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Caribbean Energy 2024:

Prospects, Challenges & Opportunities for Oil & Gas, Renewables and Environment

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Introduction

The energy sector across the Caribbean[2] is extremely diverse and the prospects, challenges, and opportunities are very different in different Caribbean nations.

The region includes some of the world's oldest and most mature oilfields, in Trinidad, and some of the world's biggest and most significant new greenfield oil and gas developments in Guyana, with similar prospects in Suriname. There are a few countries who are major exporters of energy and natural gas derived commodities and many countries who rely on imports for most of their energy needs.

While many countries have ambitious renewable energy targets, actual deployment remains relatively modest. The highest proportion of renewable electricity generation is in Belize and Suriname, where hydroelectricity accounts for just under half generation capacity, with Barbados and Dominica leading in terms of generation capacity from solar (around 25%) and Jamaica from wind (around 6% of electricity generation). Meanwhile, Trinidad & Tobago is entirely reliant on natural gas for electricity generation (though a major solar project is under construction).

What does unite all countries in the region is the fact that their domestic market for electricity is small, with only Trinidad & Tobago having a significant industrial demand for electricity from its well-developed petrochemical and heavy industrial sector. Small grids pose a particular challenge when it comes to deploying intermittent renewable energy sources and this is a major reason why renewable deployment has lagged the ambitious targets.

Electricity prices in the region are typically very high, with the exceptions of Trinidad & Tobago and Suriname, which both have very low subsidized prices. High electricity prices pose a major constraint on the development of competitive economic sectors and private-sector growth; high costs of air conditioning is a major issue for hotels in the Caribbean trying to complete with mass tourism products in other regions.

All countries in the region are also united by their vulnerability to natural disasters, exacerbated through climate change. Hurricanes are a major threat across the Caribbean archipelago, with global warming projected to make storms more frequent and more intense. Hurricanes can have a major devasting impact on economies and on the energy infrastructure. While Guyana, Suriname and (to an extent) Trinidad & Tobago are to the south of the hurricane zone, they remain vulnerable to sea-level rise and other climate impacts, including flooding caused by more intense rainfall.

Oil and Gas Exploration and Production

Two countries in the region, Guyana and Suriname, are amongst the most exciting and dynamic oil and gas provinces in the world. Guyana in particular has seen an unprecedented growth in its

[2] This paper will concentrate on the English-speaking CARICOM nations plus Suriname.

oil production with a whole series of massive exploration successes and an extremely rapid development of the industry since the first significant oil find under a decade ago.

The Exxon-led consortium in the Stabroek block has pursued the development of the very significant oil resources in the block at a relentless pace. With first oil being produced in December 2019, there are already three FPSOs operating on the block (Liza Destiny, Liza Unity and Prosperity) with production ramping up to over 600,000 barrels of oil per day. Construction is underway on FPSOs for the Yellowtail and Uaru projects, with Yellowtail anticipated to start production in 2025 and Uaru targeted in 2026. The sixth FPSO, Jaguar, is also under construction for the deployment on the recently sanctioned Whiptail project. The speed of the developments in Guyana and the pace of the ramp-up in production is unprecedented.

All of Guyana's oil production is exported to international markets. There is a project in execution deliver pipeline gas from offshore to a new gas fired power plant and a gas processing facility to produce LPG. Currently all gas is reinjected into the reservoirs.

In Suriname, the pace of development has been slower and more typical of the global industry. Onshore Suriname, the State oil company has been producing oil for many decades and there is a small refinery, primarily supply product to the domestic market through with some exports of diesel to regional markets. There have been very significant resources (oil and gas) discovered offshore but there have not yet been any major offshore projects sanctioned. The expectation is that there will be a major project sanctioned by Total later this year.

The Surinamese reservoirs discovered to date typically contain higher percent of gas than the reservoirs discovered in Guyana. Finding a route to market for this gas is a major strategic issue for the development of the industry in Suriname.

At the other end of the scale to Guyana, in terms of maturity of the oil and gas industry, is Trinidad & Tobago, one of the world's oldest oil and gas producing provinces. Trinidad's oil production started in the early years of the twentieth century and peaked in the early 1980s and has been on a downward trajectory since. Gas production began in the 1950s, first used for electricity production and then petrochemicals (ammonia and methanol). Gas production expanded rapidly in the 1990s and the early 2000s, with the development of the Atlantic LNG export facility and the expansion of petrochemical production. Gas production peaked in 2010 and has been on a downward trajectory since, as the larger prolific shallow water gas fields have been exploited and more recent developments have typically been smaller and more marginal fields.

There have, however, been some major gas finds in deep water acreage with the potential for increased production over the next decade. Bp and Shell have seismic campaigns planned for four deepwater blocks. The major discovered resource and potential development is the Calypso project in the deepwater area between Tobago and Barbados, licensed to Woodside and bp. Woodside are actively working on development concepts and offtake marketing agreements for this block, as well as reviewing fiscal terms with the T&T government. There are also two exploration blocks on the Barbados side of the maritime boundary, licensed to Woodside and Shell (though Woodside has recently announced it is exiting one of the blocks).

There are also very significant gas resources just across the maritime boundary in Venezuela, in both the Mariscal Sucre acreage and the Plataforma Deltana, as well as fields straddling the maritime boundary. In the Mariscal Sucre area, Shell and the T&T National Gas Company have a license to develop the Dragon gas field and this development has a separate specific United States OFAC license (meaning it is not currently subject to US sanctions). The Dragon field, previously drilled by PDVSA, is close to existing Shell infrastructure in Trinidad.

Shell is moving forward with the development of the Trinidad (Manatee) side of the Loran-Manatee field, with indications that gas on the Venezuela side of the maritime boundary (Loran) could also eventually be exported to Trinidad. There have also been recent discussions around the cross border Manakin-Cocuina gas field, licensed to bp on the T&T side of the border.

In addition to these offshore gas fields, there are active discussions underway for the export of gas current flared or vented on onshore oilfields in Venezuela to Trinidad by pipeline.

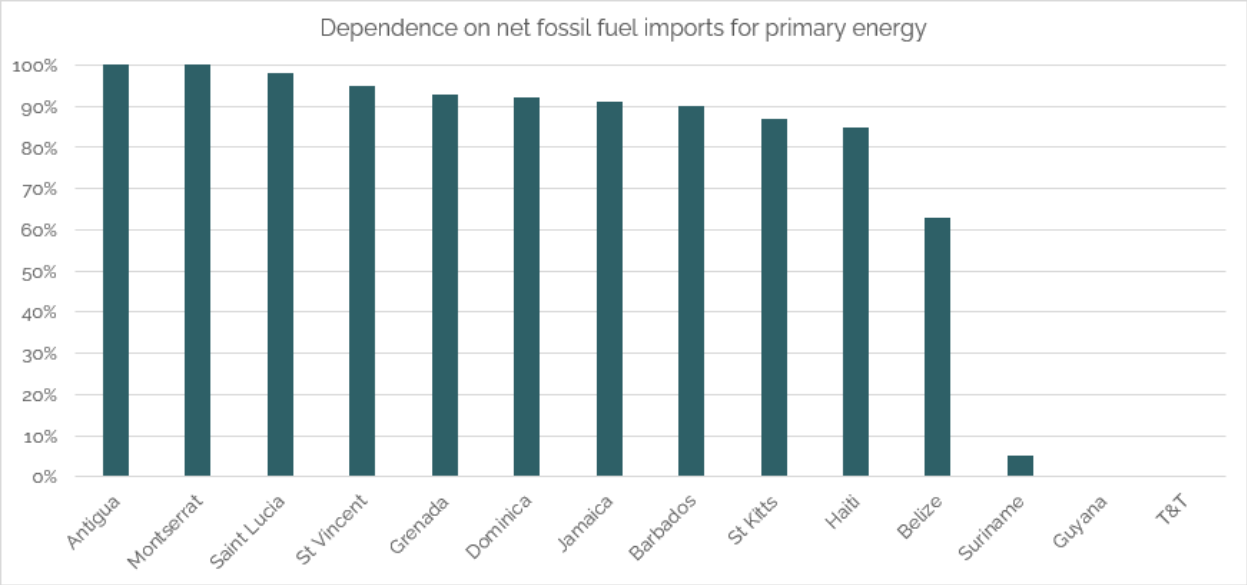
All of these projects with Venezuela carry a high degree of political risk, given the political situation in Venezuela, US Venezuela policy and the sanctions regimes.

Outside of these three major oil and gas producers, there are very small volumes of oil being produced in Belize and Barbados. There was an announcement of a gas find offshore Grenada in 2017, but subsequently there has been little news except for the fact that in 2023 the Government was setting up a working group to investigate the situation. There are also potential wildcat exploration campaigns across the region, including Bahamas, Jamaica, and Barbados. Most of these are speculative campaigns being pursued by small independent companies (except in Barbados).

With the notable exception of Belize, governments in the Caribbean have all taken the policy position that if there are oil and gas resources in their territory, they will exploit these resources and produce as much as they can, as quickly as they can, and supply international and local markets. Governments in the region have pushed back against suggestions, mainly coming from international NGOs, that they should leave oil and gas in the ground as part of the battle against global warming. In the case of Belize there is a moratorium on offshore exploration, because of concerns about the impact of the oil and gas industry on its offshore reef ecosystems and the associated tourism industry.

Fossil Fuel Consumption and Transport

Most countries in the Caribbean remain very dependent on imports of petroleum products (gasoline, diesel, fuel oil, LPG) for the majority of their energy needs (transport, industry and electricity). Even major hydrocarbon producers Guyana and Trinidad & Tobago import refined products, while exporting crude oil.



Energy for transport remains heavily reliant on diesel and gasoline, though there has been an uptick in electric vehicles (EV) especially in Barbados. Small islands are an ideal location for EV adoption, as concerns about range are not an issue, and there is considerable scope to increase EV sales. The major constraint is higher initial purchase costs of EVs and limited availability of vehicles. In Trinidad & Tobago, where the government has removed import taxes on EVs, the cost of an EV over five years has been shown to be lower than a comparable ICE vehicle despite the higher initial cost. The very low price of electricity in Trinidad & Tobago helps this affordability, though transport fuels are also subsidised.

For most of the region, diesel and gasoline is not subsidised though in some markets price controls are in place that reduce volatility. Import taxes on fossil fuels are an important source of government revenue in many countries in the region.

Trinidad & Tobago has had a longstanding policy of encouraging compressed natural gas (CNG) as a transport fuel and there has been an increase in CNG vehicles sales in recent years and the installation of conversion kits (especially in taxis). Despite the very low cost of CNG, and the availability of a fairly well distributed retail network, the uptake of CNG has not kept pace with plans and the government has stopped the active promotion of CNG (while putting a new focus on EVs).

LPG is widely used through-out the Caribbean for cooking gas. It has also been adopted in come markets, especially Jamaica, in the industrial sectors and in transport.

With the exception of Trinidad & Tobago and Jamaica, imported diesel plays an important role not just in the transport and industrial sectors but also in the generation of electricity, along with fuel oil. Trinidad & Tobago is almost entirely reliant upon domestic natural gas for electricity generation and as both a fuel and feedstock in its petrochemical and manufacturing sector. Jamaica has significantly diversified its reliance on liquid fuels in electricity generation and industrial

sectors through the import of Liquified Natural Gas (LNG). There were also announcements in 2023 about the development of an LNG import terminal in Antigua to supply a new 46 MW power plant, though the current status of the import terminal is not clear. Guyana is in the process of developing a gas fired power station, with natural gas being delivered by pipeline from offshore. Very small volumes of LNG have also been supplied in ISO Containers to some markets, including Barbados and Guyana.

There have been many discussions and policy proposals over many years about the development of small-scale LNG infrastructure in the Caribbean primarily for electricity generation. Except for the projects in Jamaica (and Antigua?) these proposals have not gained traction. Small utilities in most of the countries in the region have not had the financial clout to be able to sign long-term supply contracts needed to secure LNG supplies. Arguably, the strong policy objective to aggressively move to renewables and the ambitious renewables targets in most countries also send policy signals that do not encourage the investments into natural gas infrastructure.

There was a project proposed in the past to deliver pipeline natural gas from Trinidad & Tobago to the eastern Caribbean. However, this project has fallen by the wayside not least given the shortfalls in gas production within Trinidad & Tobago.

Trinidad & Tobago's state-owned National Gas Company (NGC), a ten percent shareholder in the Atlantic LNG facility, has stated that it is actively exploring the small-scale LNG market in the Caribbean using its volumes produced through the facility. Despite its small size, the reported natural gas import prices in the Caribbean area high, making it an attractive potential premium market. While the economic, environmental and climate case for switching from diesel/fuel oil are clear, the issues around attracting capital for import terminals and for investing in upgrading power generation units are challenging.

Renewables and Electricity

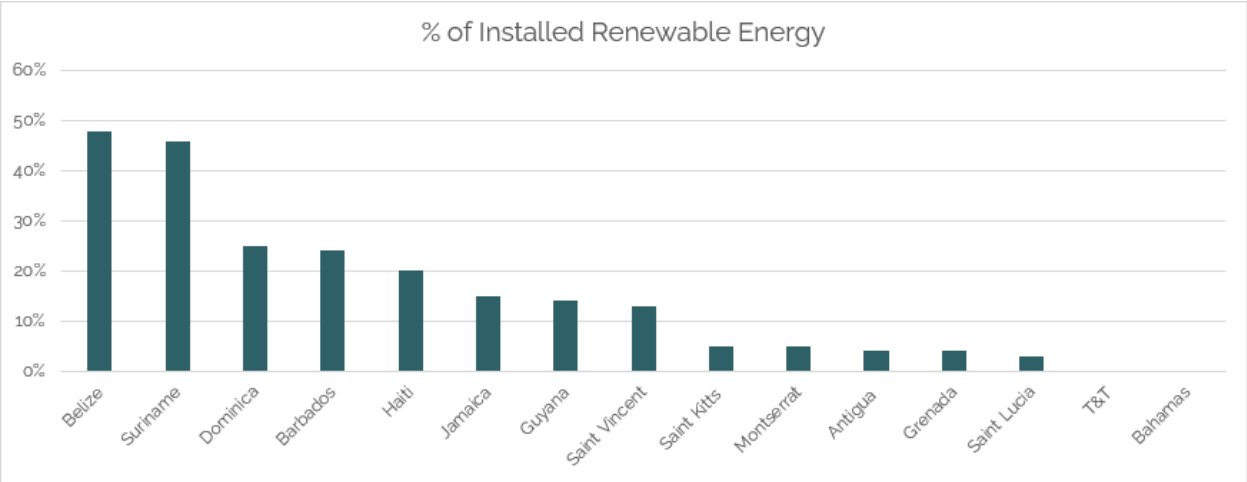
Some of the challenges around switching from liquid fossil fuels to natural gas for electricity generation are similar to the challenges faced around adopting renewable energy for electricity generation.

Most countries in the region have set ambitious targets for renewable energy penetration, but only Belize and Suriname have renewable capacity approaching 50% (both from largescale hydroelectricity). Most countries in the region have less than 10% of installed capacity from renewable sources.

Caribbean electricity grids are all small and isolated (with the exception of Belize that interconnects with Mexico). Trinidad & Tobago, with its well-developed industrial sector, has the biggest installed capacity grid at over 2,000 MW of installed capacity but most countries in the region have grids with installed capacity under 250 MW.

Small, isolated grids make deployment of renewables, especially intermittent renewables such as solar and wind, challenging. While battery storage can help to reduce the impact of intermittency, it drives up project costs. Governments in the region have typically taken a "project-by-project" approach to developing renewables which means that each project is typically small. Project

developers will typically look to size projects at a minimum of 30 MW to secure lower energy costs,[3] but most projects in the region will be smaller and hence not as attractive to commercial project developers.



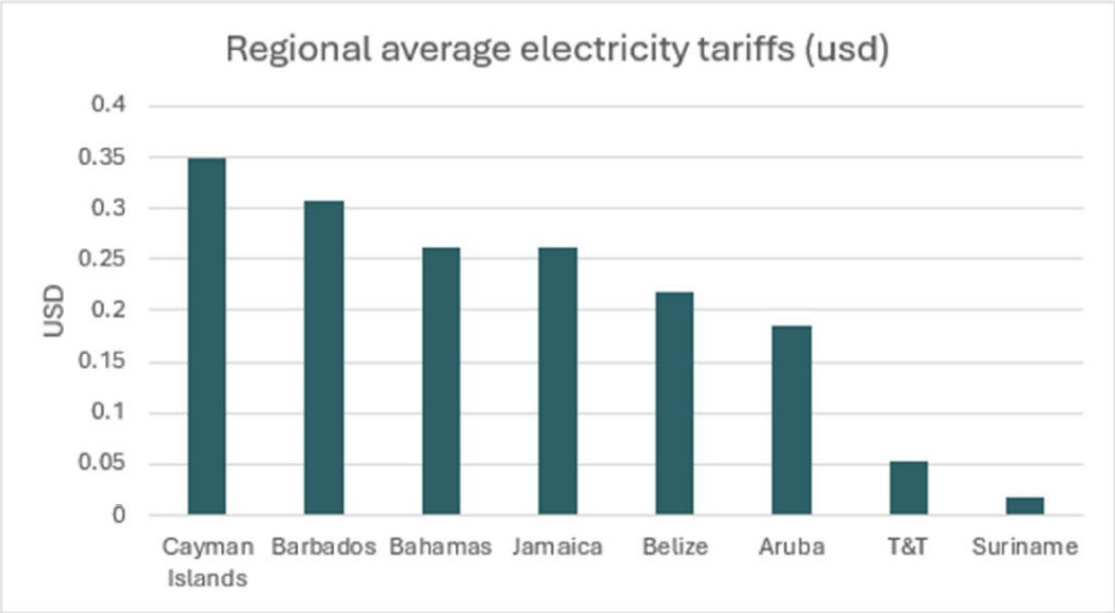
In addition, the small physical size of many Caribbean islands means that there is limited land space available of solar projects and onshore wind farms. Many electricity grids in the region are in urgent need of upgrade, making it difficult to bring on large volumes of distributed, intermittent sources of renewable energy without impacting grid stability. Grid modernisation is a vital component of plans to increase renewable energy penetration.

For many islands in the Eastern Caribbean there is one potential source of renewable energy that does not suffer from the intermittency or land constraint issue, namely geothermal energy. Despite the huge promise of geothermal to provide extremely reliable, clean baseload power attempts to tap into this resource have face serious challenges over many years. One of the major issues that the initial upfront capital costs of a geothermal project are high and the very small markets for electricity in all islands make the project economics challenging. There is a current geothermal project in Dominica that is making good progress and the hope is that success here will unlock other opportunities (see below on opportunities through interconnection).

The Caribbean region typically has vertically integrated utilities, responsible for both the generation, transmission, and distribution of electricity. There are a mix of state-owned and private utilities. In both cases there is a clear expectation that their primary role is to provide reliable electricity to all consumers. In many cases these utilities signed long term contracts for electricity supply from fossil fuel sources before the more recent push to increase renewables came into play. There are therefore potential costs associated with introducing new renewable generation sources, whilst existing contracts are in place. The integrated utility model can also mean that there is less innovation and a tendency to favour the status quo in terms of generation.

[3] https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/a-roadmap-for-the-caribbeans-energy-transition/

Electricity prices in the Caribbean are very high by global standards, with the exception of Trinidad & Tobago and Suriname. This is a major issue across the region and acts as a barrier to competitive economic development. High electricity prices impact even on the tourism sector, where high costs associated with air conditioning drives up hotel room prices and make the region less competitive with other tourism markets.



(Source: T&T Regulated Industries Commission 2023)

Reducing electricity prices is an important political objective across the region. Intuitively populations believe that the introduction of renewable energy, from free sunshine or wind, should lead to a reduction in electricity prices but for the reasons outlined above this may not be the case.

In Guyana the government has made a major political promise to cut electricity prices in half through the development of the gas to energy project. However, the rapid economic growth underway (and hence increased demand for electricity) has put a huge strain on the existing grid and frequent blackouts. This has meant that the state-owned utility, Guyana Power and Light, has had to contract expensive electricity from a power barge while the gas power plant is under construction. Many individual consumers and businesses have resorted to diesel power generators, obviously meaning higher costs.

The small size of most of the Caribbean markets also means that they often suffer from a lack of expertise and service companies to help project implementation. Trinidad & Tobago has had a strong tradition of developing engineering expertise and there are many well trained Trinidadian professionals working in the global energy industry around the world. With the downturn in the Trinidad & Tobago energy industry over the past decade (with no new plants being constructed and the refinery being mothballed) there is excess skills availability in Trinidad to support regional developments. There are very many Trinidadians employed in the expanding Guyanese and Surinamese oil industries, though other skilled workers have left the region and migrated to the US and the Middle East.

The Energy Transition: Challenges and Opportunities

The diverse nature of the energy sector in the region means that different countries will take different pathways through the energy transition.

For Guyana and potentially Suriname the major issues will be around how to translate the huge inflow of wealth from the booming oil industry into sustainable livelihoods for their population. This will include the development of secure and cheaper energy, but also maintaining their green development focus (for example protecting forestry and biodiversity, introducing renewables and ensuring that their commodity exports are acceptable in a world rapidly moving to a lower carbon future). The huge scale of developments in Guyana mean that oil can be produced relatively cheaply and with a lower carbon footprint that many more mature provinces. This provides the country with the opportunity to continue oil production even as the world moves towards net zero.

For Trinidad & Tobago the major challenge is how to attract new capital into upstream gas production, while at the same time decarbonising its commodities to ensure that they are able to find a place in international markets. The advantage of already having a well-developed gas processing infrastructure in place is important. One of the most significant opportunities is to substitute the existing "grey" hydrogen (derived from natural gas) that goes into ammonia production with low carbon "green" or "blue" hydrogen (either produced from water through electrolysis from renewables or by sequestering the CO2 split from methane in geological formations, carbon capture and sequestration (CCS)). There are also opportunities to lower the carbon footprint of other commodity exports through energy efficiency, reducing methane leaks and CCS.

For the net energy importers in the region, the major opportunities presented trough the energy transition are the ability to produce more energy from domestic renewable sources though attracting the right capital and technology and/or substituting lower carbon imported natural gas for diesel and fuel oil. Given the challenges of intermittent renewables, most countries will require continued baseload electricity from imported fossil fuels and from both a climate change, environmental impact and cost point of view it would be preferable if this was gas rather than oil products. There are also other potential low carbon fuels, such as methanol, that could be appropriate in some settings: methanol is set to play a major role in decarbonising marine transport for example.

The current approach by some international agencies that makes a clear distinction between fossil fuels and renewables (and excludes any fossil fuel related projects) is not helpful in pushing forward the energy transition in the region. Fossil fuels will play an important role I the region for decades to come and this needs to be recognized in the policy framework. Reducing the carbon intensity of fossil fuel powered energy is just as important as substituting with renewables; it is more efficient to power EVs from a single large diesel power station than from individual ICE in each vehicle.

One of the major opportunities that exists for the region is through great integration. The full implementation of the CARICOM Single Market and Economy (CSME) will assist in the movement of expertise, capital and services around the region and help reduce project

implementation costs. A more integrated and hence larger market will mean the greater possibility of equipment to support both fossil fuel and renewables projects remaining in the region and hence lower mobilisation and demobilisation costs.

Integration of the regions electricity grids also presents a major opportunity to introduce larger and more efficient renewable energy projects. This represents a major opportunity for geothermal electricity in particular, especially if the green electrons can be delivered to Trinidad by undersea cable: given the huge potential for renewable electricity to support the growth of low carbon hydrogen production.

There are also potentials for integrating gas pipeline networks from not just Venezuela (as currently being developed) but also Guyana and Suriname (and potentially Grenada and Barbados) to utilise existing Trinidad infrastructure to access international markets. For new gas producers this represents a much quicker route to market and faster returns; something which has a good strategic logic given the global moves to phasing down fossil fuels.

These opportunities for regional integration require much greater policy and regulatory harmonization. Institutional strengthening of relevant units within both national governments and CARICOM therefore represents an important opportunity that should be pursued.

Final Word on the Environment:

Globally the discussion on the environment has come to be dominated by global warming, sometimes to the exclusion of other issues. The Caribbean region is extremely vulnerable to global warming and especially to sea level rise and to more intense and frequent hurricanes. The solution to this almost exclusively rests outside of the region in the major consuming countries.

The Caribbean has a strong voice on these issues and diplomatic clout beyond the small size of our economies and populations. That voice needs to be used expeditiously, but in a manner that benefits the region and not just the agenda of the global climate crisis movement. The policy decision from international development agencies to not to be able to finance anything that touches fossil fuels, for example, should be challenged and the region should explain why support will still be needed for fossil fuels as we decarbonise.

There are, also, other environmental impacts associated with the production of energy which need to be kept on the agenda. Congestion with diesel and gasoline vehicles in urban areas like Kingston, Port of Spain and Georgetown has a serious negative impact on the respiratory health of people living and working in those areas. Spills of oil or petroleum products moving on vessels through the region can have major negative impacts on coastal environments and people, as recently happened in Tobago. These local environmental impacts associated with the energy industry must also be high on the policy agenda.

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