



Business Case for Commercial and Industrial Scale Energy Efficiency Development in the Dominican Republic

June 2019

In this paper the National Renewable Energy Laboratory (NREL) explores the need for a program supporting growth of the commercial and industrial (C&I) energy efficiency industry in the Dominican Republic. In doing so, NREL examines the energy sector's current burden on private businesses and the status of energy efficiency efforts on the island. Then NREL will describe its ongoing field-research on the Dominican energy efficiency market. Lastly, this report describes NREL's efforts to educate the market and catalyze both widespread C&I energy efficiency upgrade procurement and widely available energy efficiency upgrade financing products.

Energy and Energy Efficiency Market Overview

The Dominican Republic, like most developing island nations that are dependent on imported fossil fuels (90% of its energy consumption),¹ faces challenges in managing its energy security, reliability, and economic growth. The result is very high energy costs that negatively impact the Dominican Republic's economy and standard of living. As of 2014, the average kilowatt hour (kWh) price for both industrial and commercial retail electricity averaged \$0.1851.² However, even these prices are not reflective of the true cost of fossil fuel generation, as the Dominican government pays \$1 billion every year in power subsidies to keep electricity prices artificially low.³ Taken together, these subsidies

¹ IRENA (2016) *Renewable Energy Prospects: Dominican Republic*, REmap 2030, International Renewable Energy Agency (IRENA), Abu Dhabi, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_REmap_Dominican_Republic_report_2016.pdf#page=55

² "Energy Snapshot: Dominican Republic", *Energy Transition Initiative: Islands*, National Renewable Energy Lab (NREL), 2015, <https://www.nrel.gov/docs/fy15osti/64125.pdf>

³ IRENA (2016) *Renewable Energy Prospects: Dominican Republic*, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_REmap_Dominican_Republic_report_2016.pdf#page=55, page 19.

equated to 2% of the 2014 Dominican GDP and over 11% of the DR central government's total 2014 expenditure.⁴

If there is an upside to these high energy costs, it is the incentive to invest in energy efficiency and renewable energy which can help reduced energy expenditures through lower use and lower energy generation costs. In part, this is because electricity has comprised such a large proportion of energy consumption in key Dominican C&I sectors. In 2009 electricity constituted over 75% of total energy consumption by the Dominican commercial sector, “which includes government and public service buildings,” and was spent “predominantly for lighting, air conditioning, and appliances.”⁵ In the restaurant sector, “electricity account[ed] for 58.7% of energy consumption. Of this, refrigeration account[ed] for 25%, HVAC for 9%, [and] water heating for 7%.”⁶ Energy efficiency investments would not only strengthen the Dominican Republic's energy security but also enhance its grid's reliability, as it would engender more stable fuel supply consumption. Moreover, by decreasing both peak demand for electricity and total energy consumption, it would either lower overall energy costs to the consumer and/or diminish the rate of cost increases.

⁴ “Government at a Glance, Latin America and the Caribbean 2017”, *Country Fact Sheet, Dominican Republic*, OECD, Inter-American Development Bank, <https://www.oecd.org/gov/lac-dominican-republic.pdf>.

⁵ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic's Sustainable Energy Resources* (Worldwatch Institute, 2015)

http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

⁶ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic's Sustainable Energy Resources* (Worldwatch Institute, 2015)

http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

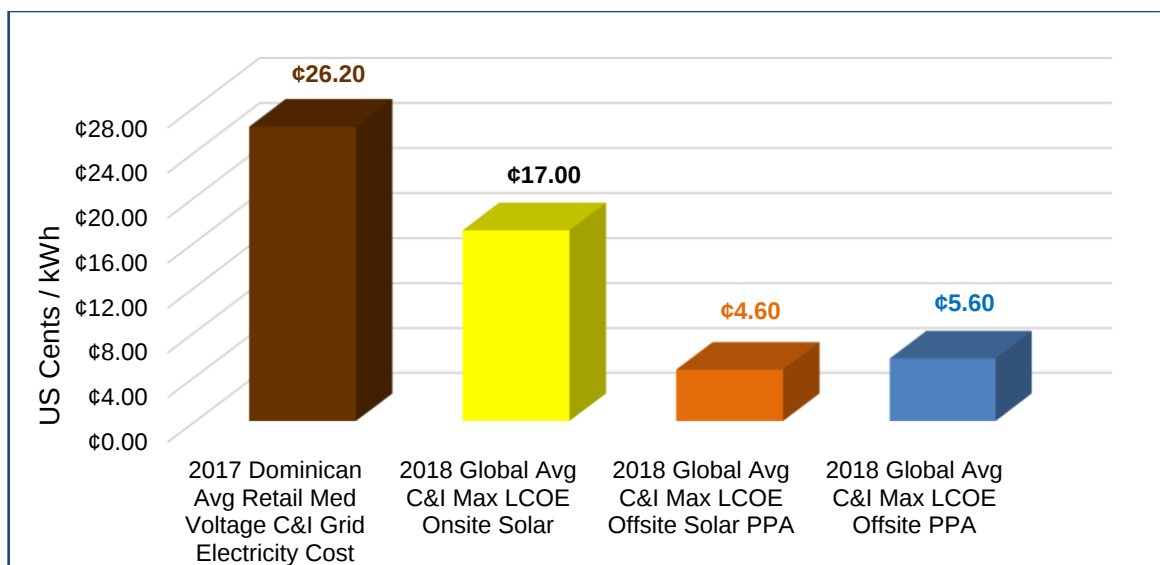


Figure 1. Dominican Republic Comparative Levelized Cost of Electricity (LCOE) (USD)⁷

Additionally, energy efficiency improvements would support renewable energy development. With the high cost of grid electricity, procuring clean energy likely can save C&I customers significantly off their operational expenses. In the absence of data from the Dominican Republic on the levelized cost of electricity (LCOE)⁸ for solar and wind, the numbers in *Figure 1* above show the average of the maximum ends of the range of LCOEs across the globe. In part because the Dominican Republic has strong solar and wind resources (and therefore its LCOEs will be lower than the global averages), it is reasonable to posit that procuring onsite solar systems, offsite solar, and offsite wind systems all would cost C&I consumers significantly less than for them to buy electricity from the Dominican grid.

Nonetheless, although procuring renewables will likely lower a company's energy bills, their costs still will be proportionate to the amount of energy they consume. Thus, energy efficiency upgrades in advance of, or combined with, renewables procurement can create synergies of even lower energy costs than investing only renewables or efficiencies by themselves. Despite these realities, energy efficiency investments in the Dominican Republic remain very low.

⁷ Lazard's 2018 annual Levelized Cost of Energy Analysis (LCOE 12.0) <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>, "Energy Snapshot: Dominican Republic", *Energy Transition Initiative: Islands*, National Renewable Energy Lab (NREL), 2015, <https://www.nrel.gov/docs/fy15osti/64125.pdf>

⁸ Levelized Cost of Electricity (LCOE), according to International Renewable Energy Agency (IRENA), is "a measure of the overall competitiveness of energy technologies, [that] can be used to assess the economic viability of [an] investment. In particular, the LCOE method consists of comparing the cost to install and operate an energy system and its expected life-time energy output. The calculation is done using the net present value method, in which upfront capital investments and payment streams over the technology's lifetime are calculated based on discounting from a reference date[...] The cash values of all the expenditures are divided by the cash values of power generation, yielding a final value measured in, for instance, USD/kWh. For this reason, the LCOE is increasingly used as a reliable indicator for comparing different energy technologies.": www.irena.org/DocumentDownloads/Publications/IRENA_RE_Island_Tourism_report_2014.pdf

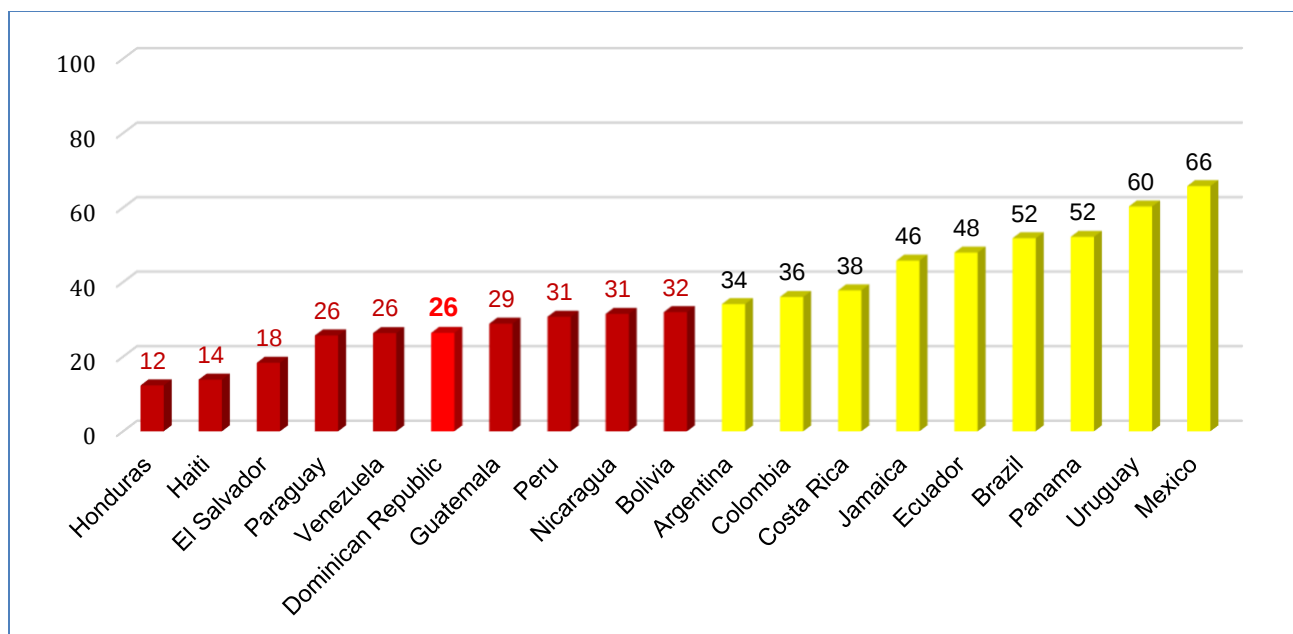


Figure 2. World Bank Energy Efficiency Scores for Latin America and the Caribbean⁹

Many of the causes of the limited scale of investments, appear related to the lack of an effective public support structure. The World Bank assessed over 130 countries based on their “Regulatory Indicators for Sustainable Energy” (RISE), which can be accessed on their RISE web portal.¹⁰ The Dominican Republic earned a raw average score of only 26 out of 100 for its energy efficiency enabling environment.¹¹ This ranks it at 92nd out of 136 countries across the globe, and as can be seen in *Figure 2* above, 6th worst out of 19 countries ranked in Latin America and the Caribbean.¹²

As shown in *Figure 3* below, RISE derived the Dominican Republic’s very poor showing from its:

- A lack of energy efficiency planning,¹³
- Weak energy efficiency entities,
- Virtually no presence of incentives or mandates for energy efficiency among C&I end users, the public sector, and utilities,
- Lack of minimum energy performance standards,
- Total absence of building energy codes
- Deficiencies in drivers of energy efficient transport
- Non-existent carbon pricing and monitoring.¹⁴

In fact, the only indicator scored that ranks high enough to be considered a strong incentive towards energy efficiency, was the Dominican Republic’s exorbitantly high electricity prices.

⁹ <http://rise.worldbank.org/country/dominican-republic>

¹⁰ <http://rise.worldbank.org>

¹¹ <http://rise.worldbank.org/country/dominican-republic>

¹² <http://rise.worldbank.org/country/dominican-republic>

¹³ Subsequent to this RISE scoring’s publication, the Dominican government announced on 11 December 2018 that they have developed a draft NDC Plan of Action (POA) in the context of the COP24 conference. This POA articulates a roadmap towards achieving a much more climate-friendly energy profile. Thus, once this plan is finalized, and then these RISE scores are revisited, the Dominican Republic’s numbers should grow. Nonetheless, these baseline measurements indicate significant room for continued improvement.

¹⁴ <http://rise.worldbank.org/country/dominican-republic>

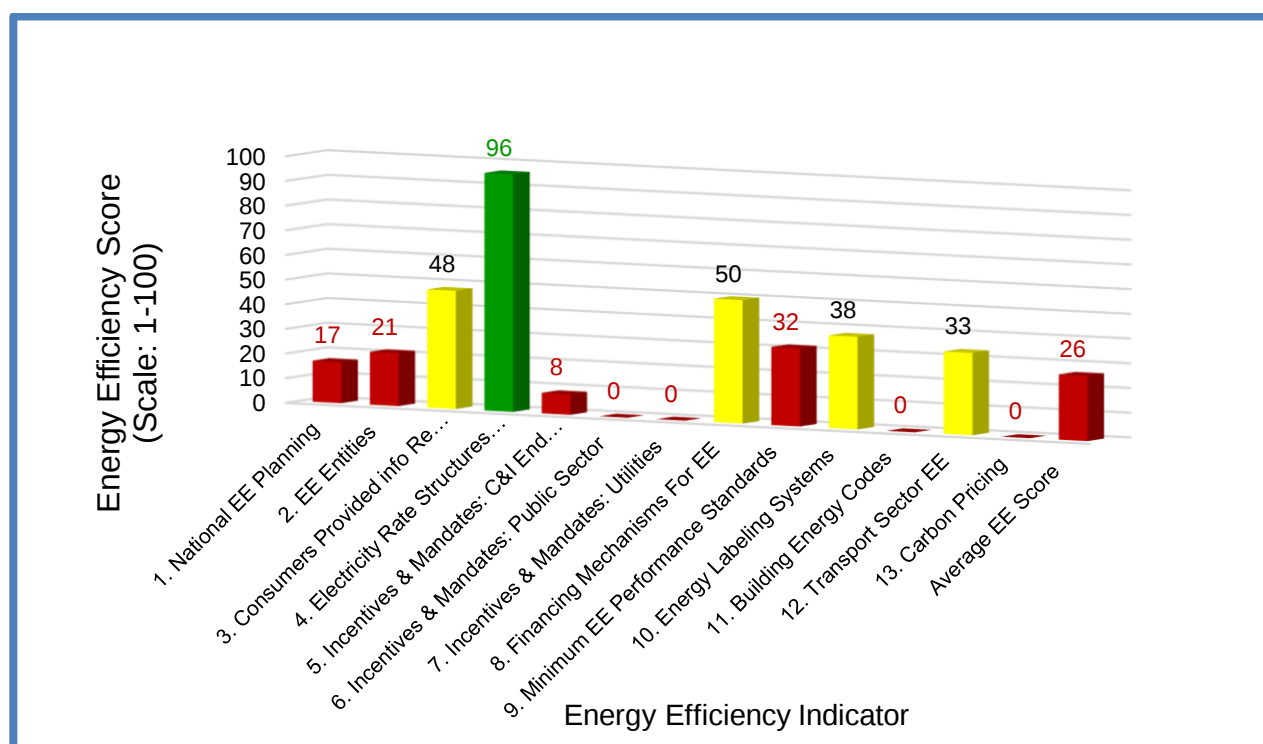


Figure 3. Dominican Republic 2017 RISE World Bank Scores¹⁵

Additional challenges to C&I energy efficiency investments arise from multiple sources, including: 1) a deficiency of developers' working capital; 2) a lack of capacity to accurately value and assess the risks of energy efficiency projects; 3) recent structural challenges in the energy sector, 4) high interest rates; 5) bank skepticism of longer-loan terms; 6) and an overall difficult investment environment. All these factors have contributed in hindering the development of new energy efficiency projects.

While this depicts a very negative picture of the energy efficiency support structure in the Dominican Republic, there have been a number of recent efforts that suggest the government is increasingly realizing the value of energy efficiency savings. In 2015 the Dominican Republic submitted its NDC with a conditional emissions reduction target of 25% of base year emissions by 2030.¹⁶ Moreover, on 11 December 2018, in the context of the COP24 conference in Katowice, Poland, the Dominican government released an official *NDC Action Plan* articulating their "priorities for the 2019-2021 period regarding legislation, finance and budgeting, monitoring and evaluation, and capacity building to strengthen climate

¹⁵ <http://rise.worldbank.org/country/dominican-republic>

¹⁶ Intended Nationally Determined Contributions - Dominican Republic (INDC-DR)
[https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Dominican%20Republic%20First/INDC-DR%20August%202015%20\(unofficial%20translation\).pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Dominican%20Republic%20First/INDC-DR%20August%202015%20(unofficial%20translation).pdf)
[https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Dominican%20Republic%20First/INDC-DR%20August%202015%20\(unofficial%20translation\).pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Dominican%20Republic%20First/INDC-DR%20August%202015%20(unofficial%20translation).pdf)

action.”¹⁷ One such priority is: “Incentives to increase energy efficiency and participation of non-conventional renewable energies.”¹⁸ In support of this and other priorities, the Action Plan is designed to:

“provide for planning, coordination, mobilization of resources and transparency in NDC implementation to advance realization of the Dominican Republic’s development and climate objectives. It will be reviewed annually to ensure priorities are updated and included in the country’s development plans.”¹⁹

Therefore, recent efforts indicate Dominican government seeks to accelerate the deployment of energy efficiency and small renewables as a means of achieving both its climate and development goals, including broadening accessibility to clean energy cost savings measures, and thereby encouraging economic growth. The government has also demonstrated other commitments to energy efficiency, including passing into law (Law 100-13) the 23 of July of 2013 that resulted in the formation of the Energy Ministry along with the formation of the Vice Ministry of Governmental Energy Savings. This new agency’s intent is:

“To propose and administer energy savings and efficiency policies, and to formulate and implement the necessary regulations, technologies, programs, plans, and projects that permit increases in energy savings and higher levels of efficiency and energy sustainability in the Public Sector, as well as residential, manufacturing, transportation and services sectors, promoting a culture of responsible, rational, and efficient use of energy.”²⁰

In 2018, the Dominican government also took strong action with additional broad-based measures to increase energy efficiency nationwide:

- Prohibiting the import of all fluorescent lights and mandating the country’s transition exclusively to LED lighting.²¹
- Implementing measures to enable more efficient electricity system operations and management (O&M) by distribution utilities, supported through a \$400 million Inter-American Development Bank (IDB) loan.²²

Additionally, the Ministry of Energy and Mines has as the goal to reduce energy consumption by 13.2 % by 2030 over the 2013 baseline. This equates to annual savings of 3,279 GWh. “If we achieve a

¹⁷ “Dominican Republic Launches Climate Action Plan with NDC Partnership”, International Institute for Sustainable Development (IISD), Sustainable Development Goals (SDG) Knowledge Hub, by Leila Mead, 8 January 2019: <https://sdg.iisd.org/news/dominican-republic-launches-climate-action-plan-with-ndc-partnership>

¹⁸ “Dominican Republic Launches Climate Action Plan with NDC Partnership”: <https://sdg.iisd.org/news/dominican-republic-launches-climate-action-plan-with-ndc-partnership>

¹⁹ “Dominican Republic Launches Climate Action Plan with NDC Partnership”: <https://sdg.iisd.org/news/dominican-republic-launches-climate-action-plan-with-ndc-partnership>

²⁰ Website of Ministerio de Energía y Minas: <https://mem.gob.do/nosotros/viceministerios/viceministerio-de-ahorro-energetico-gubernamental>

²¹ “Dominican Republic to become the first all-LED island in the world”, *Renewable Energy Caribbean*, April 18, 2018, <https://renewableenergycaribbean.com/2018/04/18/dominican-republic-to-become-the-first-all-led-island-in-the-world>

²² “Dominican Republic to boost energy efficiency with IDB loan”, InterAmerican Development Bank, November 1, 2018, <https://www.iadb.org/en/news/dominican-republic-boost-energy-efficiency-idb-loan>

saving of 10% in consumptions, we would be talking about an economic equivalent of the production of a 250 MW power plant.”²³

Beyond the Dominican Republic, there are multiple regional energy efficiency efforts pointing to opportunities for increased energy savings among Caribbean islands in general. This is because most face similar challenges of reliance on expensive, imported fossil fuels. Even initiatives in which the Dominican Republic is not directly involved could positively impact its energy efficiency market. A robust regional energy efficiency ecosystem will likely catalyze opportunity aggregation across multiple small islands and attract or develop regional energy service companies (ESCOs) who can operate in multiple countries and specialize in small-island/ Caribbean markets. Some such regional efforts include:

- The Caribbean Community (CARICOM)’s Energy Efficiency Strategy²⁴
- Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)²⁵
- IDB and Caribbean Development Bank’s Sustainable Energy Facility (SEF) for the Eastern Caribbean²⁶

Moreover, the Dominican Republic’s heavy dependence on imported fossil fuels for electricity generation reverberates through the economy. In 2014, 52% of Dominican electricity was generated from burning imported petroleum.²⁷ Because of this, the IMF estimated that a 2014 drop in oil prices, causing a decrease in the Dominican oil trade deficit, would precipitate an increase in net GDP growth of nearly 2%.²⁸ Such dependence on oil imports for growth, however, is inseparable from economic volatility and declines; energy efficiency can provide buffers from these destabilizing fluctuations.

Business Level Market Assessment & Case Studies

Data from the World Bank and elsewhere indicates businesses across the Dominican Republic could reap extraordinary benefits from energy efficiency upgrades. As *Figure 4* below shows, as far back as 2010, approximately 60% of Dominican companies surveyed considered electricity to be a “major

²³ Antonio Isla Conde, Minister of Energy and Mines during the 2019 Energy Efficiency Day Conference.

²⁴ “Energy-efficiency strategy coming for the Caribbean”, *The Gleaner*, Petre Williams-Raynor, June 23, 2016, <http://jamaica-gleaner.com/article/news/20160623/energy-efficiency-strategy-coming-caribbean>

²⁵ The Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE), <https://ccreee.org/>

²⁶ “IDB and CDB to expand the Sustainable Energy Facility (SEF) for the Eastern Caribbean”, InterAmerican Development Bank, December 17, 2018, <https://www.iadb.org/en/news/idb-and-cdb-expand-sustainable-energy-facility-sef-eastern-caribbean>, and “Sustainable Energy for the Eastern Caribbean”, Caribbean Development Bank, <https://www.caribank.org/our-work/programmes/sustainable-energy-eastern-caribbean>

²⁷ RENA (2016) *Renewable Energy Prospects: Dominican Republic*, REmap 2030, International Renewable Energy Agency (IRENA), Abu Dhabi, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_REmap_Dominican_Republic_report_2016.pdf#page=55

²⁸ “Caribbean Energy: Macro-Related Challenges” (WP/16/53), *IMF Working Paper*, Arnold McIntyre, Ahmed El-Ashram, Marcio Ronci, Julien Reynaud, Natasha Che, Ke Wang, Sebastian Acevedo, Mark Lutz, Francis Strodel, Anayo Osueke, and Hanlei Yun, March 2016, <https://www.imf.org/external/pubs/ft/wp/2016/wp1653.pdf>

constraint,” and so nearly half of all these firms owned or shared a fossil fuel generator to compensate in some way.²⁹

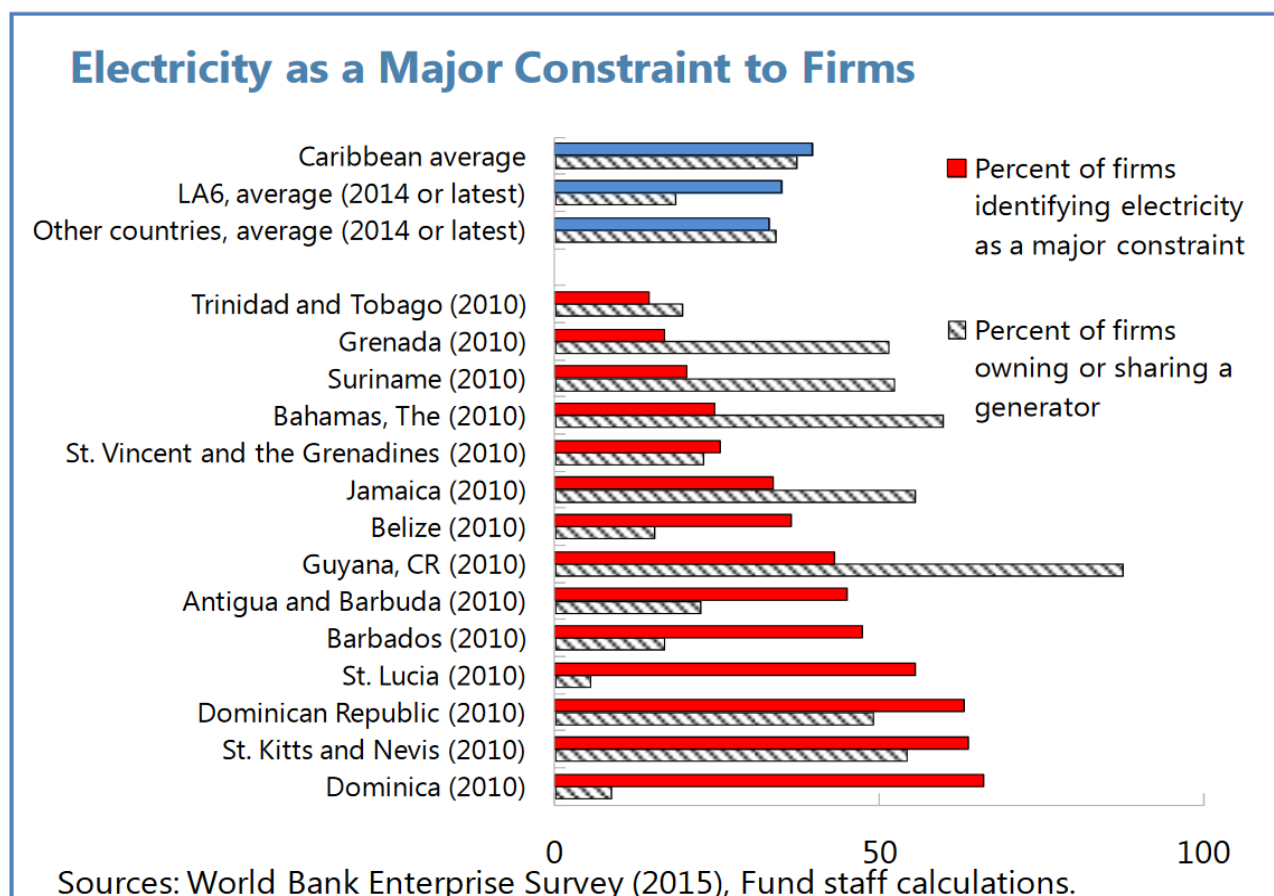


Figure 4. Electricity as a Major Constraint to Firms

In fact, as *Figure 5* below shows, in 2016, other than corruption, Dominican companies cited electricity as the single “biggest obstacle to their business.”³⁰ Among small businesses (5-19 employees), it was the largest identified challenge, even greater than corruption.³¹

²⁹ “Caribbean Energy: Macro-Related Challenges” (WP/16/53), *IMF Working Paper*, Arnold McIntyre, Ahmed El-Ashram, Marcio Ronci, Julien Reynaud, Natasha Che, Ke Wang, Sebastian Acevedo, Mark Lutz, Francis Strodel, Anayo Osueke, and Hanlei Yun, March 2016, <https://www.imf.org/external/pubs/ft/wp/2016/wp1653.pdf>

³⁰ “Enterprise Surveys: What Businesses Experience: Dominican Republic 2016, Country Profile”, The World Bank Group, www.enterprisesurveys.org/~media/GIAWB/EnterpriseSurveys/Documents/Profiles/English/dominican-republic-2016.pdf

³¹ “Enterprise Surveys: What Businesses Experience: Dominican Republic 2016, Country Profile”, The World Bank Group, www.enterprisesurveys.org/~media/GIAWB/EnterpriseSurveys/Documents/Profiles/English/dominican-republic-2016.pdf

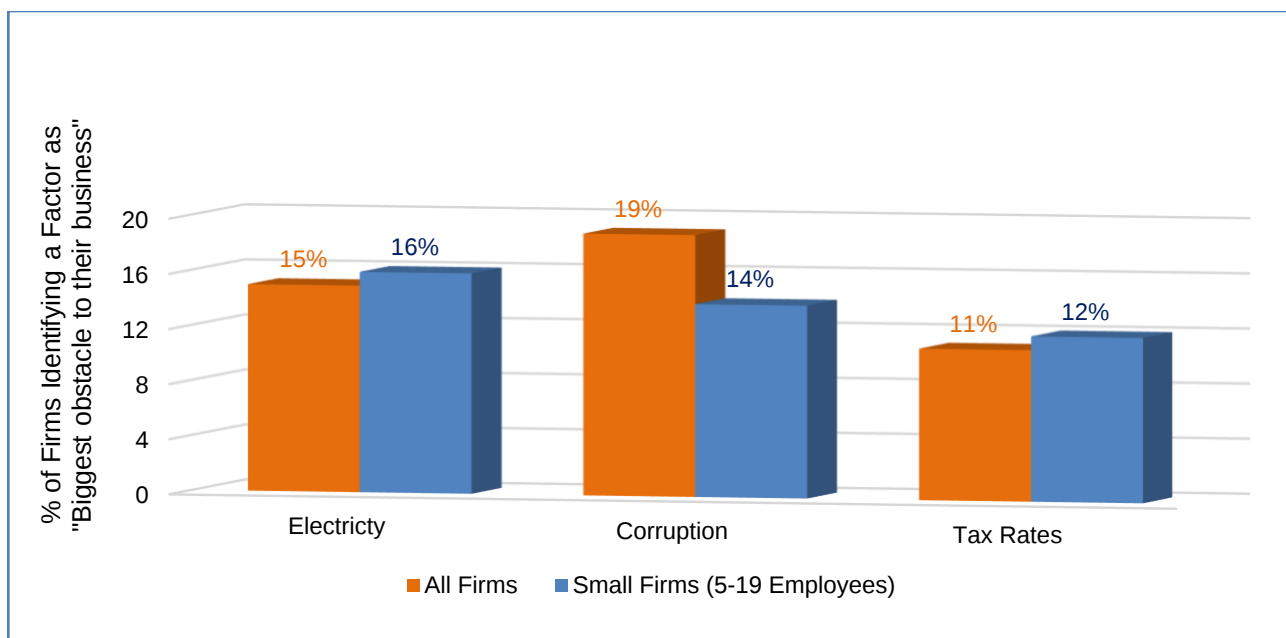


Figure 5. Top Three Dominican Republic Business Environment Constraints

NREL's current research has encountered very little information on energy efficiency investments firms or *energy service companies* (ESCOs) that are active in the Dominican Republic or the Caribbean more broadly. Such ESCOs are discussed in greater detail later in this paper. However, the presence of explicitly dedicated companies is important for the growth of energy efficiency upgrade implementation. As Worldwide Institute research in 2015 found, "Historically, energy efficiency audits in the Dominican Republic have relied on individuals to track and report data, but programs were quickly forgotten and there was no follow through from 'the top down.'"³²

One website indicates that there have been at least three major ESCOs active in the region—ostensibly focused in Jamaica, Trinidad, Barbados, and the Dominican Republic since 2015.³³ Nonetheless, Dominican news reports indicate that the very first business ever founded in the Dominican Republic explicitly for executing energy efficiency upgrades and other energy services, opened its doors in November 2017.³⁴ Clearly the number of qualified ESCOs must grow rapidly if the energy efficiency market is going to scale any time soon.

The absence of such ESCOs cannot be explained by businesses' lack of need, though. Two notable case studies below demonstrate clear examples of the lucrative opportunities open for quality ESCOs that can save other businesses tremendously off their energy bills.

Caribbean Hotel Sector Study

The *Caribbean Hotel Energy Efficiency and Renewable Energy Programme* (CHENACT) was designed to benefit members of the Caribbean Tourism and Hotel Association by informing them of

³² Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic's Sustainable Energy Resources* (Worldwatch Institute, 2015)

http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

³³ "The ESCO Environment in the Caribbean", *Fortress Light*, <https://fortresslight.com/2017/10/27/caribbean-esco/>

³⁴ "Abren primera tienda de eficiencia energética en la República Dominicana", *almomento.net*, Ali Nuñez, 25 Nov 2017, <https://almomento.net/abren-primera-tienda-de-eficiencia-energetica-en-la-republica-dominicana>

opportunities to improve competitiveness through investments in energy efficiency and distributed generation. The donor-funded program consisted of 144 energy audits and 30 walkthroughs as well as policy support to the government of Barbados, Jamaica, and Bahamas.³⁵

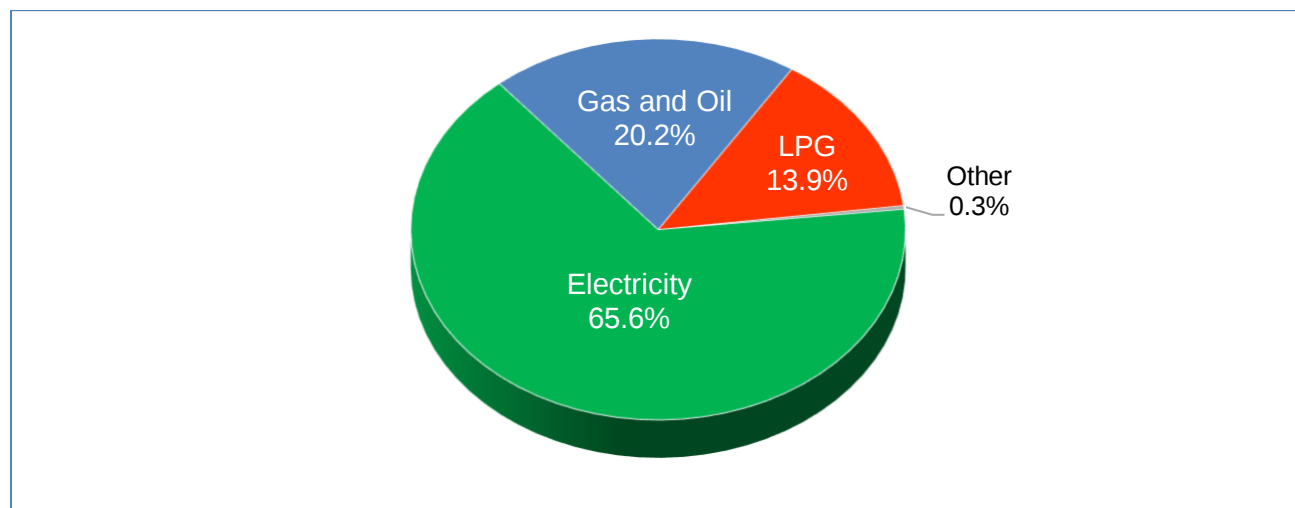


Figure 6 Energy Consumption in Dominican Hotels by Fuel Source (Source: CNE Worldwatch Institute)³⁶

The study did not focus on the Dominican Republic, but it is still relevant as the Dominican Republic “is home to more than a quarter of the Caribbean’s hotel rooms and has the most hotels and the largest average hotel size in the region.”³⁷ Moreover, as seen in *Figure 6* above, electricity accounts for over 65% of Dominican hotels’ energy consumption.³⁸ Many of the study’s lessons may inform market opportunities for small- (20 to 40 room) and medium- (up to 300 rooms) sized hotels as it identified multiple energy saving measures with paybacks under five years including improvements in lighting, appliances, HVAC, as well as behavioral and energy management practices. Such improvements not only have rapid returns on investment, they represent a critical scale of savings to the individual small and medium sized hotels, as on average electricity constitutes approximately 40%

³⁵ “Caribbean Hotel Energy Efficiency Action Program (CHENACT): Final Presentation”, October 2012, <http://www.caribbeanhotelandtourism.com/downloads/CHENACT-Presentation-Final.pdf>, and

“Caribbean Hotel Energy Efficiency Action Programme (CHENACT): TC#:ATN/OC-11465-RG: Energy Efficiency and Micro-Generation in Caribbean Hotels Consultancy: Final Report”, July 2012, <http://www.caribbeanhotelandtourism.com/downloads/CHENACT-Final-Report.pdf>

³⁶ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic’s Sustainable Energy Resources* (Worldwatch Institute, 2015) http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

³⁷ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic’s Sustainable Energy Resources* (Worldwatch Institute, 2015) http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

³⁸ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic’s Sustainable Energy Resources* (Worldwatch Institute, 2015) http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

of all their expenditures (about 0.2% of the entire Dominican GDP).³⁹ Thus wise energy efficiency investment could save hotel owners over 13% of their total costs.⁴⁰

Energy Conservation in the Caribbean - A Profitable Industry for Regional and Foreign Entrepreneurs

Although this paper, authored by a regional energy efficiency expert, was written in 2007, many of its lessons remain relevant. The paper looks (as summarized in *Table 1* below) at the range of energy costs across the Caribbean and estimates potential energy savings for individual energy efficiency technologies. The author also examines the energy efficiency market size in the region and provides recommendations to regional entrepreneurs.⁴¹

Table 1. Energy Efficiency Technologies that May be Cost Effective in the Caribbean

Type of Energy Efficiency Solution	Examples	Sample Benefits
Low Cost/ No Cost Solutions	• Compact fluorescent lightbulbs (CFL)s • Electronic timers • Occupancy sensors • CFL retrofits • Efficient motors • Refrigerant retrofits	CFL vs. Incandescent Bulbs: • CFLs use 70% less energy • CFLs last 8-10k (vs 1-2k) Refrigerant retrofit costs \$100/ ton, but saves \$150/ ton annually
Engineering Services	• Energy audits by certified engineer firms • Designing Corporate Utility Management Programs (CUMP) • Energy efficient designs for new building construction	Optimally designing facilities and informing management practices to maximize energy savings
Engineered Solutions	• Combined Cooling Heating and Power (CCHP) • Solar hot water systems • Chilled beams • High efficiency air conditioning (AC) • Building envelope • Desiccant heat recovery systems	CCHP is perfect for locations with large demands for electricity, AC, and hot water: • i.e. hotel, offices, & hospitals CCHP in Caribbean has potential payback under 2 years

³⁹ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic's Sustainable Energy Resources* (Worldwatch Institute, 2015)
http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

⁴⁰ Mark Konold, Matthew Lucky, et al., *Roadmap to a Sustainable Energy System: Harnessing the Dominican Republic's Sustainable Energy Resources* (Worldwatch Institute, 2015)
http://www.worldwatch.org/system/files/DR_report_English_hi-res.pdf

⁴¹ "Energy Conservation in The Caribbean – A Profitable Industry For Regional and Foreign Entrepreneurs", Andre Escalante M.Sc. C.E.M., http://energydynamics-lac.com/site/repository/files/EnergyConservation10_12_07.pdf

The author assesses several types of energy efficiency investments available to customers including: 1) low cost/no cost solutions; 2) engineering services; 3) engineered solutions, 4) design/product development services; and 5) financial services. Above in *Table 1* is a summary of some of the key take-aways from the author's analysis. The table presents the first three types of investments listed above, specific examples from each category, as well as some tangible benefits derivable from such investments.

ESCOs and Performance Contracting

One major business model that has helped catalyze the market in the U.S. for energy efficiency upgrades of existing facilities, and could reap significant benefits in the Dominican Republic, is the energy savings performance contract (ESPC). Under this model, the customer both pays zero money up front, and borrows zero money. Therefore, it involves very little risk to the customer. Instead, the ESCO itself finances the upgrades, either from its own assets, or more often by securing third-party financing. Then, the customer pays the ESCO a proportion of their monthly or annual savings. The presence and strength of ESCOs are a key indicator of the level of development of an energy efficiency market for the C&I sectors. ESCOs provide a suite of services to their customers that offset the upfront cost and ensure that energy efficiency investments obtain the intended level of energy savings.

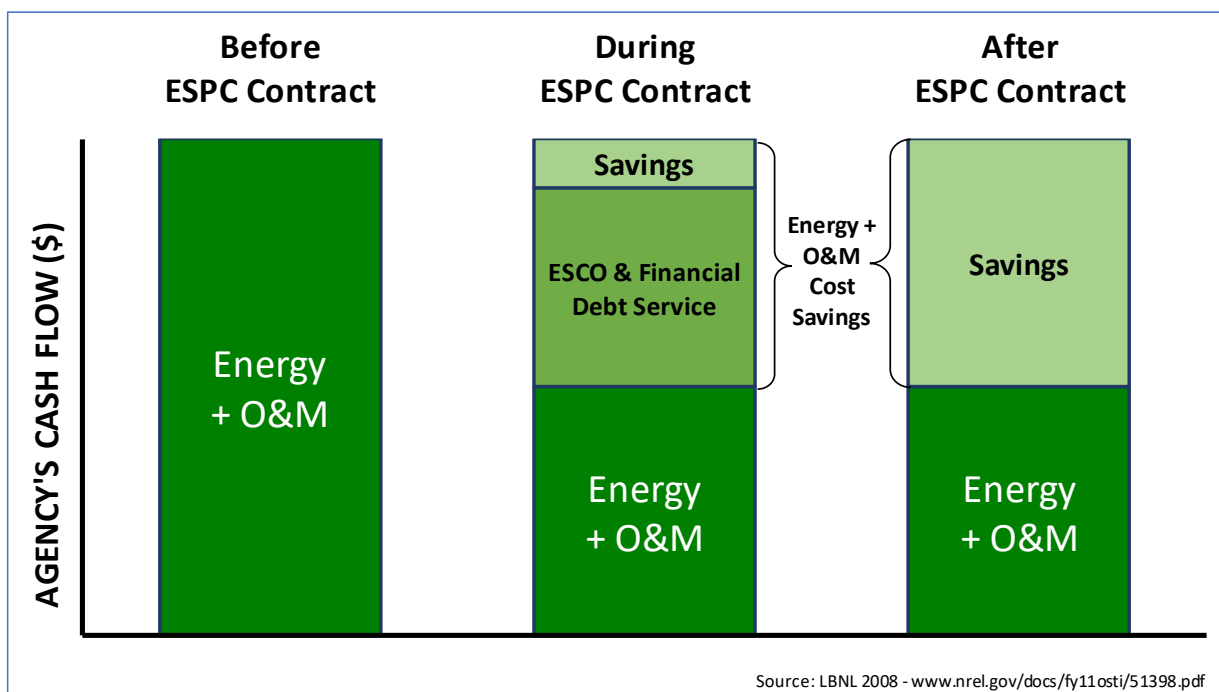


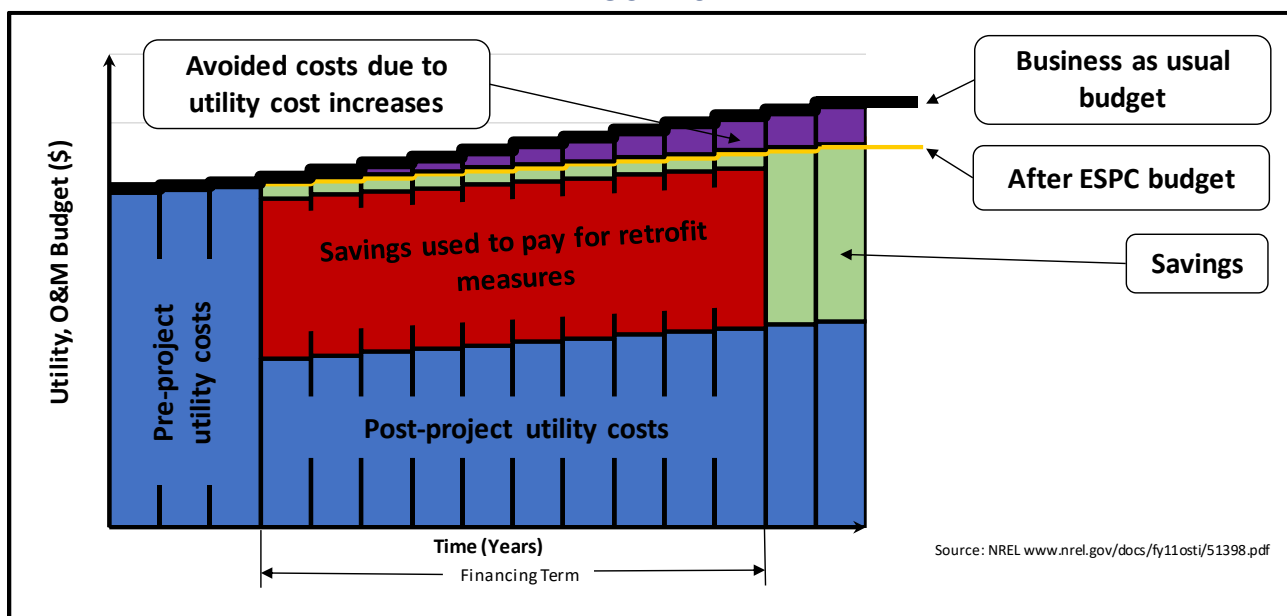
Figure 7. Cash Flows under ESPC Model.⁴²

⁴² "ESPC Overview: Cash Flows, Scenarios, and Associated Diagrams for Energy Savings Performance Contracts", T. Tetreault and S. Regenthal, NREL/TP-7A30-51398, May 2011, <https://www.nrel.gov/docs/fy11osti/51398.pdf>

As seen in *Figure 7* above, the customer begins saving money immediately, and once the cost of the project is paid off, they begin realizing the full savings of their new-found energy efficiency. Often times, the ESPC agreement specifies that if there is no energy savings, then the ESCO does not get paid at all. This of course incentivizes the ESCO to perform optimal work and ensure high energy savings and reduces risk to the customer.

Such projects can even become more valuable to the customer over time. As shown in *Figure 8* below, as facility operations increase due to expanding business, and as utility rates increase (which they tend to do as a reflection of increasing fuel costs), a facility's total energy costs normally rise gradually in a "Business as usual budget." However, by utilizing an ESPC to implement energy efficiency measures, not only does the customer save money by paying for less energy (i.e. fewer kWh), but every such unit of energy has saved will save them more money over the duration of the ESPC as utility electricity tariffs increase, as indicated in the purple bars in the graph labeled "Avoided costs due to utility cost increases."

FIGURE 8.⁴³



Because of the important roles that ESPCs, and the ESCOs that execute such projects, play in a robust energy efficiency market, NREL sought initial evidence of either during their preliminary research. NREL did not initially encounter many Dominican companies operating as fully-fledged ESCOs, therefore NREL is continuing to conduct research on this subject as part of its efforts. With our questionnaire, we are seeking to gain understanding of general market familiarity with performance contracting and its utility, as well as identify what if any are the prominent ESCOs in the market.

⁴³ "ESPC Overview: Cash Flows, Scenarios, and Associated Diagrams for Energy Savings Performance Contracts", T. Tetreault and S. Regenthal, NREL/TP-7A30-51398, May 2011, <https://www.nrel.gov/docs/fy11osti/51398.pdf>

Strengths, weaknesses, opportunities and threats analysis) for the Current Dominican Republic Energy Efficiency Sector

Given the assessment presented in the previous pages regarding the status of the Dominican energy efficiency market today, a private company may see conflicting signals as to whether investing in energy efficiency upgrades is wise. Therefore, below in *Table 2*, a “SWOT” analysis summarizes key lessons for such a prospective customer to consider.

TABLE 2.

SWOT Analysis For Potential Dominican Republic Commercial and Industrial Customers Of Energy Efficiency Investments	
STRENGTHS	WEAKNESSES
• High energy prices help make the case for energy efficiency investments • Good solar resources plus generous incentives can encourage solar + energy efficiency investments • There are a variety of low upfront cost technologies that may be available	• Lack of robust energy efficiency savings market, including locally based Energy Service Companies (ESCOs) that provide third party financing for energy efficiency investments • Companies are not incentivized through public support mechanisms • Lack of affordable debt financing and loan structures specific to energy efficiency • Lack of local qualified energy auditors • Limited capacity among regional energy efficiency professionals to assess more complex investment opportunities
OPPORTUNITIES	THREATS
• Development banks have expressed interest in supporting energy efficiency investments • Business associations similarly think there is significant opportunity to work with their members to understand energy efficiency investment opportunities • The government is picking up momentum in supporting energy efficiency investments and showing greater interest	• Companies remain disinterested in energy efficiency investments • Energy efficiency technology providers are inexperienced and install equipment that does not provide savings as promised to companies, and therefore energy efficiency investments garner a poor reputation

The SWOT table presents an analysis of the considerations for C&I potential customers as they contemplate the advantages and disadvantages of investing in energy efficiency upgrades to their facilities in the Dominican Republic. It presents both current strengths and weaknesses likely with such investments. And it examines what are probable future opportunities and “threats” to their firms likely implicit in taking such action in the near future.

NREL’s Dominican Republic Work Under the German International Climate Initiative’s (IKI) Grant on Mobilizing Private Investment

Clearly, the Dominican Republic has enormous untapped potential as a market for energy efficiency service and equipment providers. To catalyze the private sector in unlocking this potential, NREL has developed a multi-dimensional program. This program is designed to help unleash millions in revenue for entrepreneurial energy service, financing, and equipment companies, while generating millions more in savings for C&I energy consumers.

This program is part of NREL’s partnership with SouthSouthNorth⁴⁴ and the German International Climate Initiative designed to help mobilize private sector capital for implementing Nationally Determined Contributions (NDCs)⁴⁵ and thereby assist countries achieve their low emission, climate resilient development goals. The intention is to collaborate with countries to strengthen both the policy environment as well as private sector capacity to thereby create fertile and scalable markets. The goal of these efforts is the deployment of enough clean energy and energy efficiency improvements over the next 5 to 10 years, as to offset the commissioning of any new, post-2018-levels of carbon-intensive energy generation.

Achieving these objectives will require action by both governments and the private sector. Thus, NREL is assisting both to create favorable conditions for private financing of NDC implementation, by de-risking investments and increasing scale of demand. Not only in the Dominican Republic, but also in Vietnam and the Philippines, NREL is leading such efforts—particularly in the forms below:

- Identifying opportunities for scaling up private investment in priority NDC investment areas;
- Developing investment measures for priority sectors, including financial instruments and de-risking;
- Reforms of government policy, regulatory, or incentive measures;
- Expanding the pipeline for investment in NDC priority sectors by developing the investment case; and
- Building awareness and demand for de-risking measures to address barriers to investment.

⁴⁴ <https://www.pwc.com>

⁴⁵ “...at the heart of the Paris Agreement... NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.”, *United Nations Framework Convention on Climate Change* (UNFCCC), <https://unfccc.int/index.php/process/the-paris-agreement/nationally-determined-contributions/ndc-registry>

Additionally, connecting these initiatives in the Dominican Republic to a broader learning and peer network among other, similarly positioned countries, NREL will also amplify virtuous spirals of learning to enable advances towards accessing or leveraging NDC finance.

As part of these total efforts in the Dominican Republic, NREL's current primary focus is to catalyze development of the C&I energy efficiency market, initially focusing on one (still to-be-determined) specific C&I customer segment. NREL's methods include: 1) project identification, 2) business case development, as well as 3) both capacity building and network facilitation among private sector buyers, sellers, and investors. Additionally, NREL has also worked beyond energy efficiency, with government and utility partners in the Dominican solar sector. Such collaboration has identified the need for further analysis of the Dominican Republic's various model options for excess solar generation remuneration, and their implications on financial sustainability for distributed utilities. Full implementation of this solar workstream will be done with support from other development partners.

Market Analysis and Business Case Study and Handbook Reports

As Dominican C&I energy efficiency is NREL's initial focus, this report—including its previous sections' market analysis—is the first of two on this sector.⁴⁶ The second report will draw on NREL's ongoing collaborative research (under the IKI MPI grant) with multiple Dominican industry associations including: its largest, the *National Industrial Association (AIRD)*; and *EcoRed*, a group of environmentally-conscious private businesses. It will examine more closely the current state of the Dominican Republic's energy efficiency market (including best practices and emerging technologies) at the micro level, as well as best practices and emerging technologies for similar (developing-world, tropical islands, particularly in the Caribbean) markets..

Modeling Energy Efficiency Procurement Options

The market analysis found earlier in this paper demonstrates significant potential energy, and therefore monetary, savings for commercial investments in energy efficiency in the Dominican Republic. Thus, as mentioned above, NREL is currently gathering further data directly from the Dominican C&I sector, through its collaboration with multiple business associations. Together with these partners, NREL has distributed a questionnaire to scores of private businesses. Listed below are some of the types of data to be collected via the questionnaire, however the full questionnaire (in Spanish) is available in Appendix A.

- Building size and structural materials
- Total and periodic, consumption volume and rates, for energy, water, and gas.
- Types and number of lights used.
- Air conditioning and fan usage.
- Energy management and behavioral patterns

⁴⁶ These reports will focus on the private C&I sector, exclusive of the government sector. This is because of unique added difficulties in mobilizing funds for government energy efficiency investment, such as potentially poor debt ratings and challenges allocating public budgets.

Once the data is gathered, NREL will analyze it to understand which of the individual businesses may have the best opportunities for savings via energy efficiency investments. These could include those buildings with older or less efficient technologies, ones with high energy use and costs, and/or those with poor energy savings practices. After identifying one or more such individual businesses that desire to collaborate, NREL intends to simultaneously assist and study the business(es) navigate the energy efficiency upgrade procurement and implementation process.

Aggregated Procurement

Additionally, beyond analyzing specific company responses, NREL will look across the broader portfolio to identified trends. For example, the data likely will indicate subsets of companies with similar business types and energy efficiency investment opportunities. In that case NREL analysis could render a better understanding of both the energy efficiency market's full potential, as well as effective finance and procurement options.

NREL will explore helping identified subsets of firms with innovative approaches to investments in energy efficiency services and/or technologies, such as via an aggregated procurement model. Aggregated procurement increases the negotiating power of each individual purchaser to allow them access to better prices, services and technologies that they might not otherwise be able to obtain alone. Such an initiative could drive down procurement and financing costs through economies of scale, while demonstrating to all stakeholders (customer, provider, and financiers) the utility and viability of such investments.

The purpose of procurement is not to necessarily find the “cheapest” offer on the table but rather the best offer which considers cost, quality and turnaround times amongst other factors. In other words, it aims to bring the maximum value to both sides to ensure both vendor and buyer remain interested and motivated. It also increases the efficiency of sourcing products and services as the effort of finding suppliers and negotiating contracts is combined and thus each organization can spend less time looking for suppliers.

Workshops for C&I Energy Efficiency Consumers and Financiers

In July 2019, NREL will collaborate with AIRD and EcoRed to hold a Santo Domingo workshop focused on the economic value of energy efficiency investments for potential C&I customers. NREL will also build local technical capacity among AIRD and EcoRed member firms, on how to conduct internal energy audits and create the business case for such projects within their businesses' leadership.

During this workshop, NREL also plans to conduct a training on using energy simulation software programs, such as EnergyPlus.TM There are multiple software programs, some at no cost, that are downloadable and of varying utility in conducting energy efficiency assessments of C&I facilities (See *Appendix B* at the end of this report for a list of some of them). One primary such free program is EnergyPlus,TM a whole-of-building energy simulation package that is downloadable from the U.S. Department of Energy's website.⁴⁷

⁴⁷ Engineers, architects, and researchers in the U.S. often use EnergyPlusTM (<https://energyplus.net>) to model both energy consumption—for heating, cooling, ventilation, lighting and plug and process loads—and water use in buildings.

NREL's preliminary research has indicated a lack of awareness of financial products available to potentially interested C&I energy efficiency customers. Therefore, NREL is engaging with development banks in the Caribbean, as well as local banks within the Dominican Republic to characterize the loan facilities available to prospective energy efficiency customers and share this information with the company partners at the July workshops and/or via electronic communications (e.g., webinars and email blasts).

NREL's engagement with the major stakeholders have identified a significant gap in the understanding of the value of energy efficiency investment by potential customers, banks and other potential project financiers also often lack such awareness. Therefore, in November 2019 NREL will renew its partnership with AIRD and EcoRed—along with the Inter-American Development Bank (IDB), The banking sector association, the Santo Domingo U.S. Embassy, and other international stakeholders—to hold an energy efficiency financing workshop. The purpose of this second workshop will be to support the finance sector in developing special financing programs that can catalyze widespread investment in major energy efficiency projects across the Dominican C&I sector. To do so, NREL will invite multiple stakeholders, not just financing institutions, but their potential customers, ESCOs who would execute such projects, government regulators and legislators, and others. In doing so, NREL intends to build a common understanding across the essential sectors, of the value proposition beneficial to all in expanding access to energy efficiency upgrades investments across the Dominican Republic.

By proving the validity of energy efficiency to the Industry and the Banking sector, it is the goal that these institutions may work with government on joint efforts to identify opportunities to improve the market design to further encourage energy efficiency. Such joint efforts could include legislation that promotes wide-spread acceptance of the adoption of energy efficiency systems by establishing public policy instruments and the creation of standards for the development of activities that promote the use of technologies and consumption habits aimed at the continuous improvement of energy efficiency.

Appendix A. Energy Efficiency Questionnaire to Companies



Cuestionario Preliminar de Auditoría Energética

1. Introducción

El Laboratorio Nacional de Energía Renovable, AIRD, y ECORED se asocian para las capacidades y el conocimiento de las empresas en todo el territorio de la República Dominicana, con el objetivo de promover la eficiencia energética para que usted pueda ahorrar en la energía y obtener otros beneficios. Como parte de este esfuerzo, alrededor de 3 empresas van a recibir auditorías de energía, 100% gratis. Las auditorías consisten en la recopilación de datos del consumo y uso de la energía con el objetivo de realizar un análisis técnico y proveer sugerencias de tecnologías para obtener mejoras en ahorros energéticos.

Pedimos que llenen este formulario de auditoría proveyendo los mayores datos posibles. Nuestra decisión de los beneficiarios se basará en algunos aspectos, incluso si este cuestionario ha sido llenado. Entonces, por favor, llenen lo más que puedan este cuestionario. Si una pregunta no aplica a su empresa, márquenla "No se aplica".

Si su empresa es el dueño / opera varias instalaciones, por favor tomen en cuenta la instalación con mayor consumo de energía. Si quisiera agregar las otras instalaciones, añádanla en el mismo orden bajo de cada pregunta.

Si tiene preguntas, favor de ponerse en contacto con NREL en Los EE.UU.:

Tel - +1-303-384-7452

email - Ricardo.Castillo@nrel.gov

*** 1. Información del negocio y contacto**

Nombre de empresa	
Producto / Servicio del Negocio	
Pueblo/Ciudad del Negocio	
Dirección del Negocio 1	
Dirección del Negocio 2	
Nombre del contacto	
Posición del contacto	
Email de contacto	
Teléfono de contacto	

*** 2. AVISO**

NREL intentará mantener la confidencialidad de toda la información presentada, en la medida en que sea consistente con la ley o la orden regulatoria, siempre que dicha confidencialidad no tenga un impacto adverso en los requisitos legales o reglamentarios. NREL no informará ni divulgará de ninguna manera los nombres de empresas o la información de personal de este cuestionario. Los datos anónimos de este cuestionario se pueden usar para informes y para fines públicos a discreción de NREL. Al enviar las respuestas a este cuestionario, usted reconoce expresamente que NREL puede retener y utilizar para fines de discusión, evaluación e información de los informes presentados

☐ Sí, he leído y estoy de acuerdo con el pasaje anterior.

Cuestionario Preliminar de Auditoría Energética

2. ELECTRICIDAD

3. Por favor proporcione los últimos 12 meses de facturas de electricidad, en un “solo” archivo PDF.

Choose File

No file
chosen

4. ¿Tarifa de Uso (ToU) o Tarifa Fija (TF)?

☐ Tarifa de Uso (ToU)

☐ Tarifa Fija (TF)

Otra (por favor especificar)

5. Para su edificio primario, conteste las siguientes preguntas. Si no tiene los números exactos, por favor estimar.

Energía total en
los últimos 12
meses (en kWh)

¿Es el número
arriba estimado o
lectura?

Pico de demanda
en los últimos 12
meses (en kVA)

¿Es el número
arriba estimado o
lectura?

Costo total de
electricidad en los
últimos 12 meses
(en RD\$)

¿Es el número
arriba estimado o
lectura?

6. Tarifa de Uso costo por kWh

Pico (en RD\$)

Día (en RD\$)

Fuera de Pico (en
RD\$)

7. Tarifa plana: Costo medio por kWh (en RD\$)

Cuestionario Preliminar de Auditoría Energética

3. GAS NATURAL

8. Por favor proporcione los últimos 12 meses de facturas de gas, en un “solo” archivo PDF.

Choose File

No file
chosen

9. Para su edificio primario, conteste las siguientes preguntas. Si no tiene los números exactos, por favor estimar.

Total del gas
consumido en los
últimos 12 meses
(en m3)

¿Es el número
arriba estimado o
lectura?

Costo promedio
por m3 en los
últimos 12 meses
(en RD\$)

¿Es el número
arriba estimado o
lectura?

Costo total del
gas en los últimos
12 meses. (en
RD\$)

¿Es el número
arriba estimado o
lectura?

Cuestionario Preliminar de Auditoría Energética

4. AGUA CONSUMIDO

10. Por favor proporcione los últimos 12 meses de facturas de agua, en un “solo” archivo PDF.

Choose File

No file
chosen

11. Para su edificio primario, conteste las siguientes preguntas. Si no tiene los números exactos, por favor estimar.

Total de agua en
los últimos 12
meses. (en Litros)

¿Es el número
arriba estimado o
lectura?

Costo promedio
por litro en los
últimos 12 meses.
(en RD\$)

¿Es el número
arriba estimado o
lectura?

Costo total del
agua últimos 12
meses. (en RD\$)

¿Es el número
arriba estimado o
lectura?

Cuestionario Preliminar de Auditoría Energética

5. ENFRIAMIENTO/ CALENTAMIENTO DE AGUA

12. ¿Aire central o unidad de enfriamiento?

- ☐ Aire Central
- ☐ Unidad de Enfriamiento

13. ¿Si Aire Central, Qué Tipo de Sistema?

14. ¿Calentador de agua es eléctrico o de gas?

- ☐ Eléctrico
- ☐ Gas

15. Para su edificio primario, conteste las siguientes preguntas. Si no tiene los números exactos, por favor estimar.

¿Temperatura
media
establecido?

¿Días promedio
AC / año?

16. Si unidades de enfriamiento, conteste los siguientes cuestiones de sus unidades de enfriamiento. Si no tiene los números exactos, por favor estimar.

de unidades de
aire
acondicionado
que tiene

Promedio de
vatios / unidad
(en W)

Edad media de las
unidades (en
años)

17. Conteste las siguientes preguntas de sus ventiladores de techo . Si no tiene los números exactos, por favor estimar.

% de habitaciones
con ventiladores

Promedio de
vatios / unidad
(en W)

Promedio de
horas / año

Cuestionario Preliminar de Auditoría Energética

6. ILUMINACIÓN

Conteste los siguientes cuestiones de su Iluminación. Si no tiene los números exactos, por favor estimar.

18. Incandescentes

Nº total de luces
que son
Incandescentes

% de todos luces
que son
Incandescentes
(en %)

Vatios promedio
de Incandescentes
(en W)

19. ¿Cual tipo de controles usa con los incandescentes?

- ☐ Minutero
- ☐ Sensor
- ☐ Manual

20. Compacto fluorescente (CFL)

Nº total de luces
que son CFLs

% de todos luces
que son CFLs (en
%)

Vatios promedio
de CFLs (en W)

21. ¿Cual tipo de controles usa con los CFLs?

- ☐ Minutero
- ☐ Sensor
- ☐ Manual

22. Bombillas LED

Nº total de luces
que son Bombillas
LEDs

% de todos luces
que son Bombillas
LEDs (en %)

Vatios promedio
de Bombillas LEDs
(en W)

23. ¿Cual tipo de controles usa con los LEDs?

- ☐ Minutero
- ☐ Sensor
- ☐ Manual

Cuestionario Preliminar de Auditoría Energética

7. USO INTERNO

Conteste las siguientes preguntas de su gran equipo. Si no tiene los números exactos, por favor estimar.

* Para “Equipos grandes” si tiene un equipo importante en su edificio que consume mucha energía, escriba el nombre del equipo y complete la información a continuación.

24. Refrigeradores

de unidades

Total m3

Vatios totales (en W)

25. Equipo # 1

de unidades

Vatios (en W)

Total de horas /
año (en horas)

26. Equipo # 2

de unidades

Vatios (en W)

Total de horas /
año (en horas)

27. Equipo # 3

# de unidades	
Vatios (en W)	
Total de horas / año (en horas)	

Cuestionario Preliminar de Auditoría Energética

8. ENVOLTURA DEL EDIFICIO

Conteste las siguientes preguntas de su envoltura del edificio. Si no tiene los números exactos, por favor estimar.

28. Espacio total en el piso (en m2)

29. # de pisos

30. Cuales son sus horas de funcionamiento estándar

Lunes a Viernes

Sábado

Domingo

31. # de personas en día promedio

32. Ventanas

Área de la
ventana promedio
(en m2)

de Windows

33. Construcción

Año de construcción

Material de construcción primario

34. Puertas

de puertas peatonales con portales

Horas abierto cada día

de puertas peatonales sin portales

Horas abierto cada día

de puertas de la bahía de carga

Horas abierto cada día

Cuestionario Preliminar de Auditoría Energética

9. ÚLTIMA PÁGINA

Compañías que trabajan en la eficiencia energética.

35. ¿Conoce usted el concepto de “Contratar por resultados o desempeño” en relación a proyectos de eficiencia energética?

36. ¿Conoce usted nombres de algunas compañías en la Republica Dominicana que trabajen en la eficiencia energética, como uno de sus enfoques principales? ¿Si este fuera el caso, pudiera compartir sus contactos?

Compañía #1:

Nombre y

Contacto

Compañía #2:

Nombre y

Contacto

Compañía #3:

Nombre y

Contacto

Appendix B. List of Energy Efficiency Assessment Software Packages

1. **EnergyPlus™** – <https://energyplus.net>: Engineers, architects, and researchers in the U.S. often use EnergyPlus™ to model both energy consumption—for heating, cooling, ventilation, lighting and plug and process loads—and water use in buildings. Some of its notable features and capabilities include:
 - Integrated, simultaneous solution of thermal zone conditions and HVAC system response that does not assume that the HVAC system can meet zone loads and can simulate spaces with and without air conditioning.
 - Heat balance-based solution of radiant and convective effects that produce surface temperatures thermal comfort and condensation calculations.
 - Combined heat and mass transfer model that accounts for air movement between zones.
 - Functional Mockup Interface import and export for co-simulation with other engines.
 - Standard summary and detailed output reports as well as user definable reports with selectable time-resolution from annual to sub-hourly, all with energy source multipliers

2. **eQuest** – <http://www.doe2.com/equest>

eQUEST was designed to allow you to perform detailed analysis of today's state-of-the-art building design technologies using today's most sophisticated building energy use simulation techniques but without requiring extensive experience in the "art" of building performance modeling.

eQUEST is supported as a part of the [Energy Design Resources](#) program which is funded by California utility customers and administered by Pacific Gas and Electric Company, San Diego Gas & Electric, and Southern California Edison, under the auspices of the California Public Utilities Commission.

3. **Extensive listing of other useful software tools** – www.buildingenergysoftwaretools.com