ON THE GREEN AGENDA

HARNESSING THE POWER OF MICROGRIDS

ESTIMATED READ TIME: 5 MINUTES

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KEY TAKEAWAYS

Microgrids are independent energy systems that can power single sites or feed power into the national grid

Microgrids powered by renewable energy can offer benefits such as improving the resilience of national power supply, providing energy for off-grid communities or backup power for critical installations, and providing insurance against national grid failures

There are presently some barriers to widespread uptake of microgrids in the region

THE recent announcement that the Airports Authority of Trinidad and Tobago commenced construction of an EU-funded 0.5MW Solar Park at the Piarco International Airport,[1] and other pilot-scale initiatives in the recent past,[2] signals that the use of local grids - including microgrids - in Trinidad and Tobago has entered the realm of commercial possibility. Around the Caribbean, this is not a new concept. Microgrids based on renewable energy have long been used to electrify areas not connected to broader national grids, such as the Guyana interior or areas that needed additional resilience (such as airports).

> Generally, a **microgrid can be powered** by distributed generators, batteries, and/or renewable resources such as solar power.

WHAT ARE **MICROGRIDS?**

A ***microgrid*** *is a local energy grid with control capability, which means it can disconnect from a traditional grid and operate autonomously.*

A microgrid usually operates with the grid, but importantly, it can disconnect and operate on its own using local energy generation in times of crisis such as during storms or power outages, or for other reasons.[3] As we learned painfully in the recent past, a single tree falling on a power line can knock out power on a major grid for several hours.[4]

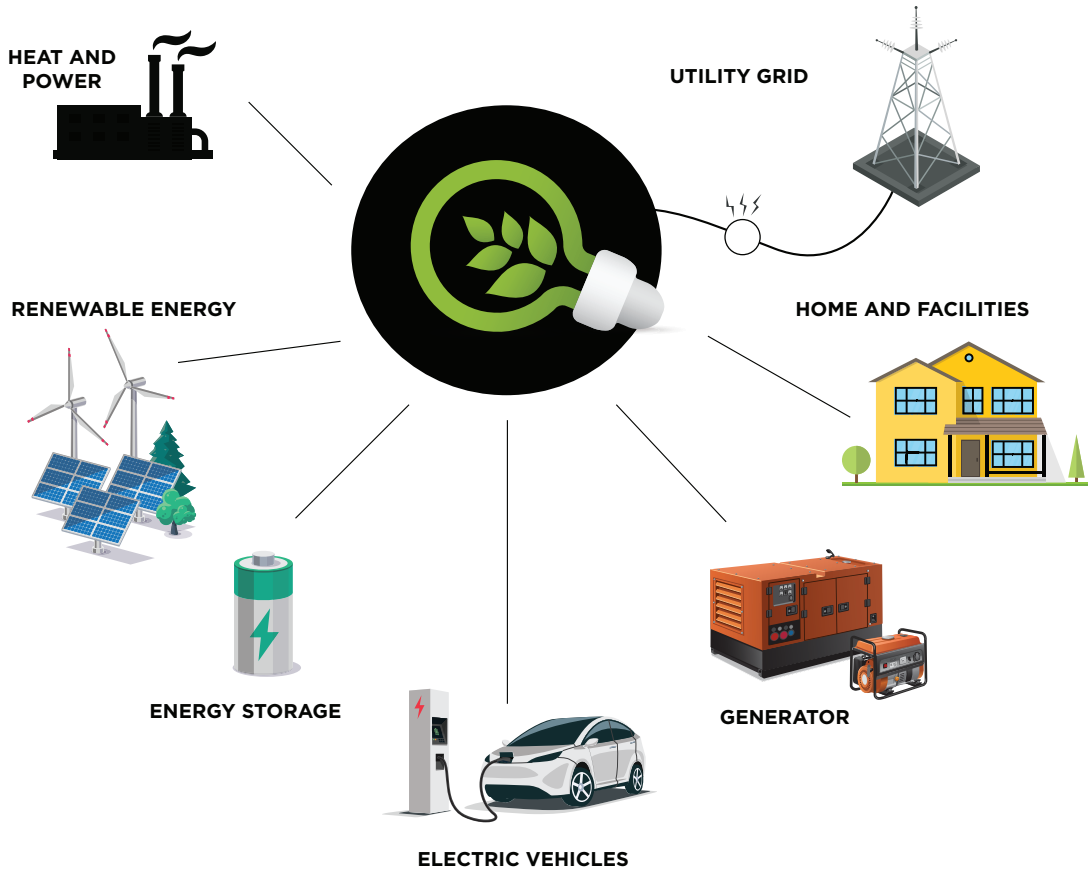
[1]https://www.eeas.europa.eu/delegations/trinidad-and-tobago/sod-turning-marks-initiation-construction-piarco-airport-solar-park_en?s=156

[2]This includes two 2-kilowatt (kW) off-grid photovoltaic (PV) systems in operation at both the University of Trinidad and Tobago and T&TEC's Mt. Hope compound.

[3]https://www.energy.gov/articles/how-microgrids-work

[4]https://trinidadexpress.com/newsextra/cause-of-island-wide-blackout-revealed/article_05021372-c7ef-11ec-912e-4f76e9173038.html

FIGURE 1: MICROGRID



Source: 3 More Frames, via Microgridknowledge.com

By islanding, a microgrid can escape such cascading grid failures. They also serve a discrete geographic footprint, such as a college campus, hospital complex, business centre, or neighbourhood.

Generally, a microgrid can be powered by distributed generators, batteries, and/or renewable resources such as solar power. Depending on how it is fuelled and how its requirements are managed, a microgrid might be able to run indefinitely. Many newer microgrids contain energy storage for times when the primary power source is unavailable, typically from batteries.

The electricity grid connects homes, businesses, and other buildings to central power sources, which allows us to use appliances, heating/cooling systems and electronics. In Trinidad and Tobago, the power source is natural gas.

However, this interconnectedness means that when part of the grid needs to be repaired, everyone is affected.

On the other hand, microgrids are local, overcoming potential inefficiencies of power loss due to transmission disruptions by generating power close to consumers. Grids are 'intelligent' at the central level, though not at the local level. On the other hand, microgrids are 'intelligent', as controllers in the microgrid manage the electricity generators and other parts of the system, without human intervention.

The controller orchestrates multiple resources to meet energy goals set by the microgrid's customers, such as energy reliability measures, efficiency targets, electricity cost or price targets, clean energy targets, or other criteria.

Microgrids may contain other energy resources – combined heat and power, wind power, reciprocating engine generators, or fuel cells – that add even greater complexity and nuance to the system.

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MICROGRIDS IN THE **DOMESTIC CONTEXT**

On a purely technical level, there are no major obstacles to Trinidad and Tobago harnessing the power of microgrids. However, several institutional and non-technical barriers remain, though most are expected to be removed in the medium term.

By far, the biggest barrier to implementation is the lack of a business case, mostly due to the very low cost charged for electricity in Trinidad and Tobago. With the price of electricity being heavily subsidised, microgrids are simply uneconomic.

There are also several legislative and structural changes that would be required before a microgrid can be legally connected to the national grid. These changes include implementing a system of feed-in tariffs and permitting grid tie-ins, inter alia. While electricity from microgrids may initially be pricier, over the medium and long term, the prices for renewable electricity are expected to decline, while the cost to consumers of electricity generated by natural gas is expected to increase over time.

In the Caribbean region, there are different challenges, mostly connected to financing issues. Absent grant financing and other incentives, most financing for microgrids must be accessed through the private sector.

Notwithstanding the challenges, with the global transition from fossil fuels to renewables, growing policy pressure to phase out fossil fuels in favour of renewables, and the resultant lower cost of adding onsite renewable energy, using renewable-based or hybrid microgrids makes more and more sense. In fact, microgrids may form part of the solution for Trinidad and Tobago to achieve its long-term emissions reduction goals. Reforms to the enabling environment in Trinidad and Tobago in the next few years (connected to the implementation of grid-scale solar PV projects) should make the environment more amenable to the use of microgrids.

> **Harvesting solar energy** alongside food (agrivoltaics) has the potential to make agriculture more sustainable and profitable by maximising the use of agricultural land.

Microgrids can also reduce strain on the national grid by diverting some energy consumers from grid-generated electricity, such as users of electric vehicles, street lighting, and community lighting.

For Trinidad and Tobago, the supply of resilient power to communities in remote (or off-grid) locations and critical national installations is desirable as a public good, since any disaster may render these areas without electricity for days post-disaster, if not weeks. Microgrids can also be used in concert with other sustainability innovations. Harvesting solar energy alongside food (agrivoltaics) has the potential to make agriculture more sustainable and profitable by maximising the use of agricultural land.

A PROMISING **FUTURE**

The reality of climate change and ongoing changes to the physical environment have amplified the need for a more resilient electricity grid in Caribbean nations, amid the increasing probability of power outages, the fragility of national grids and even cybersecurity threats. From a risk perspective, the presence of independent microgrids provides insurance and partial mitigation of risks associated with potential failure points in national grids.

For Trinidad and Tobago, the increased use of microgrids harnessing renewable energy appears to be inevitable in the medium term, given the need to increase resilience in the overall electricity grid, as well as achieve national emissions reduction goals. ■