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Towards a Hydrogen Energy Economy Transition in Trinidad and Tobago, West Indies: Part II – A Caribbean Case Study

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Abstract: *This paper (Part II) investigates the environmental, regulatory, and implementation aspects of developing hydrogen energy in Trinidad and Tobago (T&T). Hydrogen, especially green and blue pathways, has become an important part of low-carbon energy systems as the global energy sector moves quickly towards decarbonisation. This study looks at the environmental lifecycle of hydrogen production by using life cycle assessment (LCA) principles to look at emissions, energy inputs, and effects on sustainability. Case studies like NewGen Energy and CARIRI's proposed hydrogen innovation hub are used to put the findings in the context of industrial and policy landscape in T&T. A stakeholder matrix is used to show the roles, responsibilities, and incentives of important groups like government agencies, industry leaders, academia, and civil society. A policy roadmap is developed with specific, time-limited suggestions for how to include hydrogen in national energy and climate strategies. Despite the nation's strategic advantages, the transition to a hydrogen economy is hindered by regulatory gaps, limited access to green financing, technological constraints, and the need for workforce development. Phase 1 (1-5 years) addresses feasibility studies and pilot projects; Phase 2 (6-12 years) gives infrastructure development priority; and Phase 3 (13-25 years) seeks for full-scale production, export ready and domestic integration to remove challenges. The study evaluates the feasibility of blue hydrogen through a cost-benefit economic model, highlighting its potential to upgrade natural gas infrastructure. These initiatives support the efforts to diversify the economy, lower greenhouse gas emissions, and enhance energy security aligning with global climate objectives and sustainable development goals. The results show that the move to hydrogen energy depends on infrastructure and investment and strong governance and community involvement. It is crucial that the environmental and economic goals are in line with each other.*

Keywords: *Energy Diversification, Carbon Footprint, Hydrogen Infrastructure, Low-Carbon Energy, Economic assessment, environmental assessment, Trinidad and Tobago*

1. Introduction

The study looked at how to strategically place hydrogen production, how ready the country's industries are for it, and how economically feasible it would be in Trinidad and Tobago (T&T). This second paper builds on the first and goes into more detail about the bigger picture of implementation by looking at important topics like hydrogen safety standards, environmental life cycle assessment (LCA), infrastructure readiness, and case studies from the real world. It uses an economic model to figure out how much blue and green hydrogen can help the environment and how much it will cost. It also talks about how to add hydrogen to the energy and industry networks that are already there. The paper also talks about problems with the law and gives safety tips that follow international hydrogen standards set by groups like NFPA and ISO. These things are necessary to keep hydrogen safe while it is being made, stored, and moved. The problem is addressed from a local point of view with the NewGen project and the CARIRI hydrogen innovation cluster (McLeanv et al., 2021; METI, 2017).

The study also looks at how the stakeholders are involved, focussing on the reasons and roles of both public and private groups in promoting the use of hydrogen. As the world tries to cut down on carbon emissions, hydrogen is becoming a bigger part of energy systems in the future.

This step gives the nation a chance to not only follow environmental laws, but also to improve the economy, come up with new ideas for society, and lead in a way that is good for the environment. This paper proposes a complete plan for how to go from pilot projects to a hydrogen strategy for the whole country.

2. T&T's Energy Infrastructure Projects and Cases

New Gen Energy Limited is a Kenesjay Green company building a carbon-neutral green hydrogen facility in the Point Lisas Industrial Estate. This project aims to produce green hydrogen by electrolysis, so lowering the carbon footprint of present ammonia facilities. Once Hydrogène de France (HDF) bought a 70% share, Kenesjay Green kept 30% of the project.

Production facility and national hydrogen refuelling station: Apart from preparing to build a hydrogen refuelling station for fuel cell vehicles, the National Gas Company (NGC) of Trinidad and Tobago is also considering establishing a green hydrogen manufacturing facility run on solar and wind power (Mission Innovation, 2024).

Hydrogen Hub by CARIRI and Renewable Energy: Plans to build a hydrogen refuelling station for fuel cell vehicles and a green hydrogen production plant run by wind and solar energy have been announced by NGC.

Published by the government in November 2022, "The Roadmap for a Green Hydrogen Economy in Trinidad and Tobago", offers ideas for integrating green hydrogen into the energy sector. It looks at offshore wind power as a vital energy source for hydrogen generation and highlights the possibilities of green hydrogen to decarbonise the petrochemical industry (NewGen Energy Ltd., 2025). Figure 1 shows T&T's Maximum Industrial Hydrogen Demand based on sector.

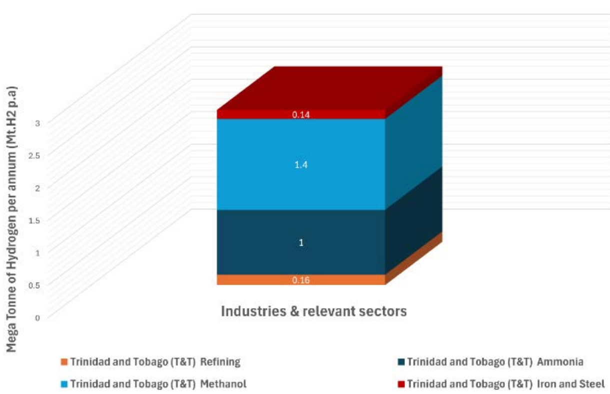

Figure 1. Trinidad and Tobago's Maximum Industrial Hydrogen Demand based on Sector (After Ramlakhan, 2025)

Regional initiatives in the Caribbean: Starting the Renewable project in association with HDF Energy and the European Union, Barbados Combining solar power generation with on-site green hydrogen storage, this project is the first power producing facility in the Eastern Caribbean to run on green hydrogen, so offering a consistent and clean source of energy.

The Aruba Green Hydrogen Valley: Green Hydrogen Valley on the island is being created by state-owned energy companies Acciona Energía and Aruba. This project seeks to establish Aruba as a leader in sustainable energy in the area by creating green hydrogen from renewable energy sources (Alves et al., 2020).

Examining how other countries have successfully carried out hydrogen projects that balance economic diversification with energy security can help T&T to develop its hydrogen sector. For instances, Germany's 2020 National Hydrogen Strategy has helped the country to be a worldwide leader in green hydrogen. The country has committed €9 billion to scale up hydrogen technologies to generate 5 GW of green hydrogen capacity by 2030 and import from key partners (BMWK, 2020). Germany's initiatives highlight how strong legal systems, public financing, and international cooperation might boost the hydrogen market; given its export-oriented economy and present energy infrastructure, T&T might decide to follow this path. Likewise, Japan has given hydrogen top attention in line with its long-term energy resilience. The country's Basic Hydrogen Strategy aims for a "hydrogen society" that is, more use of hydrogen in industry, transportation, and power generation (METI, 2017). Given Japan's limited domestic renewable capacity, T&T can pick a lot of lessons from its emphasis on importing and storing hydrogen. T&T could seek to work on hydrogen projects with countries rich in renewable energy.

Regarding exporting green hydrogen, Chile is also starting to lead the world. With many solar and wind resources under use, its National Green Hydrogen Strategy (2020) projects it to be among the top three global exporters. Chile has reduced rules and created public-private investment platforms to attract foreign investment which T&T may use to diversify away from traditional hydrocarbons (Chile Ministry of Energy, 2020). These examples show how smaller energy-producing countries such as T&T might compete in the hydrogen economy with the correct mix of financing, political support, and foreign cooperation. Give examples of regional projects looking at hydrogen-related concerns in T&T or surrounding areas to help to put the theoretical framework in perspective (Avargani et al., 2022).

3. Hydrogen Safety Standards

The language and communication are right to stress the need for strict safety and environmental rules in hydrogen infrastructure, but it would be more believable if it included current or suggested frameworks. The ISO 19880-1: 2020 standard for hydrogen refueling stations, for instance, has a lot of safety rules that deal with things like finding leaks, assessing risks, and shutting down the station in an emergency. The National Fire Protection Association (NFPA) in the United States of America (USA) has a code called the NFPA Hydrogen Technologies Code that tells people how to safely make, store, and use hydrogen. The National Renewable Energy Laboratory (NREL) do a lot of research and development on how hydrogen works, especially on making and testing safety sensors that can find leaks and check purity. Hydrogen is colourless and odourless (Azarpour et al., 2022). Their work provides important technical information and tools to help make safety rules in the US and around the world more consistent and up to date (Otto et al., 2022; Perreault et al., 2023; Lei et al., 2019). Besides, the EU's Clean Hydrogen Partnership is working to make hydrogen safer by making safety rules the same in all member states.

Even with these rules, people still do not follow them or accept them very well. This is especially true in crowded cities where safety concerns might make it hard to build infrastructure. As hydrogen technologies improve, it will be very important to keep up with them and set global standards (Bhaskar et al., 2020).

4. Evaluating Hydrogen Project Viability in Trinidad and Tobago: An Economic Model

The financial viability and general economic influence of hydrogen generation in T&T were assessed using a basic levelised cost of hydrogen (LCOH) model. This model evaluates the cost per kilogramme of manufacturing hydrogen by means of two distinct manufacturing routes: green hydrogen (renewable power with electrolysis) and blue hydrogen (natural gas with carbon capture). Important factors considered in the model are capital expenditure (CAPEX), operational costs (OPEX), natural gas and power prices, carbon pricing, and production volume.

A Levelised Cost of Hydrogen (LCOH) model is used to see if making hydrogen in T&T would be a good idea from a financial and economic point of view. This model calculates the cost of hydrogen per kilogramme over the life of a plant. It looks at things like capital expenses (CAPEX), operating expenses (OPEX), the cost of feedstock (natural gas and electricity), carbon pricing, and the plant's capacity. The formula for LCOH is:

$$\frac{(\text{CAPEX} \times \text{CRF} + \text{OPEX} + \text{Feedstock Costs} + \text{Carbon Costs})}{\text{Annual } H_2 \text{ Production}}$$

The Capital Recovery Factor (CRF) looks at the project's lifetime and the interest rate. Scenario analysis was also used for the green and blue hydrogen routes to look at local energy prices, the potential for renewable energy, and the assumptions about carbon taxes. Table 1 shows the assumptions used and the effects on T&T Energy Sector. This addresses how changes in petrol prices, carbon prices, and CAPEX scaling affect the cost of each unit.

4.1 Intricate a Roadmap for T&T Hydrogen Economy

T&T has presented a phased development of a green hydrogen economy in its Green Hydrogen Roadmap. This method evaluates the economics and viability of producing green hydrogen using economic modelling. Crucially important elements to keep in mind include:

Phase I: *Foundation and Pilot Development (Years 1–5)*

Goals:

1) Build policies, legal, and financial systems.
2) Overseeing green and blue hydrogen pilot projects.
3) Perform feasibility studies and build a cooperation between the public and commercial sectors.

Initiatives:

1) Emphasising blue hydrogen, start small-scale carbon capture (CCS) integration at Point Lisas, Couva, Trinidad, using already-existing natural gas supplies.
2) Green Hydrogen Pilots: For green hydrogen research use solar PV electrolysers and offshore wind.
3) Create models for both green and blue paths of the Levelised Cost of Hydrogen (LCOH).
4) Audits of present electrical systems and natural gas pipelines will help to ascertain hydrogen readiness.
5) Local trade schools and colleges introducing hydrogen courses will help to build capacity.

Energy Infrastructure Project estimates of production costs:

• Blue H_2: 1.5-2.5 kg/kg.
• Green hydrogen: 4-6 kg/kg
• The necessary initial infrastructure and pilot deployment funding falls between $500 million and $700 million USD.

Phase II: *Integration and Scale-Up (Years 6–12)*

Goals:

1) Capacity for high volume manufacturing.
2) Applying hydrogen in industry, transportation, and methanol and ammonia synthesis.
3) Increase exportability of hydrogen.

Table 1. Assumptions and their Effects on T&T Energy Sector

Important Assumptions	Effects on T&T Energy Sector
USD $1.50/MMBtu is the natural gas price T&T average domestic rate.	Supports low-cost blue hydrogen production; significantly below global averages.
Assuming solar power and any subsidies, green hydrogen electricity runs USD $0.06/kWh.	Enables competitive green hydrogen if solar power and subsidies apply.
Blue hydrogen scenarios are modelled using USD $30 per tonne CO_2 as the carbon price.	Increases blue hydrogen cost by ~$3–5/tonne H_2, depending on residual emissions. Blue hydrogen still emits CO_2 (even with CCS); green hydrogen is near-zero emission.
Plant capacity yearly is 100,000 tonnes.	Economic of scale; lowers unit cost in both blue and green pathways.

Source: Based on De Silva et al. (2023)

Crucially Important Work:

• Create specialist hydrogen transport systems and hydrogen mix retrofit pipelines.

• Replace grey hydrogen in Point Lisas petrochemicals with blue-green hydrogen.

• Build ammonia or hydrogen cargo export facilities with an eye towards European and Asian markets.

• Calculate breakeven times, net present value (NPV), internal rate of return (IRR) using dynamic economic analysis.

Practical Expectations include but not limited to:

1) Technologies of maturity and economies of scale help to lower costs.
2) Blue H_2: approximately 1.20/kg.
3) Green H_2: roughly 3.00/kg
4) By the end of Phase II, a Hydrogen energy economy is expected to account for 1.5% to 2.4% of GDP.
5) Direct and indirect employment range in number from 3,500 to 5,400.

Phase III: *Export Competitiveness and Market Maturity; Years 13 through 25*

Objectives:

1) T&T could be the Caribbean's Hydrogen hub.
2) Promote exports and technical creativity.
3) Use industrial hydrogen almost exactly in net-zero fashion.

Important aspects to consider:

• Funding local research and development projects for hydrogen storage, electrolysis efficiency, and fuel cell technologies will pay off.

• Applying international certifications for hydrogen products and carbon border adjusting strategies is an example of policy maturity.

• Export optimisation is aided by long-term agreements with global importers, such as Japan and South Korea.

• Circular economy ideas are integrated through waste heat recovery systems and chemical synthesis employing by-products.

Expected Outcomes:

1) Price parity for green hydrogen: approximately USD $1.50 to USD $2.00/kg.
2) Export revenue ranges from USD $1 to USD $1.5 billion per year.
3) Emissions decreased by 30% to 45% in the power and industrial sectors.
4) Full integration of hydrogen in heavy industry and public transportation.

This phased strategy offers a feasible and affordable roadmap for hydrogen adoption. Through its location, industrial capacity, and gas infrastructure, T&T can become a regional leader in hydrogen energy, supporting global decarbonisation goals and promoting sustainable economic growth. These models consider things including market demand, operational expenses, capital investment needs, and potential for renewable energy.

4.2. Hydrogen Infrastructure Technical Specifications

One flagship initiative using renewable energy sources to run the electrolysis process creating green hydrogen is the NewGen Project. Modern power plants and solar arrays' renewable energy is added to national grid power supply. Besides, raw water for electrolysis processes is supplied by the Water and Sewerage Authority (WASA). Using advanced electrolysers helps to generate hydrogen with low carbon emissions. Regarding integration, an ammonia plant in Point Lisas can satisfy 20% of its needs by generating hydrogen, so reducing the reliance on natural gas. T&T can leverage its present petrochemical infrastructure to simplify hydrogen transportation and storage.

4.3 Safety Guidelines and Current Laws Regarding Hydrogen Production

T&T is now building a thorough regulatory structure for hydrogen generation and safety. Standards produced by the Trinidad and Tobago Bureau of Standards (TTBS) are meant to follow global values. ISO standards cover ISO 19880 for gaseous hydrogen fuelling stations and ISO 22734 for hydrogen producers running water electrolysis. NFPA codes cover hydrogen technology in NFPA 2 and compressed gases and cryogenic fluids in NFPA 55.

The bulk of T&T's current energy infrastructure consists of the petrochemical and natural gas producing sectors. Several methods exist to convert this infrastructure for the production and distribution of hydrogen: Combining carbon capture and storage (CCS) with natural gas using already-existing gas processing plants produces blue hydrogen. Following safety guidelines and material compatibility, include hydrogen in natural gas pipelines and storage facilities (Ajeeb, et al., 2024).

Most of T&T's current energy infrastructure is adaptable. Several methods exist to convert this infrastructure for hydrogen generation and distribution: Combining natural gas with carbon capture and storage (CCS) using currently running gas processing plants results in blue hydrogen. Incorporating hydrogen into natural gas pipelines and storage facilities under material compatibility and safety guidelines. For instance,

1) Customising present port facilities to support export of goods derived from hydrogen. Potential Effects on Local Communities and Industries: Economic Aspects Changing T&T's economy to a hydrogen based one could have several negative repercussions for the local businesses and population. The hydrogen sector could generate new jobs in engineering, construction, and maintenance.
2) Retraining and educational initiatives are needed to provide staff members skills related to hydrogen technologies.

3) Regarding industrial diversification, present petrochemical industries can include hydrogen and associated goods on their product range.
4) Local communities must be involved in planning and decision-making procedures if we are to ensure fair benefits and handle problems. For the most current and complete information, review official publications from the Ministry of Energy and Energy Industries, the Government of Trinidad and Tobago, as well as recent reports from international energy organisations (Boretti, 2021; Butt et al., 2021).

5. Hydrogen Production Environmental Impact Analysis for T&T

A Lifecycle Assessment (LCA) approach was adopted to evaluate the environmental impacts of hydrogen production in T&T. This follows ISO 14040/44 standards, assessing emissions from raw material extraction, hydrogen production (electrolysis or steam methane reforming with CCS), transportation, and end-use. For green hydrogen, the assessment incorporated solar-based electricity and considered emissions from equipment manufacture, electrolysis operation, and transportation (~1,000 km). For blue hydrogen, upstream methane leakage, SMR process emissions, and carbon capture efficiency (assumed at 90%) were integrated. Emission estimates were benchmarked against global medians (e.g., 2.9 kg CO_2e/kg H_2 for green H_2) and adjusted for local transport distances and energy mix assumptions (Boodoo, 2023; Combariza Diaz, 2024; Das, Tushar and Zaman, 2021).

5.1 Environmental Influence

Although green hydrogen has environmental advantages, combining data and studies can help to clarify its capacity to lower greenhouse gas emissions (see Figure 2). Published in Nature Energy, a thorough investigation looked at 1,025 possible green hydrogen sites spread over 72 countries. Under ideal circumstances, the study found, the median life cycle GHG emissions for green hydrogen generation are roughly 2.9 kilogramme CO_2-equivalent per kilogramme of hydrogen. The 95% confidence interval

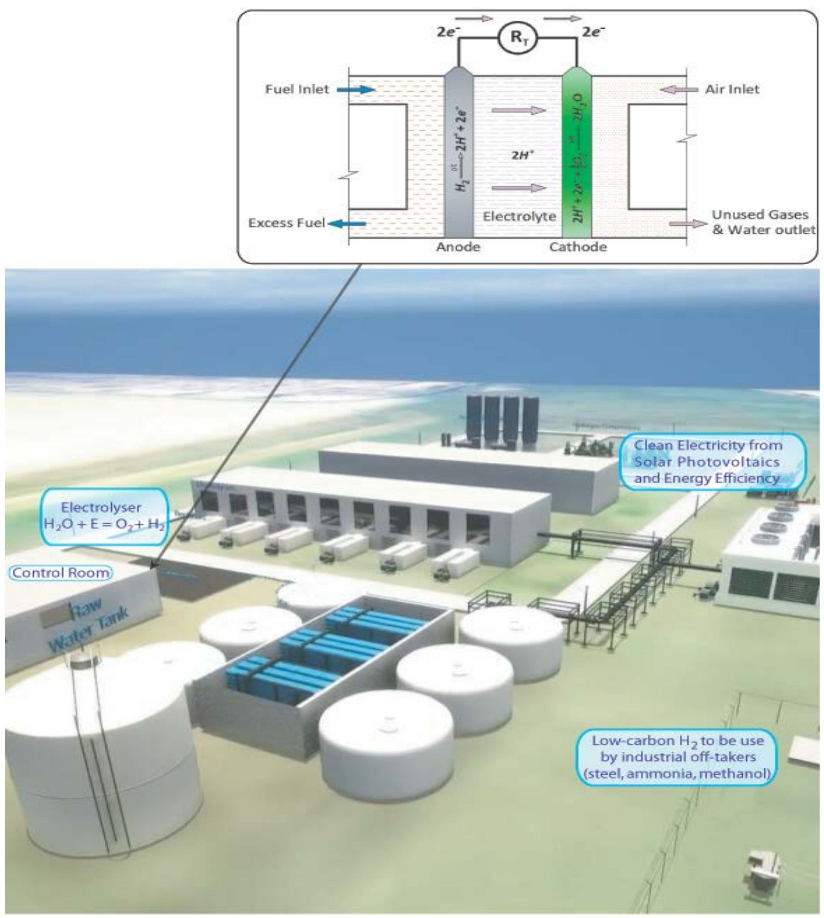

Figure 2: A Carbon Neutral/Green Hydrogen Project to Produce Decarbonised Hydrogen via the Electrolysis of Water Utilising Low Carbon Power Sources with Fuel Cells
Source: Adapted after Lei et al. (2019) and NewGen Energy Ltd, (2025)

runs 0.8 to 4.6 kg CO_2e/kg H_2. But transportation, including 1,000 km by pipeline or ship, can emit 1.5 to 1.8 kg CO_2e/kg H_2.

The Environmental Defence Fund discovered that by more than 60% over all time periods, green hydrogen paths can reduce the warming effects from fossil fuel technologies. Especially lowering hydrogen emissions to a low level (e.g., 1%) will increase the advantages for the climate by more than 90%. The results show the great potential of green hydrogen to slow down climate change, especially in cases of optimal manufacturing and distribution to lower emissions (Qazi, 2022; Ramlakhan, 2025).

Although hydrogen is usually praised as a clean energy source, the environmental effects of its manufacture and use vary significantly depending on the hydrogen generating method. Since it evaluates the environmental effects of a good or process from cradle to death, including resource extraction, manufacturing, use, and disposal, lifetime assessment (LCA) offers a more complete knowledge of these consequences (United Nation, 2023). Examples of hydrogen production environmental impact analysis in T&T are given in Table 2.

5.2 Economic Prospective

Although discussing an economic model is a good beginning, more specific information on the evaluation method and crucial components will make it more practical. Regarding capital and operational expenses (CAPEX and OPEX), such as the costs of electrolysers, storage systems, refuelling stations, and maintenance, an appropriate economic feasibility model for hydrogen infrastructure should consider. It should also consider transportation and distribution costs, market demand projections, hydrogen generation costs which today range between $3 and $6 per kilogramme depending on energy source and scale and Policy components that can have a big influence on economic results are subsidies, carbon pricing, and tax breaks. Changes in carbon credit values, technology learning curves, and electricity costs would need a sensitivity analysis to account for (Rohde, 2024; Schlapbach and Züttel, 2001; Shirizadeh et al., 2023).

Viability can be ascertained in part by metrics including payback period, return on investment (ROI), and Levelised Cost of Hydrogen (LCOH). Combining these criteria would offer a strong basis for assessing the short and long-term financial opportunities of hydrogen deployment, particularly in a regional context like T&T, where infrastructure limitations and energy markets vary. These components could improve the rigour and clarity of the text as well as guarantee that the claims made there are backed by accurate data (Davies and Oreszczyn, 2011; Dreamstime, 2025; Fattahi et al., 2024; Franco and Rocca, 2024).

5.3 Environmental Prospectuses from Hydrogen Production in T&T

Working on a sustainable energy system, T&T benefits the environment greatly from hydrogen generation especially using green and blue paths. When life-cycle emissions are as low as 0.1 to 0.4 kg CO_2 equivalent per kilogramme of green hydrogen generated by electrolysis run-through renewable energy sources like solar or offshore wind, almost none of greenhouse gases are emitted during operation. This also helps to avoid air pollutants including NOx and particulate matter, especially in fuel cells running

Table 2. Hydrogen Production Environmental Impact Analysis for T&T

Blue Hydrogen Natural Gas plus Carbon Capture	**Green hydrogen derived from renewable electricity plus electrolysis**	**Making Use of Effects**
LCA approximation: Depending on methane leakage rates and CCS efficiency, blue hydrogen in T&T could release 1.0–2.5 kg CO_2-equivalent per kg of hydrogen.	Mostly from renewable infrastructure and equipment development, green hydrogen releases just 0.1 to 0.4 kg CO_2-equivalent per kg.	Unlike engines or turbines, hydrogen combustion produces only water vapour, so preventing CO_2 emissions.
Little effect on land and ecosystems by combining manufacturing with current industrial sites like the Point Lisas Industrial Estate.	Land use: Solar and wind farms need vast acreage even though T&T shows promise for distributed solar and offshore wind.	High-temperature combustion may still generate NOx emissions, thus exhaust treatment and temperature control become even more important mitigating strategies.
Water use: SMR and CCS cooling systems make only modest use of water.	Water consumption: electrolysis requires roughly 9 litres of deionised water for every kilogramme of hydrogen. Though small, this could be a sustainability issue in areas experiencing water scarcity.	Fuel cells offer silent, clean energy conversion free of direct emissions whether they are used for mobility or stationary electricity.
Although CCS can reduce CO_2 emissions by up to 90%, methane leakage during natural gas extraction and transportation remains a problem. Over 100 years, methane has a global warming potential 28 to 36 times higher than CO_2.	During running, solar or wind energy produces virtually none of any greenhouse gas emissions.	
Blue hydrogen is the most immediately practical choice given T&T's large natural gas reserves and developed gas processing infrastructure.	Though it is currently more costly, green hydrogen made from water electrolysis using renewable electricity has the lowest emissions.	

Source: abstracted from METI (2017)

Table 3. Stakeholder Matrix for Hydrogen Deployment in T&T

Stakeholder	Roles	Responsibilities	Incentives
Ministry of Energy	Policy formulation, permitting	Approve hydrogen projects, set safety and energy targets	Energy transition leadership, emissions reduction
National Gas Company (NGC)	Infrastructure provider	Hydrogen pipeline & export hub integration	Revenue diversification, global market access
PowerGen and T&TEC	Energy generation and grid integration	Supply renewable energy to electrolysers	Modernise grid, enter renewable market
International Developers	Project finance and technology provision	Build and operate hydrogen production facilities	Return on investment, carbon credits
Local Communities	Workforce, land use, environmental impact monitor	Support or resist project development	Employment, improved infrastructure
Academia and NGOs	Research, public awareness	Assess impacts, improve technology	Capacity building, sustainability advocacy

silent, clean electricity without burning using hydrogen. If methane leakage is reduced, blue hydrogen which comes from natural gas with carbon capture and storage (CCS) has lower emissions (i.e., 1.0 to 2.5 kg CO_2 equivalent per kilogram. This still represents a major improvement over conventional fossil fuel.

Like at the Point Lisas Industrial Estate, both paths help to enable the reuse of already-existing infrastructure and considerably reduce carbon 2 emission compared to conventional fuels. By substituting low-emission fuels in sectors including transportation, generation of electricity, and petrochemicals, hydrogen can be quite crucial in reducing the entire carbon footprint of the country. The Environmental Defence Fund claims that optimising green hydrogen systems can reduce the over 90% warming impact of fossil fuels replacements. In a country mainly dependent on hydrocarbons, hydrogen offers a unique environmental potential in preserving energy leadership while aligning with international decarbonisation ambitions (Furukawa et al., 2013; Garner and Dehouche, 2023; Goubran et al., 2023).

6. Public Acceptance and Stakeholder Involvement in T&T's Hydrogen Transition

Technology or policy will not be the only factors influencing the nation's switch to a hydrogen economy. Wide stakeholder involvement and community participation are needed to guarantee long-term success and a social license to operate. Energy projects, particularly those involving developing technologies like hydrogen, call for openness, inclusiveness, and confidence building among all spheres of life. These components could improve the rigour and clarity of the work, and guarantee that the arguments put forward are backed by accurate data (Hinojosa et al., 2022). A stakeholder matrix for hydrogen deployment in T&T is elaborated in Table 3.

6.1 Civic Society, Local Communities, Workers and Labour Unions

Given T&T's large, unionised energy workforce, applying just transition ideas is essential. Projects involving hydrogen could affect land use, infrastructure building, and the environment. Communities can consider these developments as imposed from without or as environmentally harmful in the lack of quick and ongoing consultation. T&T should do public consultations considering regional issues and impact studies (Icaza-Alvarez et al.,2024; IEA, 2021; Konoplyanik, 2022). These include:

1) Start public awareness campaigns on the benefits, security, and financial opportunities of hydrogen.
2) Design community benefit-sharing programmes, particularly in places where industrial growth has had instantaneous effects.
3) Engage labour groups and unions in planning hydrogen rollouts and national hydrogen strategy discussion, and
4) Invest in reskilling and upskill initiatives to equip staff for hydrogen technologies.

6.2. Industry Involvement

Important to the T&T's economy, hydrogen adoption directly affects energy-intensive industries including ammonia, methanol, and liquefied natural gas (LNG). Effective participation entails organising industry roundtables to match public and commercial agendas. Working on pilot projects to increase trust and knowledge and promoting cooperation with worldwide hydrogen leaders, a good practice is involving national businesses such as, NGC and Massy Energy (Slaughter and Kulkarni, 2015).

6.3 Research and Academic Institutions

Local technical colleges and universities (including, College of Science Technology and Applied Arts of Trinidad and Tobago (COSTAATT), The University of Trinidad and Tobago (UTT), as well as The University of the West Indies, St. Augustine Campus) should be supported and financed to conduct autonomous policy, safety, and hydrogen production research. They should work with government and business for demonstration projects and offer specific training courses for renewable energy technologies.

6.4 Regulatory Authorities and Policies

One must coordinate a cross-sectoral effort. Establishing a multi-stakeholder advisory group (like the UK-Hydrogen Delivery Council and Belgium-Hydrogen Council) could help to encourage ongoing discussion and policy input among government, business, academia, and civil society. Including local ownership, equity, and resilience as well as stakeholders in the hydrogen transition enhances project success. Using a participative approach ensures that following international environmental standards, hydrogen development in T&T reflects national goals (Kountouris et al., 2024; Liu et al., 2020).

7. Research, Development and Innovation (RDI)

T&T must keep funding research development and innovation (RDI) if it is to lead in hydrogen development regionally. In addition to lowering costs and improving efficiency, innovation lets global technologies be customised to T&T's energy mix, climate conditions, industrial base (see Figure 3).

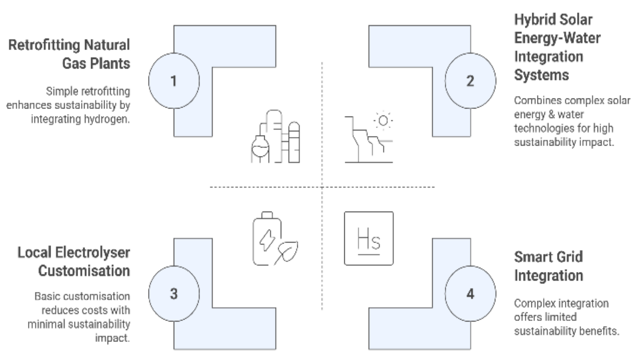

Figure 3. Priotising Green Hydrogen Production Research, Development and Innovation (RDI) Areas

Several RDI areas can be considered. These include:

1) Low-cost Green Hydrogen Production Local Electrolyser: Research and Innovation Priority Areas
2) Design and Optimisation: Customising electrolyser technology to local conditions (such as high humidity in a tropical area) could help to lower import reliance and maintenance costs.
3) Developing hybrid systems for decentralised green hydrogen generation that combine solar panels with water purification technologies is known as solar-water integration systems. Think about turning absorbed CO_2 into value-added products fit for the petrochemical industry such as synthetic fuels or urea.
4) Creating affordable, corrosion-resistant materials for tanks and pipes fit for hydrogen's properties will help with transportation and storage of this fuel.
5) Ammonia as Hydrogen Carrier: Research on effective breaking and conversion methods for hydrogen export is vital considering T&T's ammonia infrastructure.
6) Retrofitting current natural gas plants and pipelines will help to produce hydrogen blending capabilities, and
7) Smart Grid Uses: Researching hydrogen's roles in energy storage and load balancing for next systems heavy on renewable energy.

8. Discussion and Directions for Transition

This paper takes initial steps toward shaping energy policies that support the introduction of standalone hydrogen systems. The fossil fuel and hydrocarbon industries, which have propelled T&T to global prominence, are facing a decline due to increasing pressure to reduce carbon emissions. Global targets for net-zero emissions, the rise of renewable energy sources, the proliferation of electric vehicles, and stringent zero-emission regulations are limiting the future of these sectors.

Blue hydrogen in T&T might cost between US$1.40 and US$1.60 per kilogramme because petrol prices are cheap there and the government supports the current infrastructure. When one adds carbon capture to it, it stays very cheap and fits with the goals for reducing carbon emissions. It costs between $3.00 and $4.50 per kilogramme for green hydrogen because electrolysis equipment is expensive and renewable energy generation is yet small scale. Costs should go down as technology becomes better and money from other countries comes in.

At today's international rates, making hydrogen at Point Lisas, Couva, for export, with an emphasis on ammonia or methanol, offers a positive net present value (NPV). This is true because the port and plant infrastructure are in such bad shape right. Moreover, sensitivity studies reveal that in the next 5 to 10 years, lower electrolyser CAPEX and higher international carbon pricing could make green hydrogen cheaper.

By including hydrogen in its energy exports and running its own industrial operations on clean energy, T&T can ensure long-term energy security, meet future market needs, and lower carbon intensity in its goods. Important areas, including policy design, stakeholder involvement, R&D, and environmental evaluation, must be given top priority for enabling the change. Hydrogen clearly offers environmental and financial advantages. This resource clearly has advantages both economically and environmentally. T&T can lower the carbon intensity of its products, meet future market needs, and guarantee long-term energy security by including hydrogen in its exports and running its own industrial activities on clean energy.

Policy design, stakeholder involvement, R&D, and environmental assessment must be given top priority. T&T has the necessary ability and the capability to create a hydrogen economy. T&T may reinterpret itself as a worldwide hydrogen exporter with the correct policy frameworks, well-coordinated stakeholder activity, and the dedication to innovation. These actions would accomplish financial resilience and environmental sustainability.

A well-developed action plan is crucial to advancing the hydrogen economy. T&T's current plans may not fully capture the immense potential benefits that can be realised. Being already an energy exporter, T&T must now incorporate zero-emission components into its exports. By utilising hydrogen to power its processing operations, the country can enhance the environmental profile of its products, meet evolving global market demands, and secure its future in a carbon-constrained world.

Collaborative efforts are needed to mobilise stakeholders and drive the global decarbonisation agenda. The urgent need to address environmental degradation necessitates the exploration of clean and efficient energy alternatives. The hydrogen economy presents an attractive and sustainable solution. If T&T are to keep momentum and forward the national conversation on hydrogen, future studies must go beyond technical viability and investigate the broader socio-economic, legal, and environmental aspects. There is a need for T&T to initialise more Hydrogen Energy RDI and scholarly investigation (see Figure 4).

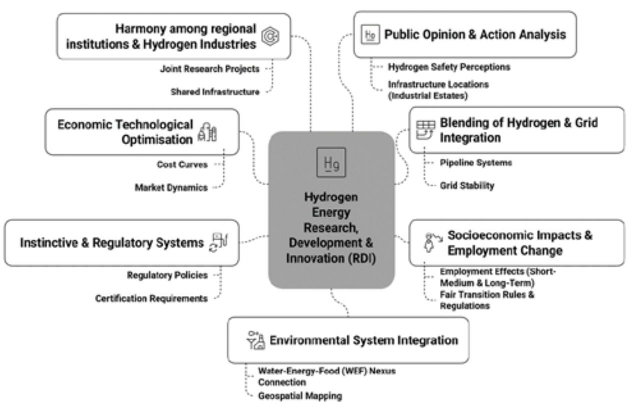

Figure 4. Hydrogen Energy Research, Development and Innovation (RDI) required for T&T

Several areas are identified for further investigation by local and regional organisations. These include:

1) *Economic Technology Optimisation*: Create integrated models that faithfully reflect cost curves, market dynamics, and several hydrogen generating opportunities. Analyse under different international carbon pricing policies how economically competitive hydrogen exports is to more precisely assess the advised areas of research.
2) *Blending of Hydrogen and Grid Integration*: Analyse for current pipeline systems the technical consequences of combining hydrogen with natural gas. Analyse how hydrogen could be applied in load balancing, grid stability, and energy storage in mixes mostly depending on renewable energy. Future studies should explore the wider socio-economic, legal, and environmental aspects beyond technological viability.
3) *Economic Technological Optimisation*: Develop integrated models that reasonably reflect several hydrogen producing scenarios, market dynamics, and cost curves.
4) *Socioeconomic Impact and Employment Change*: Examine how employing hydrogen affects employment, especially in industries mostly dependent on gas and oil. Provide fair transition rules guaranteeing communities get their fair part of the benefits.
5) *Instinctive and Regulatory Systems*: Examine early moved hydrogen nations (such Germany and Japan) to develop customised policy systems for T&T by means of regulatory policies. Review the institutional and legal requirements for world trade low-carbon hydrogen certification.
6) *Harmony among Regional Institutions and Hydrogen Industries*: Examine potential paths for hydrogen cooperation all around the Caribbean including joint research projects, export alliances, and shared infrastructure.
7) *Public Opinion and Action Analysis*: Invest qualitatively in public impressions of safety, hydrogen technologies, and infrastructure location.
8) *Environmental System Investigation*: Examine closer the water-energy connection between green hydrogen generation and T&T's freshwater source. Discover the best sites for hydrogen generation with the least possible environmental disturbance using geospatial mapping technologies.

9. Conclusions

This paper underlines the strategic relevance of hydrogen as a main component of T&T's future energy transformation. Conventional fossil fuel companies that have contributed to T&T's economy are facing increasing limitations as global momentum towards net-zero emissions grows. Hydrogen appears to be a practical and sustainable substitute, one that can uphold the nation's energy leadership and contribute to global decarbonisation efforts in the evolving energy landscape. With its robust natural gas infrastructure, extensive petrochemical experience, and an export-ready industrial base, T&T is well-positioned to lead in hydrogen development. T&T can use a phased hydrogen approach, beginning with blue hydrogen and working towards green hydrogen as technology develops and costs drop, even while location may prevent significant solar or wind deployment.

While the high costs associated with hydrogen production, storage, and transportation have historically been a significant barrier, T&T's abundant low-cost renewable energy resources make it a viable option. T&T has the potential to transform from an oil and gas exporter to a global hydrogen exporter, driving economic growth and environmental benefits. The feasibility of utilising fuel cells and producing hydrogen from renewable sources to address T&T's electricity supply and energy security challenges has been explored (Stangarone, 2021; Tota-Maharaj and Paul, 2015; Tota-Maharaj, 2020). Researchers have identified and assessed strategies to encourage interest in hydrogen fuel cells at the tertiary level. Developing a renewable energy-based hydrogen economy is particularly significant for T&T, a nation rich in natural gas and technologically advanced. Like developed nations, T&T can enhance its energy security, reduce carbon emissions, and diversify its energy supply.

T&T is uniquely positioned to leverage its technology and infrastructure to provide solutions to global energy challenges. Hydrogen offers a promising alternative as its geography may constrain the widespread adoption of solar and wind energy. A hydrogen economy could harness T&T's sustainable energy potential and ensure long-term economic viability within an environmentally responsible framework (Konoplyanik, 2022; Qazi, 2022). Transitioning to a hydrogen economy is both feasible and essential.

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References:

Ajeeb, W., Neto, R.C. and Baptista, P. (2024), "Life cycle assessment of green hydrogen production through electrolysis: A literature review", *Sustainable Energy Technologies and Assessments*, Vol.69, pp.103923.

Alves, T., Fetter, M., Busby, C., Gontijo, R., Cunha, T.A. and Mattos, N.H. (2020). "A tectono-stratigraphic review of continental breakup on intraplate continental margins and its impact on resultant hydrocarbon systems. Marine and Petroleum Geology", Vol.117, p.104341. Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Avargani, V.M., Zendehboudi, S., Saady, N.M.C. and Dusseault, M.B. (2022), "A comprehensive review on hydrogen production and utilisation in North America: Prospects and challenges", *Energy Conversion and Management*, Vol.269, p.115927. Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Azarpour, A., Mohammadzadeh, O., Rezaei, N. and Zendehboudi, S. (2022), "Current status and future prospects of renewable and sustainable energy in North America: Progress and challenges", *Energy Conversion and Management*, Vol.269, pp.115945.

Bhaskar, K., Solomon, J.M., Sathyamurthy, R., Anaimuthu, S. and Vinayagam, N.K. (2020), "A review on PEM fuel cells used for automotive applications, models and hydrogen storage for hybrid electric fuel cell vehicle", *International Journal of Green Energy*, [Online] Available at: https://www.tandfonline.com [Accessed 8 July 2025].

Boodoo, C. (2023), "Post-pandemic natural gas utilisation in Trinidad and Tobago: A sectoral analysis (2020–2023)", *European Journal of Energy Research*. Available at: https://www.ej-energy.org/index.php/ejenergy/article/view/134 [Accessed 8 July 2025].

Boretti, A. (2021), "There are hydrogen production pathways with better than green hydrogen economic and environmental costs", *International Journal of Hydrogen Energy*. [Online] Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Butt, O.M., Ahmad, M.S., Che, H.S. and Rahim, N.A. (2021), "Usage of on-demand oxyhydrogen gas as clean/renewable fuel for combustion applications: A review", *International Journal of Green Energy*, Vol.18, No.13, pp.1405-1429. [Online] Available at: https://www.tandfonline.com [Accessed 8 July 2025].

Combariza Diaz, N.C. (2024), "Alternative pathways for green hydrogen economy: The case of Colombia", *Contemporary Social Science*. [Online] Available at: https://www.tandfonline.com [Accessed 8 July 2025].

Das, B.K., Tushar, M.S.H.K. and Zaman, F. (2021), "Techno-economic feasibility and size optimisation of an off-grid hybrid system for supplying electricity and thermal loads", *Energy*, [Online] Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Davies, M. and Oreszczyn, T. (2011), "The unintended consequences of decarbonising the built environment: A UK case study", *Energy and Buildings*, Vol.46, pp.80-85; https://doi.org/10.1016/j.enbuild.2011.10.043.

De Silva, V. et al. (2023), "Framework for development of a renewable energy policy for Trinidad and Tobago (T&T)", Renewable Energy Committee, Department of Energy. Available at: https://www.energy.gov/eere/island-energy-snapshots [Accessed 8 July 2025].

Dreamstime (2025), "Trinidad and Tobago satellite country and globe", isolated [image]. Available at: https://www.dreamstime.com/trinidad-tobago-satellite-country-globe-isolated-trinidad-tobago-globe-shape-country-against-zoomed-image187285081 [Accessed 9 June 2025].

Fattahi, A., Dalla Longa, F. and van der Zwaan, B. (2024), "Opportunities of hydrogen and ammonia trade between Europe and MENA", *International Journal of Hydrogen Energy*, Vol.83, pp.967-974. [Online] Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

BMWK (2020), *The National Hydrogen Strategy. Germany*. Federal Ministry for Economic Affairs and Climate Action, Available at: https://www.bmwk.de/Redaktion/EN/Publikationen/Energie/the-national-hydrogen-strategy.pdf [Accessed 8 July 2025].

Franco, A. and Rocca, M. (2024), "Renewable electricity and green hydrogen integration for decarbonisation of 'Hard-to-Abate' industrial sectors", *Electricity*, Vol.5, No.3, pp.471-490. https://doi.org/10.3390/electricity5030024.

Furukawa, H., Cordova, K.E., O'Keeffe, M., and Yaghi, O.M. (2013), "The chemistry and applications of metal–organic frameworks", *Science*, Vol.341, No.6149, pp.1230444. https://doi.org/10.1126/science.1230444.

Garner, R., and Dehouche, Z. (2023), "Optimal design and analysis of a hybrid hydrogen energy storage system for an island-based renewable energy community", *Energies*, Vol.16, No.21, Article 7363. https://doi.org/10.3390/en16217363.

Goubran, S., Walker, T., Cucuzzella, C. and Schwartz, T. (2023), "Green building standards and the United Nations' sustainable development goals", *Journal of Environmental Management*, Vol.326, p.116552. [Online] Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Hinojosa, J. L., Villamizar, S., and Gama, N. (2022), "Green Hydrogen Opportunities for the Caribbean", Inter-American Development Bank. Available online: http://dx.doi.org/10.18235/0004621.

Icaza-Alvarez, D., Jurado, F., and Tostado-Véliz, M. (2024), "Smart energy planning for the decarbonisation of Latin America and the Caribbean in 2050", *Energy Reports*, Vol.11, pp.6160–6185. https://doi.org/10.1016/j.egyr.2024.05.067.

IEA (2021), "Global Hydrogen Review 2021", International Energy Agency (Available online: https://www.iea.org/reports/global-hydrogen-review-2021.

Konoplyanik, A.A. (2022), "Challenges and potential solutions for Russia during global gas transformation and 'Green Revolution'", *Energy Policy*, [Online] Available at: https://www.sciencedirect.com [Accessed 8 July 2025].

Kountouris, I., Bramstoft, R., Madsen, T., Gea-Bermúdez, J., Münster, M. and Keles, D. (2024), "A unified European hydrogen infrastructure planning to support the rapid scale-up of hydrogen production", *Nature Communications*, Vol15, pp.5517. Available at: https://www.nature.com [Accessed 8 July 2025].

Lei, Q., Wang, B., Wang, P., and Liu, S. (2019), "Hydrogen generation with acid/alkaline amphoteric water electrolysis", *Journal of Energy Chemistry*, Vol.38, pp.162-169. https://doi.org/10.1016/j.jechem.2018.12.022.

Liu, H., Islam, M.A., Khan, M. A., Hossain, M.I., and Pervaiz, K. (2020), "Does financial deepening attract foreign direct investment? Fresh evidence from panel threshold analysis", *Research in International Business and Finance*, Vol.53, 1pp.01198. https://doi.org/10.1016/j.ribaf.2020.101198.

McLean, S., Charles, D., and Rajkumar, A. (2021), "Navigating transfer pricing risk in the oil and gas sector: Essential elements of a policy framework", ResearchGate. Available online: https://www.researchgate.net/publication/349849243.

METI (2017), "Basic Hydrogen Strategy", Ministry of Economy, Trade and Industry, Japan (Available online: https://www.meti.go.jp/english/press/2017/pdf/1226_003a.pdf.

Mission Innovation (2024), "Clean Hydrogen Mission", Available online: https://mission-innovation.net/missions/hydrogen/.

NewGen Energy Ltd. (2025), "The NewGen Carbon Neutral/Green Hydrogen Project will produce decarbonised hydrogen via the electrolysis of water utilising low carbon power sources", Available online: https://newgenenergyltd.com/the-project/ [Accessed: 10 Jun. 2025]

Otto, M., Chagoya, K.L., Blair, R.G., Hick, S.M. and Kapat, J.S. (2022), "Optimal hydrogen carrier: Holistic evaluation of hydrogen storage and transportation concepts for power generation, aviation, and transportation", *Journal of Energy Storage*, Vol.55, pp.105714. Available at: https://www.sciencedirect.com [Accessed 8 July 2025]

Perreault, P., Boruntea, C.-R., Yadav, H. D., Guo, Y., Bengaouer, A., and Flamant, G. (2023), "Combined methane pyrolysis and solid carbon gasification for electrified CO_2-free hydrogen and syngas production", *Energy Conversion and Management*, Vol.290, pp.117003. Available online: https://www.sciencedirect.com/science/article/pii/S0196890423007329 [Accessed: 9 Jun. 2025].

Qazi, U.Y. (2022), "Future of hydrogen as an alternative fuel for next-generation industrial applications; challenges and expected opportunities", *Energies*, Available at: https://www.mdpi.com [Accessed 8 July 2025].

Ramlakhan, D. (2025), "Game-Changing H2 Production", HDF Energy (Hydrogène de France). Available online: https://cekh.ccreee.org/wp-content/uploads/2024/01/Session%204%20-%20%20-%20Dr.%20Dale%20Ramlakhan%20-%20HDF%20Energy_.pdf [Accessed: 30 May 2025].

Rohde, R. (2024), "Global temperature report for 2023", Berkeley Earth. Available online: https://berkeleyearth.org/wp-content/uploads/2024/01/AnnualPlot-2023-1.png.

Schlapbach, L., and Züttel, A. (2001), "Hydrogen-storage materials for mobile applications", *Nature*, Vol.414, No.6861, pp.353-358.

Shirizadeh, B., Ailleret, A., Guillon, A., Bovari, E., El Khatib, N., Douguet, S., Issa, C.B., Brauer, J. and Trüby, J. (2023), "Towards a resilient and cost-competitive clean hydrogen economy: The future is green", *Energy and Environmental Science*, Vol.16, No.12, pp.6094-6109. [Online] Available at: https://www.rsc.org [Accessed 8 July 2025]

Stangarone, T. (2021), "South Korean efforts to transition to a hydrogen economy", *Clean Technologies and Environmental Policy*, Springer. Available at: https://www.springer.com [Accessed 8 July 2025].

Tota-Maharaj, K. (2020), "Bioelectrochemical systems for stormwater treatment and energy valorisation processes". In: *Integrated Microbial Fuel Cells for Wastewater Treatment*, Butterworth-Heinemann, pp.175-197

Tota-Maharaj, K., and Paul, P. (2015), "Performance of pilot-scale microbial fuel cells treating wastewater with associated bioenergy production in the Caribbean context", *International Journal of Energy and Environmental Engineering*, Vol.6, pp.213-220.

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