100% Renewable Electricity by 2030: A Land Area Analysis

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Abstract

Barbados, a Caribbean island, has a goal of achieving 100% renewable energy electricity by 2030. In order to achieve that feat, it is estimated that about 600MW of renewable energy technologies would have to be installed [1]. With a land area of 431 square kilometers, it is questionable if there will be enough free land area to accommodate the predicted amount of technology [2]. With the total land area in mind, this research seeks to discover if there is enough available to achieve the 100% by 2030 goal without compromising pre-existing land used for agriculture, recreation and wildlife reserves. This goal will most likely be achieved through the use of solar and wind farms. There is some research to use ocean thermal energy conversion (OTEC) and offshore wind, but the feasibility of it actually happening is not fully known. Barbados is in a unique position, as unlike many of its Caribbean counterparts, the island cannot rely on hydroelectricity or geothermal energy. Currently, Barbados uses mostly fossil fuels alongside a 10MW solar farm and 5MW of battery storage from commercial generation. There has to be a major overhaul for this goal to happen in the next 10 years. Not only does Barbados have to worry about installing the necessary capacity, but there are also a number of issues which arise such as the opportunity cost of using the land for renewable technologies versus for purposes such as agriculture or tourism. The research will be undertaken by looking at the current data available from a variety of sources and previous studies done in Barbados and the wider world regarding Barbados' future. Barbados' goals and progress were then compared to case studies of two other Caribbean islands and looking into the general concerns in renewable energy implementation across the entire region.

Key Words: Renewable Energy, Barbados, Caribbean, Land Analysis

Introduction

Barbados is a small island located in the lesser Antilles in the Caribbean. The island was formed through underwater volcanic eruptions which broke away from the seafloor. Thus, it is not a mountainous island and has very few water sources outside of the underground water table and the surrounding ocean. The renewable energy possibilities are limited as they cannot use geothermal or hydroelectric energy which tend to have a large energy yield. Instead, Barbados' main plan is to build their renewable capacity with solar panels, wind turbines and battery storage. Right now, Barbados' energy mix consists of a 10MW solar farm, 5 MW of battery storage and about 239 MW of engines which include steam, diesel and gas turbines [2]. Other projects in the works are a 10MW wind farm and a clean energy bridge, both of which should operate out of St. Lucy [3]. By 2030, however, the fossil fueled engines should no longer be in active operation. Currently, there is a 10MW solar farm and a 5MW of battery storage in Trents, St. Lucy. These projects have been coordinated and spearheaded by the current utility company, the Barbados Light and Power Co.; however, there are plans to demonopolize the sector and other entities are being encouraged to invest in renewable energy for the island [4]. In addition to solar panels and onshore wind turbines, there are also discussions of utilizing floating wind turbines and ocean thermal energy conversion (OTEC) to add to the renewable energy capacity of the island. Aside from large scale investments, there are also 22MW of installed renewable capacity on private households and local businesses, according to the local electric company. According to the current government, the goal is to achieve 100% renewable electricity by 2030 [6]. Presently, with a peak load of about 170MW, it is estimated that they would require about

600MW of renewable energy power in order to have grid stability and the necessary reserves for inopportune environmental conditions [1, 2]. Alongside renewable energy technologies, they also need to have batteries in order to make up the load during the night/cloudy days and/or when there is less wind. With a land area of 431 square kilometers, there is concern that there is not enough space to build the infrastructure needed to reach 600MW of energy capacity. For this to be successful, there has to be a cohesive effort by part of the government, the private sector and personal households to pool resources and electrify the country. The purpose of my research is to examine the needed renewable energy capacity and assess its feasibility, bearing in mind the land space, to achieve 100% by 2030.

Limitations of Study

In this study, I intend to look at the available land space and, based on current technologies and previous projects done in Barbados, to analyze the feasibility of the 100% renewable electricity goal. I will be ignoring the price of installation and whether it would be possible for the island to afford the project, as well as technologies that are not yet fully developed. Additionally, it will be assumed that all the land area that is free and seemingly available is licensed and suitable for building renewable energy technologies. There were no site visits done in order to determine the suitability of each land area found. I will not be assessing the contributions through rooftop solar panels, which was estimated to potentially contribute 280 MW of solar power [6]. This study will take into account the land space currently used for agriculture, recreational use and wildlife reserves and how possible it would be to use the available land space and ocean capacity. In the

study, only appreciable land areas will be considered (greater than an acre). The research will analyze the combination of solar, wind and battery storage needed to accomplish the 100% goal.

Research Methodology

The research was carried out through utilizing prior data from studies of the available land space in Barbados through surveying and prior projects. Most of the data has been obtained from the local utility company, The Barbados Light and Power Company. Additionally, the use of Google Maps also supplements getting estimates of the land area and the locations which have large open spaces. Moreover, there will be information drawn from peer-reviewed articles from various databases and other sources such as newspaper articles. There is a lack of peer-reviewed articles which focuses on the Caribbean region; therefore, a considerable amount of information will be retrieved from newspaper, as well as government organizations and world organizations such as the UN. The research will be based mostly on current research regarding renewable energy technologies and batteries in order to estimate the land space needed to fulfill the required electricity capacity in the year 2030. This approach was chosen as I believe it is the best way to obtain accurate information to determine the possibility of Barbados achieving its renewable energy plans. Furthermore, Barbados' plans will be compared and contrasted with the plans of another Caribbean country, Jamaica, to understand Barbados' progress within the context of the wider Caribbean.

Discussion

Land Availability

Barbados is a Caribbean island formed from the collision of the Caribbean and Atlantic plates along with a volcanic eruption. As such, there are few rivers or streams that can be found on the island. Barbados has a land area of 431 square kilometers. Currently, this land area is used commercially, and for housing, agriculture and renewable energy technologies. The available land area is located mostly in the northern part of the island, whereas the majority of the population resides in the south. Using Google Earth, one is able to see the available land area and estimate the measurements (see burgundy areas in Figure 1). In 2016, agriculture comprised about 23.3% of Barbados' land space which is roughly 100 square kilometers [7].

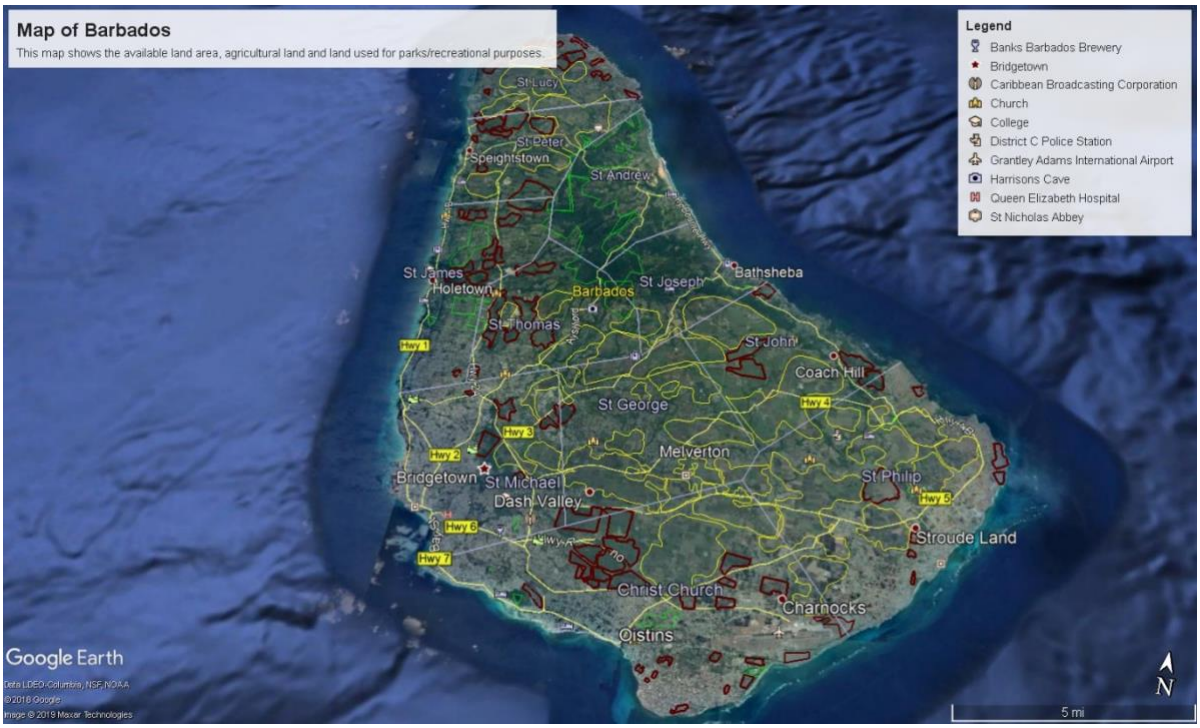

Figure 1: Map of Barbados highlighting the available land area, areas used for agriculture and areas used for parks/recreation.

Through the use of Google Earth, one is able to see the free land space and make educated guesses as to where the agriculture (highlighted with yellow), forest reserves and recreational activities (highlighted in green), e.g. golf courses, are located through the geography and the visual of the land area. For example, one could identify plantation fields through how the plots of land are arranged in a certain area. With Google Earth, and a previous study, it was roughly estimated that about 30.9 km^2 of land is available for renewable energy use around the island. These land areas are scattered throughout different parts of the island and encompass different characteristics. In the study, 83 different areas of land were identified across the island ranging from 2.34 acres to 570 acres. Of these 83 different areas, it will be assumed that there will be a mix of wind and solar energy. Due to the terrain, not all of the land will be suitable for renewable energy use; however, in order to assess the space, site visits would have to be done. Additionally, necessary infrastructure, such as substations and additional connections, may have to be built for certain areas in order to accommodate the increased electricity production.

Renewable Energy Necessity

According to [8], it is estimated that Barbados will have an annual energy consumption of 1350 GWh. When calculated, this results in a required capacity of 150 MW of power per day, with a total installed capacity of 600MW - which includes the back-up capacity - for a stable gird. Additionally, there needs to be about 30% or 180MW of battery storage to serve the country during cloudy days, night or low wind speeds [1]. This 600 MW figure accommodates for fluctuations in production from renewable sources; e.g. with 200MW of installed PV, on a sunny day the entire island could be powered at peak load from solar power alone. However, on a cloudy day the power output of PV will drastically decrease, and this deficiency could then be made up by the installed capacity of other renewable sources.

Renewable Energy Models

Solar Energy

To calculate the potential solar capacity, the ratio of 4 acres per megawatt was implemented [9]. Using this estimation, about 2400 acres of land is needed for enough solar power capacity. In our estimation, there is about 30 km^2 or 7,646.5 acres of available land with potential production of about 1,910 MW. This amount is very rough as some land areas may not be suitable for this use. However, this figure is more than three times the necessary energy needed. Therefore, there is some room for deciding which combination of land area would give the most yield and be the

most efficient and feasible to put the solar panels. If the land areas that were close to the grid (which also could be accommodated) are the only ones considered, there would be about 82.74 MW of solar energy. As such, in order to achieve fully renewable electrification, there is a need for improvements in the infrastructure and grid network around the island in order to withstand going 100% renewable. To accomplish this feat, the grid network needs to be more extensive and there have to be adjustments to the load connections.

Wind Energy

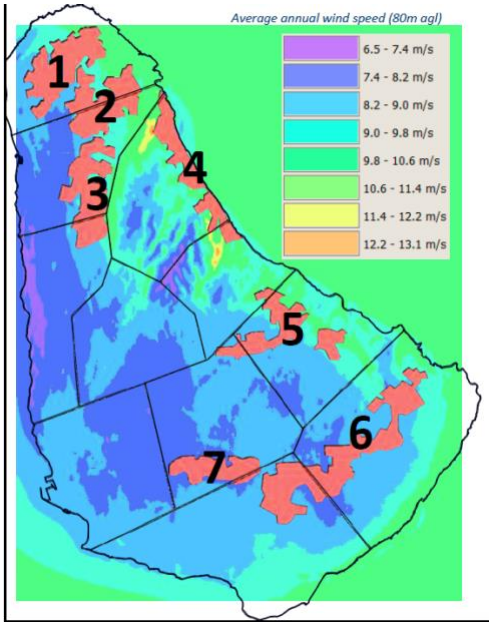

Figure 2: Study showing average annual wind speeds throughout Barbados

For wind, a prior study was utilized, which highlighted key areas on the island for wind development (see figure 2) [6]. The areas numbered and in a reddish hue are the areas that were considered the best for wind energy development.

The study and the free land space were compared and of the 83 areas, only 12 areas were suitable. It was estimated that a necessary land area of 20 - 47 acres per MW of wind would be necessary. There is a range due to the different sizes/capacity of turbines available and the set-back requirements in a country. The upper boundary of the range was calculated, using the premise of a 2 MW turbine, due to the regulation that it has to be 350m from the nearest property line and area per turbine was calculated using the area of a circle with a radius of 350m [10]. The

same could be done for the lower boundary; however, if the turbine has a larger capacity, there would be less area per megawatt in this case. Thus, it was calculated that between 49.25 MW (47 acres/MW) and 115.74 MW (20 acres/MW) of wind energy potential is available, and this does not include the 10 MW which is to be developed in Lamberts, St Lucy. Wind energy presents many issues with installation on the island. The road networks and bridges were not built to necessarily accommodate the weight and size of a wind turbine. Also, the country does not readily have the necessary manpower for the maintenance and installation of these technologies. Therefore, initiatives could be done to train people to be skilled as a wind turbine technician, as the Wigton Wind Farm in Mandeville, Jamaica could be likened to a Caribbean example of a wind farm and used as a training ground.

Mixed Renewable Technology

In this model, there is a mixture of wind and solar energy. The land areas that are suitable for wind energy will be used for wind, and all the rest of the land areas will have solar energy on it. In this model, roughly between 1382.17 MW and 1448.66 MW of renewable energy potential. These figures are still at least 2 times more than the necessary renewable energy capacity in order for the island to stay electrified.

Battery Storage

As aforementioned, there needs to be 180 MW of battery storage located around the island or roughly 30% of the total installed power capacity [1]. There will have to be batteries available

which have the ability to discharge quickly during peak times, as well as discharge relatively slowly overnight. Batteries are also an important asset during the night and during cloudy days. Efforts for battery storage will be a combination of private storage (for example, the Tesla Power Wall), utility efforts and third-party initiatives. Battery storage will play an integral part in the 100% renewable initiative and be used to regulate the frequency and stability of the grid. Batteries stabilize the grid through fulfilling dips in the energy produced by, for example, solar panels when the day becomes overcast which allows for the maintenance of the frequency. Currently, batteries are being used in St. Lucy that are charged by the grid, but discharge once the frequency drops to 49.88Hz from the stipulated 50Hz. These batteries have assisted tremendously during peak times to fulfill a spike in the load.

Possibility of Microgrids

Microgrids could increasingly become an integral part of the Barbados power grid. Microgrids are a small-scaled version of standard grids and supply one or a small group of consumers with power [11]. Microgrids can be isolated or connected to the grid. In the Barbados power grid, it is most likely that most of the microgrids made will be interconnected. Microgrids supply the island with grid stability as they are able to supply power to consumers in times of grid failure or natural disaster. It is anticipated that the usage of microgrids would be concentrated in large power consumers such as hotels, and the main hospital. Microgrids are an emerging technology that could provide a useful service in Barbados.

Utilizing Land Space

There are a variety of ways in which land is used in Barbados and will continue to evolve in the future. Currently, the land area is protected, and used for agriculture or recreational activities such as golf. Using up the land space for renewable energy alone would not be the most effective use of the land. Therefore, there are multiple ways in which the land area could be used alongside the renewable energy technologies.

In the case of solar panels, the land underneath the panels could be used for agriculture, i.e. to grow low-lying crops which require shade such as peppers, cilantro, etc. [12]. Additionally, other uses for agriculture include grazing of sheep around the panels which keep the grass low, as well as providing food for the livestock. Another use of solar panels would be in car parks which would provide shade for cars and allow for the multipurpose use of space in such a small island.

For wind energy, the free land space can be used for agriculture up to the base of the wind turbine [13].

Through the multipurpose use of the land space, economic growth could be stimulated through subsidies and governmental efforts to encourage the stimulation of the agriculture sector.

Possible Issues with 100% Renewable in Barbados

As a small island, Barbados' grid is not the most stable even now when using fossil fuels. Therefore, there has to be additional measures implemented to ensure grid stability. Grid stability would most likely be achieved through the use of batteries which would assist in the short comings of the system. Additionally, to become 100% renewable through the use of solar and

wind only is a costly endeavor and will require a large number of investors and/or heightened debt of the Barbadian government. Currently, there are discussions regarding de-monopolizing the energy sector, which adds more complications over ownership, costs and overall maintenance and responsibility of the grid and its various sections [4].

Although Barbados' plan is 100% renewable energy, there are plans to establish a clean energy bridge which should supply 33MW of diesel-generated energy. This is to ensure a reliable baseload while they are in transition to 100% renewable energy and remain as a back-up for grid resiliency and replace the aged machines which are currently being used. This clean energy bridge will comprise of four blocks which will house Wärtsilä engines which should provide energy while being efficient and having a good emissions performance [14].

With more energy infrastructure being built, there will be a need for new and/or improved substations around the island. The current substations will not be able to accommodate the capacity needed for the 600MW of power mandated. Moreover, there will have to be an increase in power lines of different capacities to be wired from the different areas of renewable energy to the substations. Not only would these projects pose a significant expense and may take some time to come to fruition, there might also be difficulties in connecting certain areas to the grid due to the distance and the loss of efficiency which results from having to run longer electric lines. In order to accomplish the goal by 2030, there will have to be a lot done in a short period of time.

Land is a vital part of human life. It is used for many purposes such as living, agriculture, recreation, etc. Through building the necessary infrastructure for the 100% by 2030 goal, Barbados is essentially giving up at least 2400 acres of their free land space which could be utilized for increased agriculture or property development. As a densely populated country, the

land area might be extremely useful for additional development to house the growing population. If the land were to be used for agriculture instead, there are ways in which crops could be grown and the renewable energy technologies cohabit the area. The decision on the type and height of crops would have to be thoughtfully made if using solar energy.

Nonetheless, the land is not spared by natural disasters. Barbados, although not frequently threatened, has the potential of being hit by a hurricane. Through using solar in particular, Barbados becomes vulnerable to a major loss in their generation capacity in the case of a category 4 or 5 hurricane. Other island's PV systems have been decimated by hurricanes of that strength, and studies are unsure of what can be done to prevent the destruction of the PV systems, but preventative methods should be put into place such as properly torqueing and double nutting the panels to the base [15]. Wind energy systems are reportedly supposed to be able to withstand a category 4 or 5 hurricane [6].

The above highlights some of the main issues associated with going 100% renewable. There is a possibility that the issues highlighted could be overcome with intentional planning and understanding of the different situations at hand and/or the goals trying to be achieved for the area of land.

Renewable Energy Development and Goals with Respect to Other Caribbean Islands

Barbados is just one island out of an archipelago of over 20. Therefore, it is interesting to compare and contrast Barbados' efforts with two other Caribbean islands with differing goals, sizes and resources available. These two islands will be Jamaica and Trinidad and Tobago. Jamaica is the fourth largest island in the Caribbean, is much larger than Barbados, but both are

energy dependent as they do not have the capacity to generate their own fossil-fueled energy. On the other hand, another island, Trinidad and Tobago, has oil reserves on the island. Trinidad and Tobago is a larger and more populous country than Barbados, but as it is also one of the few Caribbean islands that have oil reserves, it would serve as an interesting comparison of their renewable energy targets.

Jamaica

Jamaica is an island that has a population of 2.935 million where electricity costs can be as high as $0.42/kWh (USD) [16], [17]. As of 2014, electricity consumption was 1,055.52 kWh per capita [18]. Jamaica has had a gradual decrease in fossil fuel reliance over the years. In 2009, petroleum comprised 95% of Jamaica's energy with the remaining 5% being in hydro (4%) and wind (1%) [19]. As of 2020, renewable energy made up 18% of Jamaica's energy production which was highly supplemented by Jamaica's newest renewable energy addition, a 37MW solar farm in Paradise Park, Westmoreland established in 2019 [20], [21]. Currently, Jamaica still uses a mixture of wind energy, solar power and hydroelectricity.

In Jamaica's 2009 – 2030 National Energy Policy, it details steps to become a more efficient and eco-friendly nation by 2030. The vision is for "A modern, efficient, diversified and environmentally sustainable energy sector providing affordable and accessible energy supplies with long-term energy security and supported by informed public behavior on energy issues and an appropriate policy, regulatory and institutional framework". This vision is to be achieved through a number of goals which is a mix of:

1. Being more energy efficient
2. Diversifying energy sources
3. Increasing the use of renewables in the country.

As a part of the goal, energy efficiency is achievable through the education of the citizens on power saving and eco-friendly consumption of energy [19]. Additionally, in the public sector they are retrofitting government establishments with energy efficient equipment such as air conditioning, solar control film and cool roofs [22]. The private sector, on the other hand, has witnessed an increase of private households and companies investing in renewable resources such as solar panels and wind turbines. An example of this private effort was communicated to me by Janine Dawkins in November of 2017; that of the Immaculate Conception High School which started a solar project in 2014 and to date has installed 210 solar panels. These solar panels are to reduce the reliance on the national public service during daytime activities. Lastly, the goal for an increase in renewables is supplemented by a reduction of energy consumption in general.

According to the policy, the aim is to increase renewables so that it makes up 20% of energy consumption by 2030. However, in 2020, the Prime Minister put forward the plan to have 50% renewable energy by 2037. This is an ambitious target and will require significantly more investment to achieve in the coming years [20].

Like Barbados, Jamaica does not have any capacity of fossil fuel generation which is evidenced by the futile research in digging wells for oil. 11 onshore and offshore wells have been drilled to date. These wells have not resulted into any major oil source; however, it is reported that oil or gas shows up in 10 out of the 11 wells [23]. Therefore, probably because it is cheaper for Jamaica to implement renewables than to continue importing fossil fuels for electricity generation, they are supporting renewable energy more. Additionally, as an independent state, Jamaica has an incentive to become self-reliant for their electricity needs in order to not be dependent upon others for fuel and to save foreign exchange by decreasing imports.

Comparison with Barbados

Jamaica is similar to Barbados in the aspects that both countries have a commitment to transition to renewable energy; however, Barbados' plan is more rigorous and wishes to obtain 100% renewable energy by the same time Jamaica wishes to be at 20%. Several reasons could explain this phenomenon, such as Jamaica being a much larger island, Jamaica is also a mountainous island which may pose difficulties in grid integration as opposed to in Barbados where it is a flat island. The population of Jamaica is also roughly 10 times greater than the population of Barbados, requiring significantly more investment to provide renewable electricity on the island for everyone. From a land area perspective, Jamaica is about 25 times the size of Barbados, boasting a size of 10,990 square kilometers [24]. This makes it clear that Jamaica could possibly also have enough land area, like Barbados, to accomplish 100% renewable energy, but Jamaica is mountainous which could severely reduce the available land area and potential. Although Jamaica has more natural resources to exploit, such as rivers, rivers also play an important role in the Tourism sector and culturally; therefore, to dam many of the rivers to harness hydropower may hurt the economy in other ways and deny citizens a piece of their culture and social practices. The social aspect will also have to be thought about in context of energy generation on the island, as most of Jamaica's current renewable energy farms are located in low-density areas of the island. Further assessment will have to reveal if there is sufficient available land in low-density areas with solar and wind potential that can provide electricity for the island, complemented by hydroelectricity, or whether Jamaica will have to rely on an increase in private efforts such as grid-tied roof-top solar and similar efforts to reach the eventual goal of 100% renewable electricity.

Barbados is more forward and ambitious with their goals; however, the size of Jamaica could have hindered the possibilities of a similarly ambitious plan. Nonetheless, the 50% by 2037 could be comparable due to the differences in population and land size. Both countries require energy independence to prevent reliability on fossil fuels to continue the running of their countries.

Trinidad and Tobago

With a population of 1.39 million people, the Republic of Trinidad and Tobago is the only petroleum-exporting country in the Caribbean [25]. Their cumulative production has totaled to over three billion barrels of oil and has an output capacity of 70,000 barrels of natural gas per day (bbl./d) [26]. Fossil fuels consumption as of 2018 was 99% [27]. Energy and its by-products contribute to 40% of Trinidad and Tobago's GDP and comprises 80% of their exports [28]. Without these fossil fuels, Trinidad and Tobago probably would not have a very strong economy.

Trinidad and Tobago's consumption is much higher than that of Jamaica's. As of 2014, the Trinidad and Tobago republic consumed 7,134.04 kWh per capita [29] which could be attributed to the nation being a highly industrialized society as a major exporter of oil, liquefied natural gas and food and beverages. On another note, since the island produces and exports fossil fuels, they have one of the lowest electricity costs in the Caribbean at only $0.04 (USD) per kWh [30].

As of 2015, the republic has started to put more of an effort towards a greener nation, having identified solar and wind as prospective sources of renewable energy, and have set a goal to achieve 10% of power generation via renewables by 2021 [31]. In 2015, the republic used 150GW of energy and wanted to produce 150MW of energy via renewables, which is a

significant jump from almost 0W [32]. However, according to reports, it is more feasible to achieve 5% renewables through wind power by 2021 as Trinidad and Tobago lies in an area with strong winds all year round, whereas there are limited resources or problems with other renewable energy prospects [32]. As of 2018, there was not much progress in renewable energy development towards this target [27]. Along with the prospective increase in renewable energy, the island planned to implement incentives for solar water heaters in the form of tax credit and wear and tear allowance to decrease electricity use per capita [32]. This newfound interest in renewables has spurred from the nation wanting to reduce the carbon emissions per year which in 2010 was 2.5 times the world average [33]. The republic is also putting an emphasis on energy efficiency to reduce consumption of electricity to help supplement the renewables.

The trend is that, since Trinidad and Tobago actively owns and utilizes its own petroleum and natural gas to fuel its energy consumption, it does not focus or put emphasis on renewables. This is expected; if more renewables are implemented, the demand for fossil fuels would reduce and it would be working against their own economy. Furthermore, the price of electricity per kWh in the republic is much lower than the rest of the Caribbean [30]. This is also a reason why they are not as supportive of the renewables in the Caribbean. It can be inferred that it costs more for Trinidad and Tobago to implement renewables than utilize the fossil fuels that they currently use.

Only recently, the Government of Trinidad and Tobago has been giving incentives to those who decide to install solar water heaters.

Comparison with Barbados

The Republic of Trinidad and Tobago shows slow moving progress and a lack of ambitious goals when compared to Barbados. This could be highly attributed to their access to fossil fuel and low

electricity costs which disincentivizes the investment in renewable energy technologies. Barbados, not having that level of access, is more prompted to invest and relinquish their dependence on fossil fuels. It is not the case that Trinidad does not have the land capacity to produce renewable energy, with a size of 5,128 square kilometers, because there is potential that there is sufficient land for the use of solar and wind energy, at least [34]. The lack of progress and further goals from the 10% is telling of the priorities of the island, and one can only hope that progress is made in the near future.

Renewable Energy Concerns Across the Caribbean

The Caribbean has a lot of potential for 100% renewable energy across the region. Each island has its own resources which could be utilized; and in the long term, through the sufficient policies, partnerships and understandings, it might be worthwhile to implement a regional electric grid so that countries which do not have as much access to a diverse array of renewable energy technologies could gain electricity from other islands that do. There are several islands with a high geothermal potential, such as Saint Lucia and Dominica, and these islands could assist islands similar to Barbados which have solar and some wind energy to use for their electric grid [35]. Nonetheless, there is no telling what other technologies might become feasible in the coming years as there was some consideration of using OTEC in Barbados; however, the current cost and uncertainties might not make that a reality [6]. Moreover, offshore wind and solar has not been exploited in the Caribbean possibly due to concerns about the longevity, as well as the impact these types of infrastructure will have on tourism. For some renewable energy technologies, there is a deficit in trained personnel who can troubleshoot and possibly fix these renewable energy technologies, and this is a consideration when planning to implement because

it might not always be feasible for personnel to travel to fix the issue if something goes wrong. However, this issue is being mitigated through the increased availability of training programs in recent years [36]. These are several concerns that are riddled throughout the different Caribbean islands which hinder the possibilities of renewable energy development.

Acknowledgement

This paper is a combined effort from an initial research paper conducted in 2017 from one of my undergraduate classes, "Energy", and though interning at Emera Caribbean Ltd. in the summer of 2019.

I would like to first thank the Caribbean Diaspora for Science, Technology and Innovation for funding my ability to conduct this research.

I also would like to express my deepest gratitude to Emera Caribbean Inc. (ECI) and Barbados Light and Power Co. (BLPC) for allowing me access to the different resources and providing me with guidance throughout my time there. Namely, I would like to thank Peter Williams and Moishe Steinbock from ECI and Cyprian Moore, Robert Harewood, Charmaine Gill-Evans, Nathan Maynard and Jerry St. Lewis from the Asset Management Department at BLPC. All of your comments and expertise played an integral part in my learning and the completion of this manuscript.

I also acknowledge Joshua Jones from Carleton University in Ottawa, Canada for his assistance in creating the different renewable energy models. Lastly, I would like to thank Barbara Breen from Grinnell College for her continued support and encouragement to pursue this project.

Conclusion

The Barbados 100% by 2030 goal is feasible in theory. It is evident that there is enough potential land space to provide more than double the amount of power needed regardless of the model chosen. With solar panels alone, there is a potential of roughly 1900MW, and for mixed wind and solar, the potential ranges from about 1300MW to 1450MW, with both being appreciably greater than the necessary 600MW [1]. This research does not include rooftop PV and/or its potential which would contribute more to the total production of Barbados. However, there are still many issues that are at hand such as the licensing that the land has, financing, and ensuring that the infrastructure will be able to withstand natural disasters. Although there is an opportunity cost in developing such infrastructure, there can be multipurpose usage of the land, ranging from agriculture to car parks. Also, there are other factors to look into such as battery storage and microgrid development throughout the island. Improvements to this study could include the rooftop PV and analyzing the overall power potential from that source, as well as looking at the land areas of those identified which are licensed to be used for renewable development. Nonetheless, the feat will have to be a cohesive effort from all stakeholders on the island. With the right policies, regulations and availability of funds, the 2030 goal may just become a reality.

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