Financing Renewable Energy in Cuba

by

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April 27, 2018

This 2018 student paper was prepared in partial completion of the graduation requirements for the Master of Environmental Management at the Nicholas School of the Environment at Duke University. The research, analysis, and recommendations contained in this paper are the work of the students who authored the document and do not represent the official or unofficial views of the Nicholas School of the Environment or of Duke University. The authors may have relied in many instances on data provided by different unpublished sources and cannot guarantee its accuracy.

Financial support for research travel was provided by the Duke University Energy Initiative.
Executive Summary

Cuba’s 2014 commitment to generate 24% of the country's electricity from renewable sources by 2030 presents a unique opportunity to explore how an island nation can decarbonize its power system. Cuba has a significantly high electrification rate, a very high dependence on imported fossil fuels, and a small fraction of electric generation from renewable sources. To successfully increase renewable energy production of electricity from approximately 4% of Cuba’s supply mix to 24%, the government plans to install 2,144 MW of new renewable generating capacity from four sources: biomass (755 MW), wind (633 MW), solar photovoltaic (700 MW), and small-scale hydroelectric (56 MW). This new capacity development is expected to require between $3.5 to $4.0 billion of capital investment. While more than half of this investment is expected to come directly from the Cuban government, the remaining capital will have to be obtained from external sources. This analysis estimates that roughly $1.1 billion (955 MW) of new capacity will be open to foreign investors.

This project presents an assessment of the challenges and opportunities that Cuba faces in attracting the necessary foreign investment to achieve its renewable energy goals. The main objective is to present information that can be useful both to investors seeking to enter the Cuban market and to officials in Cuba and other jurisdictions who are seeking capital to fund a transition to a more sustainable and resilient electricity system. The paper first provides a review of the physical and institutional infrastructure of the country’s electricity sector, an overview of the renewable energy goals and development progress, and a summary of recent laws and regulations governing foreign investments. Second, it evaluates Cuba as a potential investment target through a lens of foreign direct investment (FDI) theory and project finance. Third, it summarizes the recent efforts by three other Caribbean island states to compare their success using the same project finance and FDI framework.

The investment framework utilizes three methods of analysis: (1) Foreign Direct Investment Analysis, (2) Credit Analysis, and (3) Jurisdictional Comparison to highlight both macroeconomic and project-level factors that are critical to improving the capacity to attract FDI for renewable energy projects in Cuba. The analysis uses the Foreign Direct Investment (FDI) Fitness Theory to evaluate the governmental and market factors that investors will consider when choosing where to invest. Three important and potentially controllable factors include (1) limiting trade and exchange rate intervention, (2) increasing transparency, and (3) implementing transparent and efficient regulatory frameworks. The Credit Analysis then describes the key risk factors to consider when
developing renewable energy projects, including revenue risks, the financial profile of the project, and macroeconomic factors (including counterparty risk). As the primary counterparty, Cuba's current sovereign credit rating is also an important driver. Finally, using a similar framework, the Jurisdictional Comparison of Jamaica, the Dominican Republic, and the Cayman Islands illustrates that transparency, economic openness, market incentives, and an efficient regulatory framework can all help attract investment for renewable energy.

While there has been progress across these categories, we recommend that Cuba implement the following improvements:

- **To reduce trade & exchange rate intervention**, allow renewable Independent Power Producers (IPPs) to index tariffs to an international currency
- **To increase transparency**, provide clear and regular updates on the status of renewable energy projects
- **To improve upon the regulatory framework**, streamline the project application and approval process and allow for third-party dispute arbitration
- **To reduce project risk**, utilize strong technology operators, site to avoid curtailment, and focus on long-term contracted revenues
- **To reduce the cost of capital**, target concessionary capital sources by tailoring projects to the missions of climate-focused funds

Though these recommendations identify potential improvements in attracting foreign investment, the government of Cuba has made considerable progress to date in providing additional access and guidance for foreign investors. Recent partnerships with international players illustrate both the complex nature of current geopolitical relationships and the momentum building in renewable energy development in the country. Broadly, the renewable energy industry is an attractive space for investment, driving competition for both private and bilateral funding across many jurisdictions. For Cuba and other countries interested in developing renewable energy, continued institutional improvements to attract capital could increase the likelihood that they reach their energy and climate mitigation goals.
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Introduction

Cuba’s focus on increasing and diversifying its sources of electricity generation is driven by two primary goals, one short- and one longer-term. In the short-term, Cuba seeks to depart from a long history of heavy dependence on foreign oil. Oil imports from Venezuela have been declining since 2008, and Cuba saw further drops in 2016-2017 that caused the government to reduce fuel allocations and electricity consumption (Parraga & Frank, 2017). In the longer term, Cuba intends to reduce greenhouse gas emissions to contribute to global climate change mitigation efforts. Cuba has committed to increase renewable electricity from the current 4% share to a share of 24% by installing 2,144 MW of generation capacity by 2030 from sources including biomass, wind, solar photovoltaic, and small hydroelectric plants (Cuba, 2015). In total, the Cuban government estimates that $3.5-4.0 billion of investment is needed to achieve their 2030 renewable energy targets (Panfil, 2017), a part of which will be funded by foreign investors.

The goals to diversify the energy system and expand renewable energy generation capacity are tied to increased government efforts to attract foreign investment. Beginning most notably in 2013, Cuba has taken steps to demonstrate their commitment to attracting and supporting foreign investment in several key sectors, including energy. In 2013, the Special Economic Development Zone of Mariel (Zona Especial de Desarrollo (ZED) Mariel) was established through Decree Law 313 (Ministry of Justice, 2013), intended to attract foreign investment through tax exemptions and other benefits. The government passed Foreign Investment Law No. 118 in 2014, which expanded foreign investment incentives and clarified regulations and processes for foreign investors (National People’s Power Assembly, 2014). In the years following, the Cuban Ministry of Foreign Commerce and Investment has released extensive annual documents outlining the “Portfolio of Opportunities for Foreign Investment” in Cuba (Feinberg, 2017), with a portfolio of renewable energy projects being showcased.

In this study, we present an assessment of the challenges and opportunities that Cuba faces to attract the necessary foreign investment to achieve its renewable energy goals. Our main objective is to present information that can both be useful to investors seeking to enter the Cuban market and to Cuban officials and those of other island states planning for a transition to a more sustainable and resilient electricity system.

The document is organized as follows. Section 1 includes a brief history of the major periods of change in the Cuban energy sector. Section 2 gives an overview of the physical and institutional infrastructure of the country’s electricity sector, the renewable energy targets, and the progress
made in renewable development to date. Section 3 discusses recent laws and regulations governing foreign investments, including renewable energy development. Section 4 summarizes the potential benefits and challenges of developing renewable energy in Cuba using a Strength, Weakness, Opportunities, and Threats framework. Section 5 describes the foreign direct investment and project finance framework used and the results from this analysis. Section 6 includes the results from the Jurisdictional Analysis of Jamaica, the Dominican Republic, and the Cayman Islands. Section 7 provides additional information on recent international partnerships Cuba has entered to support their energy development goals. Section 8 outlines recommendations for how Cuba can strengthen its attractiveness to foreign investors. Finally, Section 9 presents opportunities for continued research, followed by the Conclusion.

1. History of Cuba’s Energy System

Cuba’s energy policy over the last several decades has evolved significantly. The government has been subject to swings in geopolitics, natural resource constraints, and changing economic conditions. The period since 1959 can be separated into the following phases:

1960s-1980s, Nationalization: The period from 1959 to 1991 was characterized by growth within the energy sector. Taking advantage of close ties with the Soviet Union, Cuba expanded its infrastructure in this period extensively, and demand for energy grew at a rapid pace (Suárez, 2012). Cuba benefitted during this time from subsidized oil and other products, which helped to drive demand and grow the sector. During this time, energy assets were nationalized. Though most companies were compensated for any such losses, U.S. companies were not because of their staunch opposition to nationalization (Arrastía-Avila & Glidden, 2017).

1989-early 2000’s, Special Period: The Special Period in Cuba follows the fall of the Soviet Union and is accompanied by serious economic hardship. A key policy during this time was the National Energy Sources Development Program, passed in 1993 to prioritize increased energy efficiency and deployment of renewable energy, increased domestic oil production, and improved efficiencies in the sugar industry to increase electricity generation from bagasse (Käkönen, Kaisti, & Luukkanen, 2014). Due to decreased support from the Soviet Union, the government sought to fix the imbalances in the energy sector. Imports of energy decreased, and Cuba accelerated the development of local energy resources. The growth rate in domestic oil production reached 7% per annum, and electricity generation with domestic oil reached 15,000 GWh per year (Suárez, 2012). The government also focused on rural electrification efforts for schools and health clinics (Käkönen, Kaisti, & Luukkanen, 2014). As early as this period, Cuba expressed a sincere interest in renewable
energy. Article 125 of Law No. 81 (the Environmental Law, passed in 1997) included language indicating that renewable energy should be the preferable resource for electricity generation when feasible (Panfil, 2017).

2006-today, Energy Revolution (Revolución Energética): The Energy Revolution, beginning in 2006, was enacted in large response to the fallout created during the Special Period. In 2004-2006, Cuba entered an energy crisis, characterized by rolling blackouts due to hurricane damage and an aging and inefficient centralized generation system. The intention of the Energy Revolution was to prevent such events from occurring again by increasing energy efficiency and switching to a distributed generation model. Specifically, large, centralized power plants were replaced by smaller, distributed assets; inefficient appliances were replaced with more efficient fans, light bulbs, rice cookers, water pumps, etc.; and the production of local energy resources was expanded (Suárez, 2012). The transition to a decentralized model was largely successful in increasing reliability; blackouts ended once the government installed distributed generation systems in 110 of its municipalities (Arrastía-Avila & Glidden, 2017). It has also created the infrastructure to accommodate more renewable energy, by nature of that generation being distributed. The Energy Revolution has leveraged previously established programs, such as the Electricity Savings Program in Cuba (Programa de Ahorro de Electricidad en Cuba (PAEC)) that promotes energy efficiency and the Energy Saving Program of the Ministry of Education (PAEME) that provides energy education in schools to attempt to build a culture of conservation (Arrastía-Avila & Glidden, 2017).

2. Cuba’s Current Energy System

Cuba is an island nation with a population of approximately 11.2 million people. Cuba’s 2016 GDP (quoted in purchasing power parity) was reported to be $133B, roughly $11,900 GDP per capita (CIA, 2017). Per capita electricity consumption in Cuba was estimated to be 1,434 kWh per year in 2014, significantly lower than in the United States (12,987 kWh per year) but in line with some of its Caribbean neighbors (1,056 kWh per year in Jamaica; 1,578 kWh per year in the Dominican Republic) as depicted in Figure 1 (World Bank, 2014). Cuba has a high electrification rate, with over 99% of the population having access to electricity either through the electric grid or distributed generation. The Cuban grid is highly decentralized, with 40% of generation capacity from distributed generation sources (Panfil, 2017).
2.1 Structure of Cuba’s Energy System

The Ministry of Energy and Mines manages energy policy and oversees Unión Eléctrica (UNE), the government-owned and vertically integrated utility. Established in 1960, UNE provides electric generation, transmission and distribution services and is not run for profit (Belt, 2010). More than 95% of Cuban households have access to the electric grid managed by UNE, and retail electricity rates are subsidized by the government (Panfil, 2017). UNE has signed a Memorandum of Understanding with Siemens to collaborate on energy infrastructure modernization projects, which could include transmission and distribution upgrades as well as generation projects (Siemens, 2016).

In the oil sector, notable players include Cupet, the state-run oil company, and Sherritt, a Canadian company that has partnered with the oil and gas sector since the 1990s. Energas is a joint venture between Cupet and Sherritt that operates three natural gas plants (Panfil, 2017).

Other players in the energy system include Cubasolar and CubaEnergía. Cubasolar is a government-sponsored NGO that operates under CITMA, the Ministry of Science, Technology, and Environment. Cubasolar was established in 1994 with the mission to promote renewable energy and energy efficiency projects. They focus on demonstration projects, education, and technical training (Cubasolar, 2018). CubaEnergía, formally the Center for Information Management and Energy Development, is a part of the Agency for Nuclear Energy and Advanced Technologies (AENTA) and is also associated with CITMA. CubaEnergía is a research and development organization that supports energy and environmental technology research (CubaEnergía, 2018).
2.2 Electricity Tariffs

Residential electricity rates are tiered by monthly consumption to encourage conservation. Figure 2 shows the current consumption tiers, as updated in 2010. Due to government subsidization of household rates for low consumption tiers (particularly less than 100 kWh per month), the average residential electricity rate is less than $0.02 per kWh (Käkönen, Kaisti, & Luukkanen, 2014). While the exact amount of subsidization is unknown, one researcher estimates that the government subsidizes approximately half of the cost of electricity (~$0.13/kWh) (Belt, 2010). Several sources indicate that electricity tariffs are structured intentionally to promote social fairness and provide electricity to all consumers rather than to cover the full costs of generation (Käkönen, Kaisti, & Luukkanen, 2014).

Figure 2: Residential Electricity Tariffs ($/kWh) by Monthly Consumption

Electricity rates are very low in absolute terms, especially compared to other Caribbean countries with an average of $0.33/kWh (Panfil, 2017). However, these numbers do not necessarily imply that electricity is more affordable for Cubans than for others in the region given the weakness of the Cuban peso relative to the dollar and the average monthly household income. Measuring electricity costs as percent of monthly income (Figures 3-5) illustrates that electricity prices are relatively much higher due to lower average wages (Panfil, 2017).
Industrial customers pay time-of-use electricity rates based on three periods: Peak Load (6-10PM), Medium Load (6AM-6PM), and Low Load (10PM-6AM). Exact rates are not readily available.

It is important to note that Cuba operates under a dual currency system, and electricity tariffs are paid in Cuban Pesos (CUP), which is the primary currency used domestically. The second currency, the Convertible Peso (CUC), was established in 1993 and is valued 1:1 with the US dollar (Zhao, 2017). The official exchange rate between the two currencies is 1 CUC:25 CUP, but rates may vary for state-owned enterprises (Gonzalez, 2018). Potential challenges arising from the dual currency system are discussed further in a later section.

### 2.3 Cuba’s Current Energy Mix

Cuba still relies heavily upon fossil fuels, primarily diesel and fuel oil, for electricity generation, with less than four percent of electricity generation (roughly 801 GWh of 20,288 GWh gross electricity generation) coming from renewable sources. **Table 1** and **Figure 6** show the allocation of energy generation by source, with biomass as the largest renewable energy generation source by far.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Annual Generation (GWh)</th>
<th>Percent of Gross Generation</th>
<th>Percent of Renewable Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>16,537</td>
<td>81.5%</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>2,950</td>
<td>14.5%</td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>703</td>
<td>3.5%</td>
<td>87.8%</td>
</tr>
<tr>
<td>Hydropower</td>
<td>48</td>
<td>0.2%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Solar PV</td>
<td>33</td>
<td>0.2%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Wind</td>
<td>17</td>
<td>0.1%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Total Renewable Generation</td>
<td>801</td>
<td>3.9%</td>
<td></td>
</tr>
<tr>
<td>Gross Electric Generation</td>
<td>20,288</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Cuba’s energy system is unique in that it is highly distributed, with over 40% of its capacity coming from distributed systems, the second highest level of distributed generation in the world behind Denmark (Panfil, 2017). Cuba has approximately 3,000 MW of distributed generation capacity, primarily from the more than 1,800 diesel and fuel oil generators (Guevara-Stone, 2017). While this high level of distributed generation provides increased reliability and reduces the risk of large blackouts, these small generators may be costlier and less efficient than centralized generation, and hence result in higher emissions of greenhouse gases and air pollutants (Belt, 2010).

Bagasse (biomass from sugar cane residue) is the largest source of renewable energy for electricity generation, representing approximately 88% of renewable electricity production in 2015 (International Energy Agency, 2015), up from 80% in 2009 (Panfil, 2017). Other biomass sources
include waste products from mills (rice husks from rice mills and saw dust from saw mills). Currently, biomass generation capacity is spread across approximately 50 sugar mills (Guevara-Stone, 2017).

Historically, much of Cuba’s installed renewable electric generation capacity has been from small-scale distributed systems. Distributed solar photovoltaic systems are installed across rural areas to provide power to health centers and schools. Cuba had an estimated 1.8 MW of installed capacity in 2009 (Käkönen, Kaisti, & Luukkanen, 2014), but this had increased to 22 MW by the end of 2015, with 25 MW of additional planned installations in 2016 (Bellini E., 2017). By 2017, there was 59 MW of solar capacity installed across 33 solar farms (Guevara-Stone, 2017). Reports from January 2018 state that solar capacity has reached 65 MW (Bellini E., 2018), but unofficial sources stated that capacity had reached 80 MW by April 2018. Further, some projections state that installed capacity will exceed 100 MW by the end of 2018 (Bellini E., 2018). The first utility-scale solar farm came online in 2013, with installed capacity of 2.6 MW. The Cantarana project was financed by the government and used Cuban manufactured solar panels (Käkönen, Kaisti, & Luukkanen, 2014). However, many of the grid-connected solar PV systems are only 1-3 MW in capacity (Bellini E., Work begins on 4.4 MW PV plant in Cuba, 2017).

Cuba has a smaller amount of installed capacity from wind, representing a minor portion of overall electricity generation. As of 2016, four wind farms accounted for 11.7 MW of installed capacity (REVE, 2018). The first wind farm was built by Cubasolar in 1996, funded largely by international NGOs. The other three wind farms were paid for by the Cuban government (Käkönen, Kaisti, & Luukkanen, 2014). Two wind farms are located in the town of Gibara in the Province of Holguín. Gibara I was constructed in 2008 by Gamesa, a Spanish company, and has installed capacity of 5.1 MW. Gibara II, a 4.5 MW project, was completed in 2010. Both Gibara projects use turbines from Goldwind, a Chinese manufacturer (Xinhua, 2016). The Herradura I wind project is currently being developed and is expected to come online in 2018 (Xinhua, 2016); it will add 51 MW of wind capacity once completed (Guevara-Stone, 2017). In addition, Cuba has more than 7,000 windmills used to pump water, but these are not currently used for generating electricity (Arrastía-Avila & Glidden, 2017).

Hydropower capacity is approximately 65 MW, including both grid-connected and distributed mini- and micro-hydro systems (Käkönen, Kaisti, & Luukkanen, 2014). This capacity is spread across 147 hydroelectric power plants throughout the country (Arrastía-Avila & Glidden, 2017).
2.4 Dependence on Venezuelan Oil

Since 2000, Cuba has held bilateral agreements with Venezuela that provide Venezuelan crude oil in exchange for Cuban services, such as highly skilled doctors. Due to the economic crisis in Venezuela, crude oil shipments to Cuba have been falling every year since 2008, but shortfalls were more drastic in 2017. One source reports that crude oil and fuel imports from Venezuela were down by 13% in the first six months of 2017 and stated that the fuel shortages have resulted in a cut to fuel allocations to state-run companies (Parraga & Frank, 2017). Reliance on imported fuel, particularly from Venezuela, is one of the main drivers for Cuba’s focus on renewable energy deployment.

2.5 Renewable Energy Goals and Progress to Date

As part of its National Electric Development Program, the Cuban government approved a policy in June 2014 for the Prospective Development of Renewable Energy Sources and the Efficient Use of Energy for 2014-2030, setting a goal of generating 24% of its electricity from renewable sources by 2030. The renewable energy target aims to reduce fuel consumption by 1.75M tons per year, avoiding 6M tons of CO₂ emissions (Valdés, 2017). The plan was developed in response to a Resolution passed by the Sixth Congress of the Communist Party of Cuba (Resolution on the Guidelines of the Economic and Social Policy of the Party and the Revolution), discussed in further detail in a later section (Sixth Congress of the Communist Party of Cuba, 2011). In 2012, Raúl Castro signed Presidential Decree No. 3 (Arrastía-Avila & Glidden, 2017) to establish a government commission in charge of proposing a plan for the development of renewable energy projects and the improvement of the system’s efficiency (Delis, 2014). The goals of the commission and its resulting plan were to “reduce energy dependence on fossil fuels and achieve energy independence, decreasing the high cost of energy delivered to consumers increasing the competitiveness of the economy and contributing to environmental protection,” (Arrastía-Avila & Glidden, 2017).

Additionally, as part of its commitment to the Paris Climate Agreement, Cuba submitted a climate action plan to the UN Framework Convention on Climate Change (UNFCCC) in November 2015. Although Cuba’s emissions make up less than 0.08% of global greenhouse gas emissions, the country expects to be heavily impacted by climate change and has pledged to be part of the solution. Since 76% of GHG emissions in Cuba are attributable to the energy sector (not only including electricity), much of their mitigation plan focuses on energy, including both renewable energy generation and energy efficiency efforts. Cuba’s Intended Nationally Determined Contribution (INDC) outlined their pledge to install 2,144 MW of new electric generation from renewable sources by 2030. Outlined in Table 2, the planned generation infrastructure includes “19 bioelectric plants annexed to sugar mills with 755 MW from cane and forestry biomass, 13 wind
farms with 633 MW, 700 MW Photovoltaic and, 74 small hydroelectric plants,” (Cuba, 2015). Based on projected annual generation of 30,000 GWh in 2030, approximately 7,316 GWh of annual generation will come from renewable energy sources (REVE, 2018).

Table 2: Planned Capacity Expansions by Renewable Source (Cuba, 2015)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Additional Capacity (MW)</th>
<th>Number of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>755</td>
<td>19</td>
</tr>
<tr>
<td>Wind</td>
<td>633</td>
<td>13</td>
</tr>
<tr>
<td>Solar PV</td>
<td>700</td>
<td>191</td>
</tr>
<tr>
<td>Hydropower</td>
<td>56</td>
<td>74</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20,288</strong></td>
<td></td>
</tr>
</tbody>
</table>

To successfully increase renewable energy production from approximately 4% of Cuba’s supply mix to 24%, renewable energy development is expected to require between $3.5-4.0 billion of investment (Telesur, 2014), (REVE, 2018). To reach this investment level, the Cuban government plans to allow 100% foreign ownership of some of the renewable energy projects, a move away from the usual requirement of foreign investors entering into joint ventures with Cuban state-owned companies (Panfil, 2017). Funding will be allocated across three sources: domestic investment from the Cuban government, domestic investment via bank loans to UNE or to the government, and foreign direct investment. According to Rossel Guerra, an official of the Ministry of Energy and Mines, “almost half of [the $4B] is based on bank loans and the intervention of foreign investors,” (REVE, 2018). Based on available data for project capacity and costs, an estimated 955 MW of new capacity is open to foreign investors, equivalent to approximately $1.1B of investment.

Several solar energy projects are in progress, including a 50 MW solar photovoltaic plant being built by Hive Energy, a British solar company, under a contract with UNE at the Special Economic Development Zone of Mariel (Veraz, 2016). The project, expected to be completed in 2018, could be considered a pilot for future renewable energy project investments (Panfil, 2017). A second but smaller 4.4 MW solar PV plant is under construction in the Sancti Spíritus province, and will also be completed in 2018. The project uses Chinese technology and is funded by a portion of a $480,000 loan from the Chinese government to develop 100 MW of solar PV installations (Molina, 2018). This development is part of the larger plan to deploy solar across many Cuban provinces (as outlined in a later section discussing foreign investment opportunities). Empresa Eléctrica, the power supplier of Sancti Spíritus province, has announced that the province will have 63 MW of solar PV capacity by 2019 (Bellini E., Work begins on 4.4 MW PV plant in Cuba, 2017), which will include the development of six additional solar arrays installed in 2018 (Molina, 2018).
There is also a significant expansion of wind capacity underway. Herradura 1, the largest wind farm in Cuba, is under development in La Tunas province. When completed, the wind farm will have 51 MW installed capacity from 34 1.5 MW turbines. A Chinese manufacturing company, Goldwind Science and Technology Co., is supplying the turbines. This project is one of 13 proposed new wind farms across Cuba’s eastern northern and central coast (Xinhua, 2016). The project will be followed by the development of Herradura 2, a 50 MW project slated to be built in a second phase. Herradura 2 will have 20 2.5 MW turbines installed, manufactured by Chinese company Dongfang Electric Corp. Miguel Casi, a UNE official, says that they plan to have “at least one circuit” in operation by the end of 2018 (REVE, 2018).

3. Current Foreign Investment Policies

Cuba first officially opened the country to foreign investment in 1995 (Panfil, 2017). Since then, most of the investment in the energy sector has been in oil and gas; of the $2B in oil and gas investment from foreign companies, the majority has come through Cuba’s partnership with Sherritt, a Canadian company (Panfil, 2017). More broadly, to meet the aggressive development goals Cuba has set across the whole economy, including those for renewable energy development, officials have stated that they will need to bring in roughly $2.5B per year in foreign investment (Whitfield, 2017).

To attract this investment, Cuba has enacted several policies and legal frameworks, including the establishment of the Mariel Special Economic Zone (Zona Especial de Desarrollo (ZED) Mariel) and the passing of the Foreign Investment Law No. 118. These laws mark a change in Cuban foreign investment policy by allowing investment other than joint ventures with the Cuban government, as has been the requirement for over 25 years (Arrastía-Avila & Glidden, 2017).

3.1 Sixth Congress of the Communist Party of Cuba: Resolution on the Guidelines of the Economic and Social Policy of the Party and the Revolution

In the Resolution passed in 2011 by the Sixth Congress of the Communist Party of Cuba, the Cuban government affirmed several goals related to foreign investment and renewable energy development that set the stage for future policy changes. First, the document states that Cuba is committed to “continue to attract foreign capital” to meet several objectives, including “access to advanced technology, the transfer of management skills, a diversification and expansion of export markets, an import substitution, the supply of medium and long term financing for the construction of a production project and/or the provision of working capital for its operation, and the generation of new employment.” The Resolution conveys an interest in expanding multilateral cooperation,
specifically mentioning the importance of engaging with the United Nations as a way to access technology and financing. Further, the document specifies the need to work with international organizations to “give priority to material and technological support for the development of projects that utilize diverse sources of renewable energy.” Finally, the Resolution’s Energy Policy section defines Cuba’s plans to focus on renewable energy development with a goal to “Maximize the use of different sources of renewable energy, including but not limited to solar, bio-gas, wind, water, biomass and other sources,” (Sixth Congress of the Communist Party of Cuba, 2011).

3.2 Mariel Special Economic Zone

The Special Economic Zone of Mariel (Zona Especial de Desarrollo (ZED) Mariel) was established in 2013 by Decree-Law No. 313 and Decree No. 316. The decree cites the need to “create the [zone] for the aim of promoting the growth of infrastructures and activities that permit increased exports, replacing imports, carrying out high technology projects, generate new sources of employment and contribute to national progress.” Of several goals outlined, one objective is specifically to “attract foreign investment” (Ministry of Justice, 2013). The Zone, located roughly 30 miles west of Havana, spans 115,000 acres and includes the Mariel port. Companies operating within the Zone benefit from several exemptions, including exemption from paying income tax for the first ten years of operation (Davis L. M., 2016).

While the establishment of the Zone has attracted some new businesses to Cuba, only eight projects had been approved by the end of 2015, accounting for approximately $200M of investment in the area. Notably, about half of this early investment inflow came from BrasCuba’s relocation of their cigarette production facility to a new, updated facility in the Zone (Feinberg, 2017). Over time, interest in the Zone has picked up. By 2017, more than 400 applications had been submitted, but not all companies completed the application process. As of mid-2017, 27 companies had been approved to locate businesses in the zone, and nine had begun to operate. The companies represent nine foreign countries and Cuba; six of the 27 companies are from Spain (the most from any one country), and none of the companies are U.S. firms (Whitfield, 2017).

Ana Teresa Igarza, the director of the Mariel Special Economic Development Zone, acknowledges that the process can be “lengthy,” partially because representatives work with only 20-30 companies at a time to complete the required documentation. The government can also choose whether it is interested in moving forward with the project submission, and once it does approve the proposal, companies “must submit extensive documentation and technical specifications,” (Whitfield, 2017).
3.3 Foreign Investment Law No. 118

In 2014, the National People’s Power Assembly of the Republic of Cuba passed Foreign Investment Law No. 118, updating previous rules established under the “Foreign Investment Act” (Law No. 77) passed in 1995. The primary goal of the law was to “establish the legal framework for foreign investments” in order to gain access to “external financing, technologies and new markets,” (National People’s Power Assembly, 2014).

The law allows for foreign investors to invest via 100% foreign-owned companies, joint ventures between a foreign company and a Cuban investor, and “economic association agreements” that bring together multiple foreign and domestic investors to complete a single project without merging into a single legal company (Davis L. M., 2016).

The law expands some of the incentives previously provided only to projects within the Mariel Special Economic Zone, although the exact benefits are slightly different. Tax incentives include no taxes paid on dividends, a graduated income tax structure (no income tax paid in the first eight years of operation, 15% income tax after eight years), sales tax incentives (no sales tax paid in year one, followed by 50% of the sales tax rate going forward), and no labor taxes (Alcade, 2014). Additionally, customs duties are waived for the import of most equipment and machinery. Preferential treatment is also given in purchase agreements with domestic companies to encourage local contracts (Davis L. M., 2016).

The law outlines stipulations around labor, requiring businesses to hire Cuban citizens for most positions, with exemptions for some administrative and managerial roles. Cuban workers must be hired through a state-run “employing agency” and paid in Cuban pesos (National People’s Power Assembly, 2014).

Procedurally, Law No. 118 outlines the steps required for companies to gain investment approval. The Ministry of Foreign Commerce and Investments reviews and approves all proposals. Some critics of the process claim that the approval process is too lengthy and requires “extensive...business, marketing, financial and legal planning,” (Alcade, 2014).

The law includes the state’s guarantees for the investors, ensuring their benefits and protecting against expropriation. Article 3 of Chapter III (Guarantees for Investors) states that “The Cuban State shall see to it that the benefits granted to foreign investors and their investments are maintained throughout the entire period for which they were granted.” Chapter III, Article 4.1 continues, outlining that “Foreign investments...could not be expropriated, unless such action is
executed for reasons of public or social interest…with appropriate compensation for their commercial value established by mutual agreement…” (National People's Power Assembly, 2014).

Thought to be related to protecting companies from the effects of the US embargo on Cuba (Alcade, 2014), the law also includes verbiage in Chapter III, Article 5 to protect foreign investments from “legal claims by third parties or the extraterritorial implementation of other States’ laws, according to Cuban laws and the rulings issued by Cuban courts” (National People's Power Assembly, 2014).

After the law was passed, some were critical of the clause outlining compensation in the case of expropriation, since there are no guidelines for what could cause expropriation for the “public of social interest” or what level of compensation investors would receive if this occurred. One critic wrote that investors “should be wary of this, provided that it is, in essence, up to the discretion of the Cuban government when, and if, to dissolve a foreign entity,” (Davis L. M., 2016). Additionally, since the procedures for foreign investment are new and projects are slow to be approved and deployed, investors are watching how the early projects are being administered, creating the risk that any early mishaps will set the tone for future investors (Alcade, 2014).

The changes in investment law have practical benefits for companies operating in Cuba. For example, Sherritt already benefited from a $31.7M tax recovery in 2015 due to the reduction in taxes put in place under the new investment law. Tax rates for oil and gas projects were lowered to 22.5% from 30%, and the tax rate on electric power projects dropped to 15% from 30% (Panfil, 2017). However, the progress to date across all sectors has been slow. Reports show that while the government set an annual target of $2.5B in projects approved, only $1.3B in projects received approval in the first two years after the law was passed (Panfil, 2017).

### 3.4 Portfolio of Opportunities for Foreign Investment

The Cuban Ministry of Foreign Commerce and Investment began publishing an annual “Portfolio of Opportunities for Foreign Investment” in 2014. In this document, the Ministry promotes the advantages of investing in projects in Cuba, highlighting the favorable aspects of doing business in Cuba and describing the incentives that have been put in place to attract investment. **Table 3** is a replication of the policy details provided to investors. The 2017-2018 document provides a “Summary of Business Opportunities,” listing 456 projects across 18 priority sectors, including Energy (Cuban Ministry of Foreign Commerce and Investment, 2017).

Since the passing of the Foreign Investment Law No. 118, the government has only approved 60 projects from the Portfolio of Opportunities for Foreign Investment. Most of the projects have been
joint ventures or management contracts, and more than 30 projects were in the tourism sector (Davis & Piccone, 2017).

Table 3: Foreign Policy Summary (Cuban Ministry of Foreign Commerce and Investment, 2017)

<table>
<thead>
<tr>
<th></th>
<th>Foreign Investment, Law No. 188</th>
<th>Special Economic Development Zone of Mariel</th>
<th>Taxation System, Law No. 113</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Profits</td>
<td>0% for 8 years and, as an exception, for a longer period. Subsequently 15%. 0% on reinvested profits. It may be increased to 50% for exploitation of natural resources</td>
<td>0% for 10 years and, as an exception, for a longer period. Subsequently 12%. Application of Law No. 118 for profits reinvestment</td>
<td>35%; May increase to 50% for exploitation of natural resources.</td>
</tr>
<tr>
<td>Contributions to Local Development</td>
<td>0% during investment recovery</td>
<td>Exempted</td>
<td>Is being established gradually in the Annual Budget Law</td>
</tr>
<tr>
<td>On Sales or Services</td>
<td>0% during first year of operations, subsequently 50% discount on wholesale sales and on services</td>
<td>0% during first year of operations, subsequently 1%</td>
<td>2% on wholesale sales and 10% on services. New taxable items shall be gradually incorporated</td>
</tr>
<tr>
<td>On Personal Incomes to Partners or Parties</td>
<td>Exempted</td>
<td>Law No. 118 applies</td>
<td>15%</td>
</tr>
<tr>
<td>On Using or Exploiting Natural Resources and Preserving the Environment (5 Taxes)</td>
<td>50% discounts during investment recovery</td>
<td>Law No. 118 applies</td>
<td>For the use of beaches, waste disposal into hydrographic basins and terrestrial waters: defined in the Annual Budget Law. Use of bays and forestry resources according to taxable items in Law 113</td>
</tr>
<tr>
<td>Customs</td>
<td>Exempted during the investment process</td>
<td>Exemptions on means, equipment and goods in the investment process</td>
<td>Taxable items are established in the Customs Duties</td>
</tr>
</tbody>
</table>

Since 2014, the number of total projects included in The Portfolio of Opportunities for Foreign Investment has steadily increased. However, the number of energy projects listed rose slightly then fell, remaining roughly the same over the past four years, as shown in Table 4 and Figure 7. The 2017-2018 list includes 91 projects within the Energy Sector, most of which were related to the oil industry (78), but 13 projects were renewable energy development opportunities. The projects are divided amongst four generation types: biomass, wind, solar PV, and biomass.
Table 4: Portfolio of Opportunities for Foreign Investment, 2014-2017

<table>
<thead>
<tr>
<th></th>
<th>Energy Projects</th>
<th>Total Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil &amp; Gas</td>
<td>Renewables</td>
</tr>
<tr>
<td>2014-15</td>
<td>86</td>
<td>13</td>
</tr>
<tr>
<td>2015-16</td>
<td>86</td>
<td>22</td>
</tr>
<tr>
<td>2016-17</td>
<td>87</td>
<td>23</td>
</tr>
<tr>
<td>2017-18</td>
<td>78</td>
<td>13</td>
</tr>
</tbody>
</table>

Figure 7: Projects Available by Sector for Foreign Investment, 2014-2017

*Biomass:* To reach the 755 MW target for biomass capacity, the government plans to add electric generation capacity at 19 bioelectric plants at existing sugar mills. The biomass projects available in the 2017 portfolio are for joint enterprises in increasing the output of electricity from 11 existing facilities, with total capacity of 365 MW (Valdés, 2017). The investor would enter a partnership with Zerus S.A., and the expected capital cost of the projects sum to $120M (Cuban Ministry of Foreign Commerce and Investment, 2017). This investment amount increased over the 2016 estimate, despite listing fewer projects. The 2016 portfolio includes 16 projects ranging in capacity from 30-50 MW, with a total investment cost of $90 M. Unión Nacional Eléctrica will be the offtaker for the electric sales agreements (Cuban Ministry of Foreign Commerce and Investment, 2016). According to an official of the Ministry of Energy and Mines, “three bioelectric plants are in the execution phase, another eight are the object of negotiations for the creation of joint ventures and the remaining 14 are part of the portfolio of opportunities” that were presented recently at the Cuba Sustainable Forum 2018 that was held at the end of January 2018 (REVE, 2018).

*Wind:* To achieve its goal of 633 MW of wind capacity, 13 new wind projects were proposed by the Ministry of Energy and Mines in 2015, with seven projects being made available to foreign investors (Panfil, 2017). The projects range from 32-52 MW each, and UNE will enter into power purchase agreements for the energy production (Cuba Business Report, 2016). The 2017 Portfolio lists only
one wind project; the Manatí Wind Farm is a proposed 40 MW project located in Las Tunas province with an estimated investment cost of $65M. The project will be a “100% Foreign Capital Enterprise” that includes a “Building, Operation and Ownership (BOO)” agreement with Unión Eléctrica. The document claims that this project will result in 66M CUC in savings over the wind project’s useful life (Cuban Ministry of Foreign Commerce and Investment, 2017). In the prior year, the Manatí Wind Farm was included alongside two other wind projects. The Los Jagüeyes and Río Seco wind farms, at 35 MW and 50 MW respectively, are located in Holguín province and are also “100% Foreign Capital Enterprise” projects with Unión Eléctrica as the offtaker. No estimated capital costs are listed, but savings from each project are estimated to be 62.5M CUC and 76M CUC over the life of each project respectively (Cuban Ministry of Foreign Commerce and Investment, 2016). The 2015 document listed two different wind farms for 100% foreign ownership. The Banes Wind Farm was a planned $100M investment for 102 MW, and the Maisi Wind Farm was listed at $285M for 174MW (Panfil, 2017).

In a recent interview, a Ministry of Energy and Mines official stated that four wind projects are currently undergoing negotiations and 10 wind projects have been awarded to foreign investors (REVE, 2018), but no further details have been made available.

**Solar:** Unlike the specific projects being bid out for wind development, the portfolio is less clear on the exact sizes and locations of proposed solar PV farms. The 2017 portfolio includes a project describing the availability of investment in 100 MW of solar PV across “several provinces.” Similar to wind development, UNE will be the sole offtaker of the electricity. The investment type is listed as a joint enterprise with either a build-own-operate-transfer (BOOT) or engineering, procurement, construction (EPC) with funding arrangement. The portfolio document also describes the opportunity to include batteries in the solar developments and the option for partnership with the Cuban solar panel manufacturing plant to increase capacity and production (Cuban Ministry of Foreign Commerce and Investment, 2017). The 2016 portfolio also highlighted the opportunity for development of 100 MW of solar PV, but it specifies that the investment would be “100% Foreign Capital Enterprise as an Affiliate” and would operate through a “Building, Operation and Ownership Contract (BOO).” It is unclear why this specification changed year over year. Both documents publish an estimated investment cost of $2/kW installed (Cuban Ministry of Foreign Commerce and Investment, 2016).
4. SWOT Analysis: Developing Renewable Energy in Cuba

To take a broad view of how Cuba is positioned to develop a significant amount of renewable energy capacity, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is summarized in Table 5.

Table 5: SWOT Analysis Summary

<table>
<thead>
<tr>
<th>Key Factors</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• High electrification rate (&gt;99%)</td>
<td>• High reliance on imported fossil fuels</td>
<td>• External Engagement (European Union, China, IRENA)</td>
<td>• Extensive project approval process</td>
</tr>
<tr>
<td></td>
<td>• Highly distributed system (40%)</td>
<td>• Single offtaker (UNE) with limited privatization</td>
<td>• Development banks</td>
<td>• Subsidized electricity tariffs may divert government spending</td>
</tr>
<tr>
<td></td>
<td>• Availability of biomass, solar, &amp; wind resources</td>
<td>• Dual currency system</td>
<td>• Co-location of bioelectric generation with sugar mills</td>
<td>• Continued US embargo may deter developers and investors</td>
</tr>
<tr>
<td></td>
<td>• Educated workforce</td>
<td>• Aging grid infrastructure</td>
<td>• Continued policy reform</td>
<td>• Volatility of imported oil (supply and prices)</td>
</tr>
<tr>
<td></td>
<td>• History of energy efficiency project success</td>
<td>• Lack of experience &amp; transparency in renewable project development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Strengths:** To highlight several factors identified as strengths, a high electrification rate allows the government to focus on deploying renewable generation rather than being faced with large electrification challenges that would otherwise divert time and money. Further, UNE is already accustomed to operating a largely decentralized system due to the significant amount of distributed generation built after the Energy Crisis in 2004-2006. Integrating renewable energy from additional distributed systems should be less challenging.

**Weaknesses:** The reliance on imported fuels is a current weakness that could also be a potential opportunity. Imported fuel is expensive, so shifting away from oil generation to wind or solar could be beneficial in reducing overall system costs. For now, it may restrict the capital available to UNE. A second potential weakness is the regulatory structure in which UNE is the sole offtaker since developers must accept any terms and pricing UNE offers, and financing is dependent upon the credit worthiness of the Cuban government. The dual currency system also presents challenges to investors, which will be addressed in the section covering foreign direct investment theory.
Opportunities: Recent engagement with foreign players, such as the EU and China as well as the International Renewable Energy Agency’s (IRENA) Small Island Developing States (SIDS) Lighthouses Initiative, presents opportunities to bring in partners that can share technical knowledge and project development experience. These partnerships as well as recent discussions with development banks are covered further in a later section.

Threats: The primary threats to consider include the potentially extensive timeline for approval on foreign-owned renewable energy and other projects as well as the electricity subsidies discussed previously. While electricity access in Cuba is seen as a social service that should be available to all consumers, subsidies distort market prices and require government to pay “wholesale” prices to generators while not passing along the full cost to consumers, posing liquidity risks. However, if these renewable energy projects reduce system costs by reducing oil generation, liquidity risk may be less of a concern.

5. Framework Analysis: Attracting Foreign Investment

5.1 Overview of Framework Analysis
In order to assess the attractiveness of renewable energy projects in Cuba, this paper utilizes a framework that consists of foreign direct investment theory, credit analysis, and jurisdictional comparison. The analysis is structured to highlight both macroeconomic and project-level factors that will positively influence investment in renewable energy development. Macroeconomic factors typically encompass government- or location-specific aspects of development, versus project-specific factors which trend towards technology, contracts, and stakeholders. This analysis takes three different approaches to gauge which factors which would make renewable energy projects in Cuba attractive. First, this paper looks at the theory of foreign direct investment to assess what are the main determinants or drivers for foreign direct investment. The analysis then assesses project risk through the lens of credit rating agencies to determine how to de-risk projects to drive competitiveness. Finally, an analysis of comparative jurisdictions highlights best practices for attracting foreign investment for renewable energy projects.

5.2 Financing Players
The government of Cuba will look to optimize its investments to meet its sustainable development goals. In an effort to attract the most optimal capital for its projects, it is helpful to understand the resources that the government of Cuba can currently or potentially access. For the purposes of this
study, we look at three sources of capital: (1) private developers, (2) development finance institutions, and (3) climate-focused investors.

5.2.1 Private Developers
Equity from private developers is the costliest source of financing of the three options that this paper assesses. In this case, the government of Cuba loses ownership of projects to foreign entities. In turn, these entities mobilize the required capital. These parties can either operate project or develop and sell projects to the government of Cuba. There are a few instances of private companies operating in the energy industry to date.

*Sherritt*: Sherritt is an energy and mining company that both produces oil and gas and operates assets in the power sector. It is the largest independent energy producer on the island of Cuba (Sherritt, 2015). The company operates under production-sharing contracts (PSC) with Cuban government, covering both production and exploration. On the power side of the business, Sherritt owns one-third of a joint venture called Energas (Sherritt, 2017, p. 5). The company also has a fifty-fifty partnership with the General Nickel Company S.A. (GNC) called the Moa Joint Venture which produces nickel and cobalt for sale internationally (Sherritt, 2017).

*Hive Energy*: Hive Energy is a solar energy developer based in England that recently launched operations in Cuba. The company’s first project in Cuba is a 50 MW, $67 million solar project that will be the first of its scale developed in Cuba, expected to begin operation in 2018 (Hemlock, 2018). The company has agreed to a 25-year power purchase agreement with Unión Eléctrica, though as of the writing of this paper, the company is still looking for financing.

5.2.2 Development Finance Institutions
Development Finance Institutions (DFIs) provide tools for supporting a variety of economic development objectives in developing countries. The specific tools offered vary by institution and include loans—private or public sector—grants, equity, and technical assistance. Cuba distanced itself from the major development finance institutions during the Cuban Revolution. Further, United States legislation prohibits the “international finance institutions” (U.S. Congress, 1996) from providing support for Cuba, limiting the country’s access to these resources. However, the landscape has changed since then, and Cuba is increasingly able to access these funds. In particular, the island has been improving relationships with some of the regional development banks.

*Development Bank of Latin America (CAF)*: Headquartered in Caracas, Venezuela, CAF is a development bank supported by 19 countries and 13 banks (CAF). The bank held US$35.7 billion (CAF, 2017) in assets at year-end 2016, and member countries include Spain, Portugal, and 17
countries from Latin America and the Caribbean. The bank has been looking to develop a relationship with Cuba since 2013. In September 2016, CAF signed an agreement with the government of Cuba to provide initial technical support to the island, potentially paving the way for the island to one day become a shareholder of the bank (CAF, 2016).

*Central American Bank of Economic Integration (CABEI)*: CABEI is the primary development bank in Central America focused on the region's development and economic integration. The member group comprises eight regional members and five non-regional members. Cuba's relationship with CABEI is also in its infancy, as Cuba was admitted as an extra-regional member recently in April 2017 (Chauvin, 2017). Due to restrictions related to U.S.-Cuba relations, CABEI cannot make loans to Cuba in U.S. dollars, and different mechanisms were created to ensure that the $200 million in potential loans did not violate any restrictions pertaining to the United States (Chauvin, 2017).

*OPEC Fund for International Development (OFID)*: OFID was set up originally in 1976 as the development finance institution by the member countries of Organization of the Petroleum Exporting Countries (OPEC). This DFI had $4.433 billion in contribution pledges by year-end 2016 (OFID, 2018). OFID began developing a relationship with the Government of Cuba in 2002, and since then the institution has granted $228.5 million in public sector loans to the island (OFID, 2018). Specific to the energy sector, OFID recently signed a $45 million public sector loan deal to help finance solar energy in Cuba (OFID, 2018).

### 5.2.3 Climate-Focused Investors

Global actors have expressed increasing interest in supporting climate change mitigation efforts. To support these efforts, several funds have been created to specifically target climate mitigation or adaption, often with a focus on developing nations that require additional support. These funds often provide concessionary or low-cost financing which help support lower cost development of renewable energy projects.

*Green Climate Fund (GCF)*: The Green Climate Fund is a globally supported fund devoted to helping developing countries reduce carbon emissions and improve climate resiliency. It was established by the 194 participants of the United Nations Framework Convention on Climate Change (UNFCCC) specifically to benefit countries that are "highly vulnerable" (GCF) to climate change, including Small Island Developing States (SIDS) and Least Developed Countries (LDCs). As of April 2018, the fund had received $10.3 billion in pledges and $3.7 billion in commitments (GCF). Cuba has already selected a national designated authority (NDA) and a "focal point" (entities required for interfacing
with the GCF (GCF, 2017). The island was in the pipeline for GCF’s Readiness program that provides capacity support as of November 2016 (GCF, 2016). Cuba has also recently (Stone, 2018).

**Climate Investment Funds:** Climate Investment Funds (CIF) provides concessional financing to help build capacity and bolster investor confidence both in new markets and for new business models. The fund is comprised of four distinct programs, supported by $8.3 billion in country pledges that are expected to yield $58 billion of co-financing (CIF). Specific initiatives relating to renewable energy and developing countries are the Scaling Up Renewable Energy in Low Income Countries Program (CIF) and the Clean Technology Fund (CIF). Both of these projects funnel funds to recipient nations through partnerships with development banks. Cuba currently does not have a relationship or any investment plan in place with Climate Investment Funds.

### 5.3 Foreign Direct Investment Fitness Theory

To best understand how Cuba can attract the necessary capital for developing its renewable energy projects, this paper first assesses the academic literature on foreign direct investment. Many theories have been developed to explain the key determinants that drive FDI, and these theories can be classified as either macroeconomic or microeconomic in nature (Makoni, 2015). To best organize the analysis, this paper focuses on the Institutional FDI Fitness Theory to guide the analysis of which macroeconomic determinants Cuba can leverage.

The FDI Fitness Theory was developed by Saskia Wilhelms to explain the key determinants of foreign direct investment. The theory applies the Darwinian concept of fitness to a nation’s ability to attract and retain foreign capital: countries that can find a niche and react in response to the needs of investors will better attract needed FDI (Wilhelms & Witter, 1998, p. 2). The basis of each country’s total fitness lies in the fitness of four distinct institutions: Government, Market, Educational and Sociocultural. These institutions play differing roles in attracting FDI. The government is vital for enacting policies that create an enabling environment for FDI, while well-functioning markets are needed to encourage investment. Power is concentrated in these two institutions because decisions can be made swiftly by governments that affect the markets and permeate the other institutions within a given country (Wilhelms & Witter, 1998, p. 4). The Sociocultural and Educational institutions are also important for FDI; however, they take a much longer time to evolve. A study of 67 emerging countries showed that the fitness of government and market institutions was most crucial for attracting FDI fitness (Wilhelms & Witter, 1998, p. 38).

Any changes to address each of these institutions must be actionable and politically conceivable. Specific aspects of these institutions that are relevant to renewable energy development include (1)
limiting trade and exchange rate intervention, (2) increasing transparency, and (3) implementing transparent and efficient regulatory frameworks. Low exchange rate intervention is considered to be a measure of economic openness and a key driver of foreign direct investment (Wilhelms & Witter, 1998, p. 25). Corruption and rule of law often play a significant role on FDI flows (Wilhelms & Witter, 1998, p. 33), so greater transparency can drive more investment. Also, investors typically prefer “clear-cut regulations and consistent implementation” (Wilhelms & Witter, 1998, p. 34). Though favorable treatment may at times benefit specific actors, on the aggregate efficient and transparent regulatory structures encourage increased investment.

5.4 Evaluating Cuba within the FDI Fitness Theory

While there are a growing number of projects available to foreign investors and a public desire to attract investors to Cuba, foreign investment has not kept pace with stated goals. Investing in renewable energy in Cuba has several advantages, as discussed in the SWOT analysis. However, barriers to investment seem to be preventing more capital from flowing into the country. Cuba has an investment to GDP ratio (including both domestic and foreign investment) roughly half that of the average for Latin American countries (Feinberg, 2017); Cuba’s investment rate was 12.7% of GDP from 1998-2018 (Torres, 2018). As previously mentioned, the Cuban Minister of Foreign Trade and Investment (MINCEX) Rodrigo Malmierca has announced a $2.5 billion annual target for total foreign investment, but Cuba saw only $1.3 billion in investment in 2015-2016. Development in the Mariel Special Economic Zone has also been slower than anticipated. Further, a drop in Venezuelan crude oil shipments and the impact of the Venezuelan crisis broadly has hurt Cuba’s ability to invest domestically (Davis & Piccone, 2017).

The analysis of Cuba using the FDI Fitness Theory as a framework focuses on the three government institutional factors introduced above: (1) limiting trade and exchange rate intervention, (2) increasing transparency, and (3) implementing transparent and efficient regulatory frameworks. The next section evaluates the aspects of the legal and regulatory environment that investors would consider, focusing on two characteristics: (i) the current foreign investment policies, primarily Foreign Investment Law No. 118, and (ii) the dual currency system.

5.4.1 Foreign Investment Law No. 118

As previously discussed, Foreign Investment Law No. 118 was passed in 2014 with the goal of establishing the legal framework and benefits for foreign investment. Table 6 summarizes the current policies against the three aforementioned FDI Fitness Theory factors. Several benefits to investors include select tax incentives and exemptions as well as the ability to transfer profits out of
the country (Alcade, 2014). Regarding transparency, this law as well as the annually published portfolio of opportunities provide some clarity for investors, but there is limited insight into which projects have been approved, funded or completed, and triangulating this information across multiple sources sometimes provides conflicting results. Generally, there is also a lack of precedent for foreign-owned projects. While the list of projects available to foreign investors is extensive, the number that have been signed and executed is short. Within the energy sector, there are even fewer projects that have signed contracts or begun generating electricity, leaving investors potentially cautious of the lack of history with power purchase agreement (PPA) contract negotiation and execution (Panfil, 2017). One example investors can look to is the joint venture between UNE and Sherritt to run two combined-cycle gas plants (Belt, 2010).

In terms of regulatory framework, the law does outline the required steps for investors to gain project approval, but anecdotal feedback includes complaints of a lengthy process with extensive documentation required, which expands beyond the energy sector (Panfil, 2017). Companies must submit extensive paperwork with detailed financial information before garnering approval for projects, both within and outside the Mariel Special Economic Zone (Whitfield, 2017). Additionally, establishing partnerships in Cuba is seen as a gradual process that requires an investment in relationship building rather than the quick execution of a single project (Davis & Piccone, 2017).

Finally, the law outlines protection from unjust expropriation, but as discussed, some critics claim that it leaves too much open to government determination regarding what is in the public interest and what is appropriate compensation (Davis L. M., 2016).

Table 6: Foreign Investment Law No. 118 – FDI Fitness Framework Analysis

<table>
<thead>
<tr>
<th>Factor</th>
<th>Benefits to Investors</th>
<th>Potential Criticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade &amp; Exchange Rate Intervention</td>
<td>• Tax incentives &amp; exemptions&lt;br&gt;• Waived custom duties for select imports&lt;br&gt;• Allows transfer of profits &amp; dividends out of Cuba</td>
<td>• Includes labor restrictions&lt;br&gt;• Restricted benefits to 100% foreign-owned projects</td>
</tr>
<tr>
<td>Transparency</td>
<td>• Clarity for investors</td>
<td>• Unclear status of previously advertised or approved projects&lt;br&gt;• Project portfolio is inconsistent year over year and with other government documents</td>
</tr>
<tr>
<td>Regulatory Framework</td>
<td>• Outlines steps required to gain investment approval</td>
<td>• Lengthy, detailed process&lt;br&gt;• Potential concerns over expropriation clauses</td>
</tr>
</tbody>
</table>
5.4.2 Dual Currency System

One widely cited barrier to foreign investment is Cuba’s dual currency system. Two currencies are used in Cuba: the Convertible peso (CUC) and the Cuban peso (Davis L. M., 2016). Introduced in 1993 as a response to currency devaluation, the CUC was originally used only for foreign trade and tourism (Gonzalez, 2018) and is tied to the US dollar (Desgain & Haselip, 2015). Most Cubans instead are paid in CUP, and the official exchange rate is 25 CUP:1 CUC, a rate which is set by the government. However, public sector enterprises may use a 1 CUP:1 CUC exchange rate (Frank, 2015). The exchange rates can vary drastically by economic sector, with the value of US$1 ranging between 1-24 pesos depending on the sector (Torres, 2018). The CUC is only used within Cuba, so any international spending must be done in US dollars or Euros, limiting spending to income from exports or tourists made in these currencies. For the energy sector, this can create liquidity challenges. Revenue to UNE is paid in Cuban pesos, which are valued lower than the CUC. Purchasing equipment to maintain and upgrade the electric system is limited by access to currency (Desgain & Haselip, 2015). Neither currency can be converted outside of Cuba or exchanged in foreign markets, and currently there are no clear rules allowing investors to index their payments to foreign currencies (Zhao, 2017). For renewable developers and investors who want steady and predictable cash flow streams, this is a potential red flag. While there have been discussions of currency unification, no plans for the process or timeline for unification have been released.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Potential Criticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade &amp; Exchange Rate Intervention</td>
<td>• Currency is not convertible in foreign exchange markets</td>
</tr>
<tr>
<td></td>
<td>• Exchange rates are set by Cuban government</td>
</tr>
<tr>
<td>Transparency</td>
<td>• Exchange rates can vary across sectors</td>
</tr>
<tr>
<td></td>
<td>• No clear currency indexation rules for foreign investors</td>
</tr>
</tbody>
</table>

5.4.3 Additional Potential Barriers to Foreign Investment

While the previously discussed factors are significant drivers of investment within the FDI Fitness Theory framework, research on development in Cuba covers several other institutional characteristics that are important to mention.

Energy Regulatory Structure: The regulatory power is concentrated, and some researchers cite that the “agency staff lack incentives to take action” (Panfil, 2017). Further, the single offtaker structure, with UNE as the only purchaser of renewable energy generation, ties all investments to the credit quality of UNE. The subsidization of electricity tariffs may also limit the financial strength of the utility (Panfil, 2017).
**Subsidized Electric Tariffs:** Investors and researchers also cite the highly subsidized residential energy costs and limitations of the current tariff structure. As previously discussed, residential rate subsidies are estimated by one source to be $0.13/kWh, roughly half the cost of generating the electricity (Belt, 2010). Since the exact amount of subsidization is not known, investors may have difficulty in understanding the economics of the current energy system and the range of costs in which their projects need to fall to be competitive (Desgain & Haselip, 2015).

**Lack of Access to International Financing:** Since Cuba will need to balance foreign investment with domestic financing via loans, investors are wary that Cuba will be able to access the necessary financing. Cuba is largely isolated from the world financial markets and, as discussed previously, has limited access to foreign currency (Panfil, 2017). Cuba also has not previously secured guarantees from development banks and other international financing organizations, but its recent engagement with the International Renewable Energy Agency (IRENA) and the Abu Dhabi Fund for Development (ADFD) may be a signal that this is changing (IRENA, 2018).

**Implications of the US Embargo:** Despite moves from the Obama administration to improve relations between the US and Cuba, the future of the relationship is unclear, and the US trade embargo is still in place (Panfil, 2017). The purpose of this analysis is not to focus solely on US investment in Cuba, so this section will not cover the intricacies of the US embargo and its impacts on US companies’ abilities to invest capital in Cuba. However, multiple resources discuss the impact the embargo has had on renewable energy development in Cuba, specifically related to Cuba’s access to technology (Desgain & Haselip, 2015). As one example, the embargo may have limited wind energy development by forcing Cuba to procure technology from Europe and Asia rather than US wind technology manufacturers. Wind projects to date have sourced turbines from Ecotècnia (Spain), Vergnet (France), Goldwind (China), and Dongfang (China) (Ini, 2014).

### 5.5 Credit Factors

To better understand which risks underlie renewable energy projects in Cuba, this analysis looks at how credit rating agencies assess renewable energy projects. Credit ratings offer a measure of how reliably a debtor will pay back its debt obligations. This measurement is important as it often impacts the price of that debt.

Entities that finance renewable energy projects, whether the government of Cuba or foreign entities, will need to raise funds beyond their equity investments. Financial institutions will assess these organizations based on the types of risk associated with the specific project and the jurisdiction where the project is located. An assessment of these risks can reveal ways to improve
creditworthiness and reduce the cost of credit. Operation risk, for example, relates to the expected availability or productivity of a project, and to the costs associated with operating that project over its expected life cycle (Fitch Ratings, 2017, p. 11). This risk can be mitigated in part with several strategies: utilizing an operator with experience in the technology and jurisdiction, choosing a project type where alternative operators exist, or ensuring that maintenance can be conducted easily (Fitch Ratings, 2017, p. 13). The ratings agencies will rate projects using a matrix of several of these factors to ultimately determine overall creditworthiness.

Though many project-level risks can be mitigated with this assessment, macroeconomic concerns may still drive overall credit quality. It’s important to comment on two distinct categories of risk, as determined by Fitch Ratings: Revenue from price and Financial Profile. Both categories hinge on the creditworthiness of the offtaker of a company or project. For example, revenue risk from price can typically be mitigated by fully contracting electricity sales for the life of the project, thereby eliminating merchant revenue exposure (Fitch Ratings, 2018). In these cases, however, rating agencies then look to the credit quality of the counterparty, and this rating will serve as the maximum rating for the project.

In the case of Cuba, where the sole offtaker on the island is the state-run Unión Eléctrica, one must then look at the country’s sovereign credit rating. Moody’s has listed the island as Caa2, a non-investment grade rating. For comparison the credit ratings of Jamaica, Cayman Islands, and the Dominican Republic are B3 (Moody’s Analytics, 2016), Aa3 (Moody’s Analytics, 2017), and Ba3 (Moody’s Analytics, 2017), respectively. Of these, only the Cayman Islands holds an investment grade credit rating, but Jamaica and the Dominican Republic have both seen upgrades to their credit ratings in recent years. Until recently, it seemed that Cuba’s credit rating might improve, but due to a deterioration of Cuba-United States relations and a failure to see macroeconomic improvement, Cuba’s credit rating outlook was downgraded from Positive to Stable (Moody’s, 2017). Thus, taking the view of credit rating agencies helps to inform many project-specific factors that can improve credit quality, but Cuba’s poor credit rating may still drive the cost of borrowing, and to address this rating, macroeconomic factors have to be addressed.


The Government of Cuba is not alone in facing the myriad of challenges unique to island energy systems. Islands, by nature of their small size and limited economies of scale have typically been subjected to high power prices. A heavy reliance on fossil fuels further exposes many island nations to fuel price volatility and other national security concerns. However, these islands do often have
significant renewable energy resources. In light of increasingly cost-competitive renewable generation technologies and a sweeping tide of climate-related commitments, a number of islands are pursuing renewable energy generation as a way of diversifying their energy mix. Some are looking to be leaders, while others promote steady progress (Figure 8 shows the renewable energy targets for each jurisdiction). This section details the efforts of three governments: Jamaica, the Cayman Islands, and the Dominican Republic.

Figure 8: Renewable Energy Targets by Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>24%</td>
</tr>
<tr>
<td>Jamaica</td>
<td>20%</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>25%</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>70%</td>
</tr>
</tbody>
</table>

6.1 Jamaica

The island of Jamaica has succeeded in creating a sound regulatory and policy framework that has attracted private capital to forward its renewable energy goals. The basis for its strength in its transition comes from its National Energy Policy, originally written in 2009 and embodying significant vision (NREL) that the government has pursued since then. Building off this framework and sound regulatory infrastructure, the island has successfully attracted utility-scale renewable energy project developers and financiers to its shores. Table 8 includes key statistics of Jamaica and its energy policy.

Table 8: Key Statistics – Jamaica

<table>
<thead>
<tr>
<th>Population</th>
<th>Success to Date</th>
<th>GDP per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.88M</td>
<td>Solar ~80 MW, Wind ~100 MW</td>
<td>$5,000*</td>
</tr>
</tbody>
</table>

**Power Sector Overview**
- 1997: Office of Utilities Regulation introduced
- 2001 Utility privatized (80%)
- 2004: Generation fully liberalized; now 30% IPPs

**Key Strengths**
- **Transparency:** Energy Policy 2009
- Detailed project tailoring

* (IMF, 2017)
** (The Ministry of Energy and Mining, 2009)

Jamaica is similar to other islands in respect to some of the difficulties that it faces with its energy sector, while also having its own unique set of challenges to address. To support a population of
roughly three million people, the country had approximately 988 MW of generation installed in 2015 (CIA, 2015). Like many island nations, the energy sector has been almost completely dependent on fossil fuels (The Ministry of Energy and Mining, 2009, p. 5), particularly imported petroleum products. As of 2013, the island faced utility rates of $0.39/kWh and generated only 6% of electricity from renewable sources (NREL). The presence of a large bauxite/aluminum industry is unique to Jamaica; this industry consumed 34.6% of oil consumption by volume in 2008, compared to the electricity sector that consumed 23.1% (The Ministry of Energy and Mining, 2009, p. 13). The power sector has been liberalized to some degree, and in 2008, 217 of 818 MW of installed capacity was operated by Independent Power Producers (The Ministry of Energy and Mining, 2009, p. 14).

The National Energy Policy is the backbone of success for Jamaica’s energy transition. Within the policy document, the government first establishes a vision for its energy sector, consisting of ten different aspirational elements. The document then systematically breaks out the government’s strategy to address seven priority areas, to which it applies specific goals. The document provides justification for each of these goals, states how the goals address key issues, recommends Strategies and Key Actions to reach the goal by 2030, and lists the agencies and other parties responsible for carrying out work towards the goals. Priority Area #3, for example, is Renewable Energy Sources. The government specifically outlines renewable energy targets of “11% by 2012, 12.5% by 2015 and 20% by 2030” (The Ministry of Energy and Mining, 2009, p. 31). This granularity of the government’s goals makes clear why each of the issues is important, and it sets forth concrete steps to achieve the goals (The Ministry of Energy and Mining, 2009, p. 7). This likely has been a driver in support of maintaining broad support for reforms in this area over time.

The government not only sets out high-level strategy, but also puts into place near-term plans to achieve concrete and realistic goals. The government periodically issues Strategic Business Plans which detail the government’s implementation plan across a number of different industries. The plan of 2014-2017, for example, called for the addition of 37 MW of renewable energy projects to complete the 115 MW of projects put out to tender in 2013 (Government of Jamaica, 2014). These actionable plans make achieving the goals more manageable. The policy is designed to be “flexible and adaptable” (The Ministry of Energy and Mining, 2009, p. 21) while these development goals contain concrete action items that define incremental success to meet the goals of the policy.

The government of Jamaica has sought to create a favorable environment for renewables and has mixed success with distributed generation. The government launched a generous net metering program in May 2012 for PV systems up to 100 kW in size, with hopes of reaching 12 MW of
installed capacity. By December 2015, that number had reached merely 1.4 MW (Bellini E., Jamaica targets $300 million renewable energy investments, 2017). The scheme was closed in mid-2015, and the government engaged USAID and NREL to analyze the program. The report found that the roughly US$125,000 pilot project (Doris, Stout, & Peterson, 2015) had succeeded in spurring the industry but had significant room for improvement. Areas for improvement included increasing transparency and improving processing, changing the system size cap, and changing deposit and fee structures. The program was re-established in 2016.

The government of Jamaica has seen most of its success more recently, particularly in attracting foreign capital to spur utility-scale renewable energy development. The country’s first MW-scale PV system came into operation in 2014 when a 1.6 MW rooftop solar PV system was installed atop the Grand Palladium Lady Hamilton Hotel. Excess solar energy from this project is sold to JPS under a PPA (Clover, 2014). Following that project, a 20 MW project by WRB Enterprises Inc become the next the largest solar PV project, billed at roughly US$62 million (Mahapatra, 2017). A subsidiary of WRB, Content Solar, oversaw construction of the project which provides power to JPS for 20 years under a fixed-price contract with no escalation (Clover, 2014). The project was granted on a competitive auction with funding from the Overseas Private Investment Corporation and the U.S. Government’s Development Finance Institution (Mahapatra, 2017). Jamaica’s first utility-scale solar PV plant was completed in February 2017. The 28 MW plant was developed by the Spanish firm Global Energy Services (GES) (Clover, 2017). The island recently installed a 37 MW, US$60 million solar PV project (Ryan, 2017) at a PPA price of US$0.0853/kWh. The project was developed by IPP Neoen and is 50% owned by its subsidiary Eight Rivers Energy and 50% owned by Rekamniar (Ryan, 2017). The price bid by Eight Rivers was the lowest (Bellini E., 2017) received by Jamaica’s Office of Utilities Regulation for its RFP for a 37 MW renewable energy Build, Own, and Operate (BOO) plant (OUR, 2015).

There have also been a number of wind energy projects developed on the island. The Wigton wind farms were constructed in three separate tranches, now totaling 62.7 MW (Myers, 2015). The most recent tranche was developed by Gamesa for US$45 million, with financing provided by Petro Caribe (80%) and Wigton, which is a subsidiary of the Petroleum Corporation of Jamaica (PCJ). Over time, the projects have been made more profitable by trading carbon credits with Europe. The largest single wind energy development is a 36 MW wind farm developed by BMR Energy LLC, with US$42.7 million in funding from the Overseas Private Investment Corporation (OPIC), US$10 million from the International Finance Corporation (IFC), and US$10 million from the IFC-Canada Climate Change Program (OPIC, 2016). This funding was raised alongside US$26.9 million in equity
funds, for a total of $62.7 million in funding. The concessional funding from Canada, coupled with the commercial IFC funding helped make the deal financeable. The contract consists of a 20-year PPA.

The country has consistently pushed the edge with sound policy, firm goals for the country, and effective project execution. The government continued its push with its announcement that it is seeking $300 million in investment for renewables in the short-term (Mahapatra, 2017). To enable this push and attract effective partners, the government is creating frameworks for renewable energy projects that align with requirements for international funding bodies such as the Green Climate Fund. This approach to developing the country's infrastructure strategy by looking outward could be applied to other jurisdictions.

The efforts of the Jamaican government are being recognized not just in its progress towards its renewable energy goals, but also for the development of its energy system as a whole. The World Economic Forum releases an Energy Architecture Performance Index (EAPI) to benchmark energy systems across the globe. According to the 2017 edition, Jamaica has improved its rank from 116th to 92nd, largely driven by lower commodity prices but also attributed to lower energy intensity and increased renewable energy use (World Economic Forum, 2017, p. 18). Effective “energy sector goals should be aligned with other areas of the economy and related policies” (World Economic Forum, 2017, p. 20). Jamaica has done this in hiring an investment advisor to help develop strategies to develop projects across various sectors of the economy (Mahapatra, 2017). Beyond a sound investment strategy, countries also need to encourage investor confidence. A stable policy regime is supportive here, and Jamaica’s long-term vision is supported by a deregulated generation environment (World Economic Forum, 2017).

6.2 Cayman Islands
The Cayman Islands, though much smaller than Cuba, is pushing the boundaries of renewable energy goals. The foundation of Cayman’s energy transition is a sound regulatory environment. With such a backbone, the government is pushing for aggressive renewable energy targets. To date, the country has made minor progress towards its lofty goals. With a country of this size, however, a small number of large-scale renewable energy projects can dramatically impact the island’s generation portfolio.
Compared to other islands in this study, the Cayman Islands are very small. With a population of 58,441, the country in 2015 had an estimated 132 MW of installed electricity generation capacity (CIA, 2015). Cayman is like other small islands in its reliance on imported fossil fuels: more than 99% of energy demand is provided for by imported fuel oil products (Government of the Cayman Islands, 2017). Limited access to hydro or local fossil fuels has hindered local energy production to date, particularly that from renewable sources. Renewable energy in 2017 accounted for only 0.9% of electricity generation (Government of the Cayman Islands, 2017).

A sound regulatory structure underpins the Cayman Islands’ efforts towards modernizing its energy infrastructure. The Utility Regulation and Competition Office (OfReg) is a relatively new institution established by the Utility Regulation and Competition Law of 2016. This independent body combines the Electricity Regulatory Authority (ERA), the Information and Communications Technology Authority (ICTA), and the Petroleum Inspectorate. The new body is not solely responsible for promoting fair competition and protecting consumer interests. OfReg is also mandated by law to “promote innovation and facilitate economic and national development” (Cayman Islands, 2016). This mandate will encourage the regulator to lean in favor of newer technologies, likely to benefit renewable energy generators.

The Government has also set very aggressive renewable energy targets. The Cayman Islands have only recently issued a National Energy Policy, spanning the years 2017-2037. Compared to Jamaica, the Cayman Islands have been much more aggressive in what they hope to achieve with new energy technologies; renewables as a contributor to electricity generation are set to rise from 0.9% in 2017 to 70% by 2037. Beyond the considerations of costs and prudent environmental concerns of most similar jurisdictions, the Cayman Islands express an interest to become a “destination of excellence” (Government of the Cayman Islands, 2017, p. 6). Regarding technology, the government is not pursuing as balanced of a portfolio as other locations. Here, the policy leans heavily on the potential for solar PV. It projects that 62% of generation will come from utility-scale solar PV and battery
systems; specifically, 202 MW of solar PV systems will be added in Grand Cayman from 2022-2037 (Government of the Cayman Islands, 2017, p. 10). The plan is to phase out retiring fossil fuel plants and replace them with combined solar PV and battery plants.

To date, there has been slow growth in utility-scale renewables in the country. In 2015 the then-Electricity Regulatory Authority set a precedent in approving a PPA between Caribbean Utilities Company, Ltd. (CUC) and Entropy Cayman Solar Limited. The 5 MW plant will provide power to CUC at a price of CI US$0.17/kWh for 25 years (CUC, 2016). The plant became operational in June 2017. The regulator then embarked on a process to analyze how this project succeeded (Cayman Compass, 2017) so that it can be emulated again to help meet the country’s renewable energy goals.

Despite slow progress in utility-scale renewable energy, there has been rapid uptake in smaller-scale, distributed solar energy. In 2009, CUC and the ERA introduced the Consumer Owned Renewable Energy (CORE) tariffs, which were replaced by the Feed-in Tariffs (FIT’s) Programme. The limits imposed by the tariffs were revised up several times. Most recently, in 2016, the cap of projects that enrolled into the system was 6 MW, comprising 3 MW for residential and 3 MW for commercial projects (CUC & ERA, 2016). Rates that were paid out for projects depended on system sizing, ranging from 30 CI cents for projects 0-5 kW in size, to 21 cents for projects 20-100 kW in size, the rates meant to reflect the true cost of energy per installation. Residential units were capped at 20 kW, while commercial systems were capped at 100 kW, providing an FIT for 25 years (CUC & ERA, 2016). The program was a success, as the new caps for capacity were hit one year after the 2016 amendments.

The island has thus experienced mixed success with renewables to date. The country has only one example of an operational utility-scale renewable energy project, but the incentives put into place by the regulators have succeeded in spurring demand for distributed solar energy on a residential and commercial level. The country now hopes to learn from their experience so far to accelerate the transition away from fossil fuels. It addresses the demand issues for renewable energy projects while creating an environment where large-scale renewables can play a more significant role without driving up electricity prices.

6.3 Dominican Republic

The Dominican Republic has made material strides to grow its renewable energy base. Since first liberalizing parts of their power sector, the country has put into place incremental incentives and structures to make the island a favorable place to invest in renewable energy projects.
Table 10: Key Statistics – Dominican Republic

<table>
<thead>
<tr>
<th>Population</th>
<th>Success to Date</th>
<th>GDP per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.80M</td>
<td>~195 MW wind and solar 361 MW pipeline</td>
<td>$8,300*</td>
</tr>
</tbody>
</table>

**Power Sector Overview**
- 1990s: Unbundled power sector; privatization
- State owns 100% transmission and 78% distribution
- 2013: Ministry of Earth and Mines (MEM) formed

**Key Strengths**
- **Economic openness**: Law 57-072 – tax incentives, feed-in tariffs

* (IMF, 2017)  ** (IRENA, 2016)

Of the three cases assessed here, the Dominican Republic most closely resembles Cuba in terms of scale. The country has a population of 10.7 million people (CIA, 2015) and an electrification rate of 98%. The country has an installed generation capacity of 3.732 GW, with fossil fuel plants comprising roughly 81% of installed generation. The country opened up its power sector in some part to private participation in 1997, with the reforms of Law No. 141-97 (Congreso Nacional, n.d.). As a result, private companies began participating in both generation throughout the country and distribution in select areas. In 2001, the government took a step towards promoting renewable energy with Law No. 125-01, giving renewable energy preferential treatment in procurement, and providing a 5-year tax exemption to companies that provide solely renewable energy. However, the most significant incentives came through the Renewable Energies Incentive Law 57-07 of 2007. The law included exemptions in import duties for components, tax exemptions, and low-cost financing (IEA, 2018). These policies were put in place to support the government’s renewable energy goal: 25% of the generation mix by 2025.

Ownership structures have varied significantly across projects. New ownership structures and financing mechanisms are emerging as more projects come online in the country. The first wind park, Los Cocos, was largely financed largely by EGE HAINA itself. The recent 58 MW Montecristi solar project will be fully owned by a joint venture between F&S Caribe Solar (a local subsidiary of F&S Concept Solar GmbH and AAC Global BV (AAC Global, 2016)) (BIO, n.d.).

The Dominican Republic has made good progress towards its renewable energy goals, and installations are happening at an increased rate. The first wind farms in the Dominican Republic, the Los Cocos and the Quilvio Cabrera wind farms, became operational in 2011 with a combined capacity of 33 MW (Comision Nacional de Energia, 2012). By 2016 wind capacity swelled to 135 MW in 2016, with 94% of that capacity operated by Empresa Generadora de Electricidad (EGE) HAINA (Dominican Today, 2017). EGE Haina is capitalized with both public and private money and
is the largest power producer in the country. By mid-2017, the country had an installed wind and solar base of 194.95 MW (Ryan, 2017). Leading into 2018, the government has a series of projects slated to ramp up the installed capacity of renewables on the island, including 132.96 MW of solar and 228.3 MW of wind energy (Canadian Trade Commissioner Service, 2017). The combined 361.2 MW of renewable energy are mobilizing US$779.9 million and slated to be online by 2018.

7. Recent International Partnerships

7.1 Cuba’s Relationship with the European Union
Cuba has been strengthening its ties to the European Union, particularly around the issues of climate change mitigation and renewable energy development. Cuba recently announced a new “E.U.-Cuba cooperation program” that will provide “€18 million (US$22 million) to support renewable energies, €21 million (US$25 million) for sustainable agriculture, and €10 million (US$12 million) to support cultural exchange.” (Jessop, 2018). This financial commitment follows a bilateral cooperation agreement that was signed between Cuba and the EU in November 2017 (REVE, 2018). Federica Mogherini, the high representative for foreign affairs and security for Europe, has visited Cuba to continue discussions on the E.U.-Cuba relationship that covers “issues from sustainable development, to trade and investment, and their dialogue on human rights,” (Jessop, 2018).

The Ministry of Energy and Mines sponsored the Cuba Sustainable Energy Forum 2018 (also referred to as the Renewable Energies Showcase) in partnership with the European Union at the end of January 2018, bringing in approximately 70 companies, both domestic and international (Cadena Agramonte, 2018). The event featured opening remarks from the International Renewable Energy Agency (IRENA) Director-General Adnan Z. Amin, who emphasized that “strong partnerships are vital for accelerating Cuba’s energy transformation and realising its goal of generating 24 per cent of its electricity from renewables by 2030,” (IRENA, 2018). The event served two primary purposes: 1) Cuba was able to showcase their opportunities for foreign investment in renewable energy, and 2) the EU demonstrated their technology and project financing knowledge that can be shared with Cuba (IRENA, 2018).

7.2 Cuba’s Relationship with China
Cuba has used wind turbines and solar PV technology from several Chinese companies, and they may be further expanding their relationship with China. Cuban and Chinese companies participated in a three-day meeting in January 2017 to discuss energy investment and research opportunities.
This meeting “resulted in the signing of 10 agreements to create joint ventures relating to renewable energy research, wind energy production, and electric vehicles,” (Davis & Piccone, 2017). Additionally, as previously discussed, China has committed 12 million Cuban pesos (approximately US$480,000) to fund 100 MW of solar development, including a 4.4 MW solar farm in the Sancti Spíritus province (Molina, 2018). More recently, China dispersed approximately US$36 million in aid funds used to support Cuba’s agriculture industry, water systems, transportation infrastructure and energy sector. Specifically, the agreement includes the "supply of raw materials for the production of photovoltaic solar panels worth 3 million dollars,” (Xin, 2018).

7.3 Engagement with the International Renewable Energy Agency

Beyond the recent conference, IRENA has been engaged with Cuba in various ways since 2013, supporting the exchange of technical knowledge for renewable energy development. Cuba is also beginning to participate in IRENA’s Small Island Developing States (SIDS) Lighthouses Initiative that supports island nations’ deployment of renewable energy. Further, IRENA has recently supported Cuba in pursuing funding for a 10 MW solar project through a co-funded Project Facility between IRENA and the Abu Dhabi Fund for Development (ADFD). One goal of the co-funded project is “to inspire investor confidence and attract further finance” (IRENA, 2018).

8. Recommendations to Attract Foreign Investors

8.1 Recommendations based on FDI Fitness Theory

The analysis in this paper points to several recommendations that could lead to increased investment in renewable energy projects. Many of these recommendations can be considered macroeconomic in nature.

*Trade and exchange rate intervention:* To reduce trade and exchange rate intervention, decisionmakers should pursue projects with fixed prices that are indexed to international currencies to minimize the risk of operating in a dual currency system in which exchange rates are controlled (Zhao, 2017). Currently, these currency index contracts cannot be denominated in US dollars, but some other currency could be utilized for this purpose. Currency indexation is not explicitly prevented based on the current foreign investment law; however, adding clear provisions to allow indexing to be included in power purchase agreement contracts would provide additional clarity and stability of cash flows for developers.

*Transparency:* To improve transparency, the government could provide clearer and more frequent updates on projects and milestones. Since Cuba lacks history of entering into and maintaining
extended power purchase agreements with third party operators (Panfil, 2017), more openness into the status of project negotiations, construction progress, and operational successes would give much greater insight to investors to better gain confidence in the market. One small example would be to provide status updates to energy projects included in the Portfolio of Opportunities to Investment, while ensuring a minimum level of privacy for bidding companies to protect competitive advantages. The Energy Transition Initiative’s Islands Playbook encourages transparency in the selection of project partners and vendors to manage stakeholder expectations and increase the chances for project success (Energy Transition Initiative, 2015).

*Regulatory Framework:* To improve the regulatory framework, project applications and approval processes should be further streamlined. While more substantial relationship-building is expected when doing business in Cuba that may require longer negotiation periods (Davis & Piccone, 2017), as more projects are developed, there should be opportunities for contracts to be standardized to expedite project timelines.

Finally, given the concerns over the amount of discretion the government maintains to determine what constitutes “public or social interest” to trigger expropriation of assets (Davis L. M., 2016), third party dispute arbitration rules and a process structure should be clearly established. Even for smaller potential conflicts that may arise, the Overseas Private Investment Corporation recommends including offshore dispute arbitration clauses in power purchase agreements that follow international standards (Overseas Private Investment Corporation, 2014).

### 8.2 Recommendations based on Project-Level Factors

Decisionmakers can take specific actions when designing projects to reduce risk and improve the attractiveness of those projects for investors. To reduce operation risk, stakeholders should utilize strong technology operators and select technologies that have many operators in existence. This will result in projects operating as closely as possible to predictions made in the planning phases. To reduce the revenue risk associated with volume, planners should work with potential operators to carefully site projects to minimize curtailment and any other downtime, thereby ensuring that the operator is compensated for the maximum expected power production. Revenue risk from price has been mentioned in this paper as a key issue, and decisionmakers should promote long-term contracted revenue streams. Beyond tailoring projects to optimize the cost of those projects, planners could also tailor their projects to the missions of climate-focused concessionary capital sources. Receiving such funds at a low cost could greatly improve the economics of renewable energy projects to help ensure continued affordability for customers.
8.3 Additional Recommendations from Literature Review

The literature on this topic reveals many ways that the government in Cuba can overcome its potential investment obstacles. Panfil (2017) and Davis & Piccone (2017) both broadly argue for the need to attract foreign investment by removing barriers to investment and mitigating risks. This could take the form of increased cooperation with external lending bodies, creating guarantees that reduce repayment risk, crafting public-private partnerships (Panfil, 2017), or streamlining Independent Power Producer (IPP) contracts (Belt, 2010). Regarding the regulatory environment, recommendations include establishing a Public Utilities Commission (Belt, 2010), decentralizing the management of state-owned companies in the power sector, and promoting urban cooperatives (Davis & Piccone, 2017).

9. Opportunities for Continued Research

There are many areas for research that can build on the work in this analysis. As previously stated, this paper takes a very private-sector driven view of what is required for investments in renewable energy. In planning ahead, the following topics would bolster this research and support the continued development of Cuba and similar jurisdictions:

Resource optimization for more aggressive renewable energy goals: Cuba’s goal of 24% of electricity from renewable sources is conservative compared to some other jurisdictions. As Cuba approaches its current goal, it may look towards increasing the penetration of renewable energy on the grid. Research is required to determine the most optimal resources to achieve such goals, considering the current asset base, feasible technology, and available financing.

Demand forecasting based on Cuban reform and U.S.-Cuba relations: Cuba underwent a political transition in April 2018 that ushered in its first President since the Revolution that is not a member of the Castro family. Potential political and economic reforms will inevitably have an impact on the power sector. Research would be helpful to understand the magnitude of such changes and the subsequent impact on Cuba’s power system. Though U.S.-Cuba relations have deteriorated since the Obama administration began to engage in talks on opening ties, there is potential for these relations to improve once again. Given the size and proximity of the U.S. economy, conducting a scenario analysis of the impacts of improved relations could inform policymaking. Disaggregating the impact on the industrial, residential, and commercial sectors could also aid in utility planning.

Economic analysis of currency reunification: The dual currency system currently in place in Cuba has some major implications for FDI and other economic activity within the country. Unifying the
currency and potentially floating it on the global market could dramatically impact its value and volatility. Such a change could have unintended consequences, potentially both positive and negative, for businesses and consumers in Cuba. Studies could quantify these effects to gauge the overall impact on Cuba’s economy or on specific sectors.

Landscape analysis of geopolitics in Cuba: Over the years, the countries that have maintained close economic ties to Cuba have shifted. Recent partnerships for developing renewable energy projects and other segments of the economy reveal that the coming decades may see Cuba develop closer ties to countries that have not historically been significant trade partners. There is room to conduct a landscape analysis of this shifting geopolitical climate to understand how new entrants will interact with Cuba and the region more broadly.

Conclusion

Cuba’s goal to reach 24% electricity generation by 2030 is dependent on the ability to source up to $4 billion in capital investment, with approximately $1.1 billion open to international financing players. This target, coupled with changes in foreign investment laws, provides a unique opportunity for energy developers to enter the market. The goal of this analysis was to provide information to assist investors interested in the Cuban energy market as well as policymakers that can drive change to improve the institutional landscape for foreign investment. The primary framework focused on three areas of analysis: (1) Foreign Direct Investment Analysis, (2) Credit Analysis, and (3) Jurisdictional Comparison of Jamaica, the Dominican Republic, and the Cayman Islands. The recommendations formulated based on the investment framework analysis highlight several potential improvements Cuba could make to attract foreign investment needed to finance their targeted increase in renewable energy capacity.

The paper also notes the progress that the government of Cuba has made to improve legal and regulatory structures for foreign investors interested in developing renewable energy and recent partnerships that have emerged between Cuba and several international players. These developments emphasize the momentum that is building in Cuba around developing renewable energy. Interviews conducted in Havana in April 2018 with academics and former energy industry practitioners conveyed a significant optimism that Cuba will reach their renewable energy targets on aggregate by 2030. The specific path to the 24% goal may be unclear in terms of how the exact allocation of capacity across resource types will materialize or which ownership structures will be used, but interviewees communicated that there is building interest from foreign players and negotiations for projects underway. Interviewees were generally confident that the financing will
come in some form. To them, the open question is not if the development will happen but rather how and by whom.
References


