In 2022, NGC subsidiary, National Energy, co-authored *The Roadmap for a Green Hydrogen Economy in Trinidad and Tobago*, which was sponsored by the Inter-American Development Bank (IADB). The document outlines a pathway towards this country's entry into the green hydrogen business, in which hydrogen will be generated via electrolysis from renewable sources.

At the Caribbean Sustainable Energy Conference in 2023, the Minister of Energy and Energy Industries announced that his Ministry will be collaborating with National Energy to embark on a pilot project to produce green hydrogen in Trinidad and Tobago.

THE ROADMAP MAKES A STRONG CASE FOR THE DEVELOPMENT OF A GREEN HYDROGEN INDUSTRY, AS THIS POTENT ENERGY CARRIER IS PREDICTED TO SUPPLY **12% OF THE WORLD'S ENERGY DEMAND BY 2050.**[1]

For decades, Trinidad and Tobago has been positioned as a leading exporter of methanol and ammonia, of which hydrogen is a major component. The roadmap provides preliminary evidence that the country is well placed to leverage its energy-based expertise, infrastructure, and trade relationships to capitalise on the emerging opportunities in green hydrogen for the production and export of green methanol and green ammonia. Wind energy – specifically offshore wind energy - is identified as the renewable energy source with the highest potential to produce the required energy to power the electrolysis of water molecules for production of green hydrogen.

THE DOCUMENT ESTIMATES THAT UP TO 57GW OF OFFSHORE WIND COULD BE EXPLOITED ACROSS FIXED AND FLOATING TECHNOLOGIES, EQUATING TO 25GW IN AVERAGE ENERGY OUTPUT.[2]

[1]https://www.irena.org/Energy-Transition/Technology/Hydrogen
[2]https://publications.iadb.org/en/roadmap-green-hydrogen-economy-trinidad-and-tobago

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WHY WIND ENERGY?

In May 2023, the Ministry of Planning and Development hosted a workshop to present the *Strategy for Wind Power Generation in Trinidad and Tobago*. The strategy was derived from a study undertaken from September 2022 to April 2023 by a consortium led by an international firm Stantec that specialises in sustainable engineering, architecture and environmental consulting.

The document outlines steps that should be taken for successful development of a wind energy industry in Trinidad and Tobago by 2035. In agreement with the roadmap for hydrogen, the wind energy strategy indicates that there is exploitable wind energy potential in excess of 25GW both onshore and offshore. Furthermore, the report puts forward a target of 2GW of installed wind energy capacity by 2035.

There are various driving factors towards adoption of wind energy technologies as an addition to the country's energy mix, including:

Trinidad and Tobago's natural gas-based petrochemicals industries that require hydrogen feedstock. Green hydrogen can be a viable solution for sustaining and growing these industries and can position the country as a central player in the green hydrogen space.

The addition of wind energy would allow natural gas used for power generation to be redirected towards higher value petrochemicals production.

There is the potential for over 2.5GW of onshore wind energy and over 30GW of offshore wind energy. Offshore wind also reduces the issue of land usage associated with other forms of renewable energy, such as solar energy.

Trinidad and Tobago possesses facilities including industrial ports, and equipment such as heavy-lift cranes that can support the wind energy industry during the construction and operations phases.

There are established trade relationships with multinational methanol and ammonia firms which are poised to propel the new industry.

Trinidad and Tobago possess a skilled workforce in the energy sector that can transition into the wind energy industry with retraining and reskilling.

Creation of a new industry would create new job opportunities in productive industry.

IT'S NOT ALL SMOOTH SAILING WITH WIND

The strategy indicates that while the potential for wind energy in Trinidad and Tobago is high, there are potential roadblocks that could hinder its successful implementation. While the Global Wind Atlas - a free, web-based application developed to help policymakers, planners, and investors identify high-wind areas for wind power generation[3] – indicates strong potential for adoption of wind power in Trinidad and Tobago, a Wind Resource Assessment Programme (WRAP) is required to evaluate the wind potential and chart a specific course for achieving targets. The WRAP process includes measurement and assessment of wind potential at prospective sites using meteorological masts and other data collection equipment such as LiDAR sensors, along with relevant software, depending on the characteristics of the selected location. Factors including wind speed and direction; temperature; relative humidity; atmospheric pressure; and air density would be assessed in the WRAP study.

Another factor to be considered in deciding whether to invest in wind energy assets is the Levelised Cost of Electricity (LCOE), which is defined as "the average total cost of building and operating the asset per unit of total electricity generated over an assumed lifetime." Alternatively, the levelised cost of energy can be thought of as "the average minimum price at which the electricity generated by the asset is required to be sold in order to offset the total costs of production over its lifetime."[4]

The Stantec report presents the following estimated LCOEs:

- **50MW onshore project – 45-85 US$/MWh**
- **200MW offshore project – 120 – 175 US$/MWh**

[3]https://globalwindatlas.info/en/about/introduction
[4]https://corporatefinanceinstitute.com/resources/valuation/levelized-cost-of-energy-lcoe/

Port of Galeota

Based on these figures, the report recommends that onshore wind measurements be started at Orange Field on the west coast and Galeota on the south-east coast of Trinidad. Commencement of offshore measurements is recommended at Galeota in Trinidad and at Crown Point on the south-east coast of Tobago.

Both the roadmap for hydrogen as well as the strategy for wind energy refer to the need for a suitable policy, legal and regulatory framework to support the implementation of renewable energy. Trinidad and Tobago has clearly signalled its stance as supporting decarbonisation through its iNDCs, the National Climate Change Policy, the National Environmental Policy and the Government's Vision 2030. However, renewable energy is yet to be incorporated into the laws that govern power generation in Trinidad and Tobago. The strategy highlights four critical Acts that would require amendment to include provisions for the adoption of renewable energy into the nation's energy mix:

- **Trinidad and Tobago Electricity Commission (T&TEC) Act (Amended 2009)**
- **Regulated Industries Commission (RIC) Act (Amended 2001)**
- **Environmental Management Authority (EMA) Act, 2000**
- **Town & Country Planning Act (Amended 1990)**

The legislation requires amendments to facilitate process harmonisation across governmental agencies and creation of an enabling environment for new industries that increases the ease of doing business. The lack of legislation to manage local content and local participation is also cited as a potential challenge in the strategy. Such a policy would address the need for capacity building to empower local communities, businesses and individuals to participate in the new industry's value chain. This would in turn, contribute to management of socio-economic and reputational risks.

Wind energy projects are capital intensive with multiple factors to be considered in the financial decision-making process. The strategy for wind energy estimates an investment of US$7-8 Bn would be required to construct a 2GW wind capacity plant in 2035.

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The document identifies several areas of risk that would concern investors in making a decision, including:

- **POLICY RISK – related to the presence or absence of enabling legislation, regulations and project permitting processes**
- **PROJECT IMPLEMENTATION RISK – related to the availability of relevant skills, equipment and infrastructure**
- **COUNTERPARTY RISK – related to the ability of the electricity off-taker to meet contractual obligations**
- **CURRENCY RISK – related to the country's economic strength and commensurate level of currency volatility**
- **BUSINESS RISK – related to the level of confidence in the development of the industry**

IMPLEMENTING A WIND ENERGY STRATEGY

The wind energy strategy outlines an aggressive programme towards implementation of the country's first utility-scale wind energy facility by 2035 involving actions from key stakeholders as shown at right.

Following the establishment of a clear vision for wind energy integration, the strategy recommends the formation of a steering committee to provide guidance and resources and ensure alignment of stakeholders. This process has commenced and NGC has been invited to participate on the Inter-Ministerial and Agency Steering Committee for the deployment of utility-scale wind energy, as announced by the Minister of Energy and Energy Industries in June 2024.

Government
Set vision and goals, amend and create laws, and demonstrate commitment

Steering Committee on Wind Energy
Develop policies, procedures and legislation, and track progress

Technocrats and State Entities
Implement laws and procedures and manage the auction process

Wind Energy Developers
Develop projects, manage risks and ensure economic viability

Additionally, NGC subsidiary - National Energy – in collaboration with the Ministry of Energy and Energy Industries, has embarked on a pilot project for the production of green hydrogen in Trinidad and Tobago.

NGC is pleased to support the nation's journey towards wind energy generation, which will build on its history of low carbon natural gas-based development. ■

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