

Memorandum



Date: October 9, 2018

Agenda Item No. 2B5
October 23, 2018

To: Honorable Chairman Esteban L. Bovo, Jr.
and Members, Board of County Commissioners

From: Carlos A. Gimenez
Mayor

A handwritten signature in blue ink, appearing to read "Carlos A. Gimenez", written over a blue circular stamp.

Subject: Report Regarding Solar Feasibility Study for County Buildings Resolution No. R-303-17-Directive No. 162749

The following report is provided pursuant to Resolution No. R-303-17 approved by the Board of County Commissioners (Board) on March 21, 2017. The report evaluates the capacity and feasibility of generating electricity and hot water using solar technology at County properties including, but not limited to, those managed by PortMiami, Aviation, Solid Waste, Internal Services, Water and Sewer, Fire Rescue, Police, Libraries, Public Housing and Community Development, and Parks and Recreation.

As per R-303-17, the report addresses the following six topics listed below and provides additional relevant information.

1. Estimated cost of installation and maintenance
2. Available area where solar photovoltaic and solar hot water systems could be placed
3. Amount of electricity and hot water that are being used by the County onsite
4. Opportunities to net-meter the energy output
5. Identification of different funding options and creative low-interest financing opportunities using the County's property and rooftops in particular
6. Prioritized list of County properties recommended for additional in-depth analysis.

When the use of renewable energy is analyzed from a comprehensive and long-term perspective, such as reduced climate pollution and increased local high-skill jobs, on-site solar energy generation and use at County facilities, it is feasible and practical and should be pursued. In addition, further monetary and social benefits can be realized by adding energy storage capacity to solar energy generation projects, as this will increase the County's resiliency during emergency and energy disruption events and should be considered a best practice for emergency management planning and disaster recovery strategies.

In accordance with Ordinance No. 14-65, this report will be placed in the next available Board meeting agenda.

If you have questions concerning the above, please contact James F. Murley, Chief Resilience Officer, Department of Regulatory and Economic Resources, at 305-375-5593 or at James.Murley@miamidade.gov.

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Miami-Dade County Country Village Park

SOLAR FEASIBILITY STUDY FOR MIAMI-DADE COUNTY

FINAL REPORT FOR RESOLUTION NO. R-303-17

OCTOBER 2018

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I. EXECUTIVE SUMMARY

Renewable solar energy is available throughout the United States. While Florida ranks third in the nation in terms of the amount of solar electricity it could generate (solar potential) it is twelfth in the nation in terms of the amount of solar photovoltaic (PV) systems that have already been installed, otherwise known as installed solar photovoltaic capacity ([U.S. Department of Energy, Energy Information Administration, Florida Profile, 2018](#)). Taking into consideration the County's high solar potential and the declining capital costs of solar energy, this report evaluates the feasibility of on-site solar energy generation and use at Miami-Dade County (County) properties.

Miami-Dade County Government uses 1.2 billion (1,234,844,938) kWh of electricity per year to operate its facilities and conduct business (EnergyCAP data, 2017). Among the County departments with larger industrial operations, Water and Sewer Department, the Aviation Department and the Transportation and Public Works Department use approximately 63 percent of the electricity consumed by the County. The other 37 percent is used by the remaining departments in different types of facilities such as libraries, fire stations, office buildings, courthouses, port operations, etc. This Phase 1 solar feasibility analysis focused on the latter group of facilities using 37 percent of the energy consumption above. In addition, these facilities have an excellent potential for a quicker installation of on-site solar energy generation systems propelling the County in the right direction to reduce emissions, become less dependent on the energy market, and attain net-zero energy status for its facilities.

For the Phase 1 analysis records from 543 County facilities that mostly have no manufacturing or process energy usage were submitted to the U.S. Department of Energy's National Renewable Energy Lab (NREL) for a solar feasibility analysis to quickly and efficiently identify potential priority solar photovoltaic projects. The NREL analysis provided an initial screening of 238 County facilities that were determined to have suitable roof areas. Prospective installation of photovoltaic panels at the 238 facilities were determined to have a total solar photovoltaic capacity of 61,725 kW and an annual solar energy production of 87,855,519 (87.8 million) kWh.

In addition to total photovoltaic capacity and energy production, the NREL analysis ranks the County facilities based on the Levelized Cost of Energy (LCOE), which considers the total projected energy a project generates and all

total costs. The rapid decline in prices of solar equipment has made it economically feasible for many consumers to own their own generation system of renewable energy sources. The LCOE has shown that on-site solar energy generation is increasingly feasible as the levelized cost becomes equal to or less than the cost of electricity produced from traditional fossil fuels, a condition known as grid parity. Grid parity is the point when the cost of the alternative energy becomes equal to or less than electricity from conventional energy forms and indicates that on-site solar energy is affordable at these specific sites.

On-site solar photovoltaic systems also have the added benefit of stable, fixed electricity costs as compared to rising or fluctuating prices for fossil fuels used for producing electricity. With a trend of escalating energy costs, fixed electricity costs offer the County greater stabilization of electricity costs for the life of the system, typically 20 plus years, potentially saving more money over time. Moreover, if the County uses 87,8 million kWh of solar energy, it would have the added benefit of reducing climate pollution emissions by 65,384 *metric tons of carbon dioxide equivalent (CO₂e)*, the equivalent of removing 14,001 passenger vehicles off the road for one year or powering 9,800 homes for one year (as per EPA's equivalency calculator).

Using the 238 County buildings prioritized in this Phase 1 analysis, it is recommended the next steps include a detailed site evaluation as part of a Phase 2 assessment. The Phase 2 study should be coordinated by executive level staff with representation from the departments operating the selected facilities. As part of the Phase 2 study, departments will need to identify capital, funds, and staff resources to evaluate the feasibility of the project. In addition, the Phase 2 study should analyze those facilities with manufacturing or process energy usage which consume approximately 63 percent of the total energy used by the County.

To realize the true potential of on-site solar energy generation, it is further recommended the County establish policies and procedures requiring all departments to complete a solar feasibility checklist for all County facilities prior to re-roofing, conducting major repairs, and for all buildings constructed or re-roofed after 2009. To ensure an adequate assessment, it is recommended that a solar review be incorporated into the County's Sustainable Building Program for all new construction and major renovations of buildings and infrastructure projects. Although solar hot water heating was not included in this analysis, solar

thermal systems have a very short return on investment and this technology was widely used and proven in South Florida in the past. Therefore, it is recommended that a thorough feasibility evaluation for this technology be prioritized for County investment. Additional recommendations have been outlined in the *Recommended Next Steps* section of this report.

In conclusion, based on the current grid parity cost of solar photovoltaic installations and the anticipated increasing price and diminishing supply of traditional fossil fuel-based energy production and consumption, it makes financial sense for the County to pursue on-site solar photovoltaic installations at selected County facilities. When analyzed from a comprehensive and long-term perspective that includes economic externalities and life-cycle costs and benefits such as reduced climate pollution and increased local high-skill jobs, long-term, on-site solar energy generation and use at County facilities and buildings is feasible and practical and should be pursued. In addition, further monetary and social benefits can be realized by adding energy storage capacity to solar energy generation projects, as this will increase the County's resiliency during emergency and energy disruption events and should be considered a best practice for emergency management planning and disaster recovery strategies.

II. BACKGROUND: RESOLUTION NO. R-303-17

On March 21, 2017, the Miami-Dade Board of County Commissioners (Board) passed [Resolution No. R-303-17](#) requiring a study to evaluate the capacity and feasibility of generating electricity and hot water using solar technology at County properties and to prepare a report for the Board. The resolution further specified that the following six points be included in the preliminary analysis:

1. Estimated cost of installation and maintenance
2. Available area where solar photovoltaic and solar hot water systems could be placed
3. Amount of electricity and hot water that are being used by the County onsite
4. Opportunities to net-meter the energy output
5. Identify different funding options and creative low-interest financing opportunities using the County's property and rooftops in particular
6. Prioritized list of County properties recommended for additional in-depth analysis.

This report is provided pursuant to Resolution No. R-303-17 and addresses the six topics above as well as provides additional relevant information.

III. RESOLUTION NO. R-303-17 REPORT CONSIDERATIONS

The Phase 1 preliminary screening of potential County sites was completed with the goal of evaluating the viability of potential on-site County photovoltaic projects. Various factors that impact the technical and economic potential of solar projects were used to determine the feasibility of solar photovoltaic electricity production at specific sites:

- The average daily total solar resource available at specific sites in Miami-Dade County which was then used to determine the amount of energy the on-site solar photovoltaic will produce
- Available roof space for photovoltaic panel placement (or ground area for ground mounted photovoltaic)
- Amount of electricity consumption
- Cost of electricity
- How much future solar energy generation savings will offset solar project installation costs
- Available financial incentives
- Opportunities for net metering

To complete the requested study report and initial Phase 1 screening, Miami-Dade County's Office of Resilience applied for and received a technical assistance grant as part of the U.S. Department of Energy's (DOE) Community Data Analysis project. DOE then paired the County with research staff at the *National Renewable Energy Laboratory* (NREL). NREL analyzed Miami-Dade County buildings based on data pulled from various County resources and produced a final report titled, "Miami-Dade County, Florida: Comparing LCOE for Potential Rooftop Solar Photovoltaic Systems on County Facilities." This report was used to assist the Office of Resilience's (OOR) response to Resolution No. R-303-17 and is included as Appendix A. For the remainder of this report, the NREL report is referred to as the "NREL Analysis."

To estimate potential for rooftop photovoltaic systems, NREL used Light Detection and Ranging (lidar) data with *photovoltaic* (PV) productivity modeling to estimate a *levelized cost of energy* (LCOE) for potential rooftop photovoltaic systems. Levelized Cost of Energy (LCOE) considers the energy a

project generates and all total costs (including capital costs, construction, operation and maintenance, fuel costs, and financing costs and may also include any salvage or residual value at the end of the project's lifetime). The LCOE has shown that on-site solar energy generation is increasingly feasible as the levelized cost becomes equal to or less than the cost of electricity produced from traditional fossil fuels, a condition known as grid parity.

To begin the analysis, OOR provided NREL with records for 543 County facilities. Of the 543 facilities listed, 279 (51 percent) records could be matched with necessary data for analysis. Because accurate address information was missing for 144 facilities and 120 facilities were outside the physical boundaries of the available lidar coverage, 264 facilities were excluded from the analysis.

After addresses were matched to building footprints, NREL determined the orientation of roof planes and estimated the amount of available roof area suitable for hosting a photovoltaic system. NREL's methodology for estimating suitable roof area is described in *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment* (Gagnon et al. 2016). In addition, NREL used GIS tools to process lidar data from the U.S. Department of Homeland Security's Homeland Security Infrastructure Program to complete the analysis. NREL excluded any roof areas that contained visible obstructions or where photovoltaic placement would be too close to roof edges or objects, and then filtered the remaining roof area by three criteria: shading, tilt, and azimuth. The portion of the roof area that met or exceeded the standards for the three criteria was labeled the "estimated suitable roof area." As a result, a set of roof planes with an acceptable orientation and a suitable roof area was determined for County buildings. However, this filtering only included criteria based on orientation and physical obstructions discernable by lidar data. For this reason, due to the limitations of the lidar data, subsequent "on-the-ground" site visits will be required to determine available roof area more accurately and to improve estimates.

The NREL Analysis provides a preliminary assessment of County facilities, including a prioritized list of County properties recommended for an additional Phase 2 in-depth analysis. While this initial screening is very beneficial, it does not provide a final selection of County sites that should be targeted for future investment in on-site solar generation nor is the analysis comparable to an *investment grade audit* (IGA).

III. A. PRELIMINARY ANALYSIS OF CAPACITY AND FEASIBILITY FOR GENERATING ELECTRICITY AND HOT WATER WITH SOLAR TECHNOLOGY

NREL's preliminary analysis determined solar photovoltaic generation capacity at County facilities with suitable roof plane as 87.8 million (87,855,519) kWh annually. Compared to the County's current use of 1.2 billion (1,234,844,938) kWh annually, based on 2017 electricity consumption, the amount of solar electricity generated would equate to seven percent of electricity needs by County operations. Additional solar generation capacity is even greater because ground mounted systems were not included in the NREL Analysis and an additional 264 buildings were excluded from the NREL Analysis. The 264 buildings excluded from evaluation consisted of 120 buildings out of lidar range and 144 buildings with insufficient addresses. In addition, Miami-Dade County operates many other facilities such as pump stations, etc. which are not included in this analysis.

Determining the potential use of solar hot water (*solar thermal*) use at County facilities was also not possible within the scope of this study due to very limited available data about hot water consumption at County facilities and the absence of flow meters to measure hot water volumes being used in County buildings. Although the capacity and feasibility of solar water heating in County facilities has not yet been evaluated, it should be noted that the Fire Rescue Department is successfully using solar hot water in some existing fire stations and will incorporate this technology into all future fire stations. In addition, the Parks, Recreation and Open Spaces Department (PROS) has installed solar hot water heaters at some of its campgrounds and pools. Therefore, the feasibility of solar water heating should be revisited in the near future because solar hot water systems are highly economical and efficient, offer a very quick return on investment and a relatively short payback, making hot water essentially free. According to [Energy.gov](https://www.energy.gov), upon installation of solar water heaters, water heating bills should drop 50 percent to 80 percent, thereby shielding consumers of *solar thermal* from increasing rates and fuel shortages. Currently, the Office of Resilience is working with all county departments in the migration of water bills into Miami-Dade County's utility bill management software, known as ECAP. Once the project is completed, easy access to water consumption data at County facilities will be available and therefore evaluation of solar water heaters will be feasible.

III. B. ESTIMATED COST OF INSTALLATION AND MAINTENANCE

Capital costs for installation of non-residential rooftop photovoltaic systems in 2016 in the United States range from \$2.20, for photovoltaic systems sized greater than 1000 kW, to \$4.10, for photovoltaic systems less than or equal to 10 kW. According to the NREL analysis, larger systems benefit from *economies of scale* and tend to have lower unit costs (\$/W). Total capital costs include direct costs for purchases of system hardware such as the photovoltaic modules, inverters, structural and electrical balance of systems, other direct costs for electrical, mechanical, and construction labor, permit and inspection fees, and interconnection to FPL's grid. Indirect costs include engineering design, permit administration, and construction oversight and administrative costs.

Estimated costs of maintenance are approximately \$15 per kW per year according to NREL's analysis citing [U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017](#). Regular maintenance is required to ensure solar panels continue to provide power according to specifications. Following best management practices for diligent operation and preventive and corrective maintenance are required to ensure photovoltaic systems are in good repair and appearance, operating at optimal efficiency in compliance with manufacturer's recommendations, and in adherence of all manufacturers' warranties and County policies. Examples of scope of work documents for routine service and preventive maintenance schedules detailing service and frequency for commercial rooftop and ground mount installations are provided in Appendix B for reference.

III. C. AVAILABLE LOCATIONS FOR SOLAR PHOTOVOLTAIC AND SOLAR HOT WATER (THERMAL) INSTALLATIONS AND CURRENT EFFORTS

County facilities were first identified through ECAP, the County's utility bill management software, to generate a list of County facilities. This list was provided to NREL for analysis to identify suitable locations and available roof area. The results of the NREL analysis identified 238 available County facility locations for solar photovoltaic systems and ranks the sites based on the lowest LCOE. In short, LCOE measures the lifetime costs of an energy producing system (in this case, solar photovoltaic systems) relative to its energy production. According to the [U.S. Energy Information Administration](#), LCOE is the commonly cited measurement of the overall competitiveness of different energy generating technologies. In this case, it can be used as the average price that

the solar photovoltaic system must receive in the market to break-even over its lifetime.

Table 1. Top 50 County Facilities ranked by LCOE according to the NREL Analysis

Facility Ranking	Description	Department	Total Suitable Roof Area (m ²)	PV Capacity (kW)	Annual Energy Production (kWh/year)	LCOE (\$/kWh)
1	1751 N. Cruise Blvd	Seaport	24,562	3,082	4,385,766	0.202
2	FOOD SVC BUREAU	Corrections	11,276	1,330	1,906,822	0.211
3	Elections Headquarters	ISD	8,152	962	1,381,209	0.217
4	Preston & Hialeah WTPs	WASD	8,240	1,024	1,460,642	0.218
5	1509 N. Cruise Blvd.	Seaport	24,562	3,082	4,385,766	0.202
6	1265 N. Cruise Blvd	Seaport	8,444	1,129	1,590,607	0.219
7	Police Headquarters	Police	6,718	797	1,142,978	0.220
8	Headquarters	Fire	6,244	734	1,054,680	0.221
9	1435 N. Cruise Blvd.	Seaport	5,564	674	964,800	0.223
10	Animal Services Building	Animal Services	5,430	646	924,461	0.224
11	North Dade Regional Library	Library	5,077	597	857,644	0.224
12	ISD Trade Shops	ISD	6,249	735	1,055,457	0.221
13	Graham Building - State Attorney	ISD	3,989	471	676,107	0.227
14	Fleet Shop South	Fire	3,913	463	662,743	0.228
15	Public Defenders	ISD	3,257	388	555,152	0.230
16	Pre-Trial Det. Ctr.	Corrections	3,257	388	555,152	0.230
17	Medical Examiner Main Building	ISD	3,061	374	530,387	0.232
18	SWM Resources Recovery Plant	Solid Waste	28,505	3,398	4,867,578	0.200
19	Data Processing Center	ISD	3,848	509	705,153	0.235
20	Overtown Transit Village South	ISD	2,849	343	488,609	0.237
21	Overtown Transit Village North	ISD	2,849	343	488,609	0.237
22	1303 N. Cruise Blvd.	Seaport	5,046	622	886,758	0.225
23	Richard E. Gerstein Criminal Jus	ISD	2,663	322	460,302	0.240
24	LeJeune Building	WASD	2,636	313	448,519	0.242
25	Caleb Center	ISD	2,573	310	441,948	0.243
26	West Dade Regional Library	Library	2,511	296	424,534	0.244
27	Youth and Family	CAHS	2,477	294	421,728	0.245
28	514 Australia Way	Seaport	3,364	396	568,218	0.229
29	Doral Police Department Bomb Squad	Police	2,419	286	409,772	0.246
30	Downtown Government Center	ISD	2,280	289	410,649	0.248
31	Douglas Building	WASD	2,268	267	383,084	0.250
32	ISD Fleet Shop 1	ISD	2,257	268	384,346	0.250
33	Frankie S. Rolle Center	CAHS	2,151	260	372,738	0.251

Facility Ranking	Description	Department	Total Suitable Roof Area (m ²)	PV Capacity (kW)	Annual Energy Production (kWh/year)	LCOE (\$/kWh)
34	North Dade Justice Center	ISD	2,011	243	347,310	0.255
35	Coral Gables Library	Library	2,005	237	339,133	0.256
36	Central Transfer Station	Solid Waste	1,977	233	333,960	0.256
37	Miami-Dade County Auditorium	CUA	1,883	226	323,609	0.258
38	TGK CORRECTIONAL	Corrections	1,904	225	322,308	0.258
39	1050 Caribbean Way	Seaport	1,901	228	325,414	0.258
40	1080 Caribbean Way	Seaport	1,767	209	299,595	0.260
41	Colonel H Zubkoff Head Start	CAHS	1,740	211	301,738	0.261
42	Alexander Orr WTP	WASD	1,753	221	311,295	0.263
43	Miami Beach Regional Library	Library	1,615	190	272,782	0.264
44	SWM Engineering & Environmental Division	Solid Waste	28,505	3,398	4,867,578	0.200
45	Hickman Garage # 5	ISD	2,637	322	458,101	0.242
46	CDWWTP	WASD	1,495	176	252,558	0.267
47	TTC Correction Facility/Jail	Corrections	1,482	174	250,328	0.267
48	C&R WAREHOUSE	Corrections	4,559	536	770,095	0.225
49	ETSD Radio Shop	ISD	1,618	199	279,598	0.268
50	ISD Fleet Shop 2	ISD	1,618	199	279,598	0.268

A complete list of 238 County locations with suitable roof planes for solar photovoltaic systems are identified in Appendix C. While this report identifies County facilities suitable for the installation of solar photovoltaic, the evaluation of solar hot water (thermal) was beyond the scope of the NREL Analysis.

It is interesting to note, per [2018 Florida Statue 1013.44](#), Florida mandates that new educational facilities with hot water demands exceeding 1,000 gallons per day must include a solar water heating system that provides at least 65 percent of hot water needs, whenever economically feasible. Additionally, if educational facilities or plants include heated swimming and wading pools, they must be heated by either a waste heat recovery system or a solar energy system, whenever feasible.

III. C. a. CURRENT EFFORTS

1. FIRE RESCUE DEPARTMENT

As of April 2018, the Miami-Dade Fire Rescue Department is reviewing an agreement with BioStar Renewables, LLC for a scope of services related to energy conservation, renewable energy, and sustainability strategies. Pursuant to Section 255.065 of the Florida Statutes, the company submitted an unsolicited proposal to perform services comprised of an energy audit, analysis of options to conserve energy and generate renewable energy, including solar photovoltaic systems, and preparation of a comprehensive report. The unsolicited proposal identifies possible solar photovoltaic energy generation projects within the Fire Rescue Department as follows below in Table 2.

Table 2. Fire Rescue Department Potential Solar Energy Generation Identified in an Unsolicited Proposal

FIRE RESCUE DEPARTMENT POTENTIAL SITE AND SIZE OF ARRAY		FINANCIAL COST	FINANCIAL SAVINGS		
Location	Project Size (kW)	Estimated Cost (Cash Purchase) (\$)	Energy Production (kWh) (year 1)	Operating Income (\$) (year 1)	Simple Payback (years)
Headquarters Carport	750	2,287,318.00	1,598,000	155,548.85	14.7
Headquarters and Training Center Rooftop Installation	540	1,437,518.00	1,204,000	74,300.00	19.4
Headquarters Firetruck Canopy Rooftop Installation	120	259,534.00	198,300	74,300.00	19.4
Firehouses <10 Years Old (12 locations)	100	2,471,936.06	1,813,900	126,042.50	19.6
Firehouses 10-25 Years Old (23 locations)	50	3,710,209.86	2,578,000	203,017.50	18.3
Firehouses >25 Years Old (35 locations)	30	2,104,466.94	2,578,000	112,995.00	18.8

At the time this report was written, according to the Fire and Rescue Department, no agreements had been made or contracts signed for any of these solar photovoltaic projects.

2. INTERNAL SERVICES DEPARTMENT (ISD)

[Resolution No. R-696-18](#) for an Energy Performance Contract (EPC) between Honeywell and ISD was passed by the Board of the County Commissioners on July 10, 2018 in response to Request for Qualifications (RFQ), RFQ No. 9. Prior to finalizing the EPC for Resolution No. R-696-18, Honeywell performed an Investment Grade Audit (IGA) on behalf of the County's Internal Service Department and reviewed options for solar energy installations at the Stephen P. Clark Center, Cultural Center, Caleb Center, Medical Examiner Building and the Overtown Transit Village (OTV) North and South buildings. The audit concluded the payback for these measures was beyond 25 years for all six buildings and as

result, recommended against inclusion of solar photovoltaics in the energy performance contract. Additionally, Honeywell evaluated the use of solar hot water heating at these buildings and determined the amount of hot water use and storage was too insignificant in these buildings to create a viable energy conservation measure (ECM).

In response to RFQ No. 10 in August 2017, another company, Ameresco, was selected to conduct an Investment Grade Audit (IGA) of approximately 35 County facilities managed by the ISD to evaluate the technical and economic feasibility of incorporating solar energy technology. This audit's findings will be communicated through a report that will include a site by site evaluation of specific technologies, site suitability, and technical and financial considerations. The report will also include a detailed recommendation for possible deployment of solar technologies at each site. After evaluation of the IGA by County staff, if feasible a recommendation will be made to the Board whether to proceed with the implementation of all or some of the recommended measures. Per [Florida Statute 489.145](#), the recommended measures that are implemented must provide enough reduction in electrical consumption to pay for themselves over a maximum period up to 20 years after the date of installation through a reduction in the associated electricity cost to the County.

As of May 2018, the County has held preliminary talks with Ameresco regarding the details of the audit to be conducted and is negotiating an Investment Grade Audit Agreement with them.

3. PARKS, RECREATION AND OPEN SPACES DEPARTMENT (PROS)

In 2005, three grid connected photovoltaic systems were successfully installed with U.S. Department of Energy grant funds at three County Parks as noted below in Table 3. Specifications were prepared by an in-house engineer while design, permitting, and construction were bid out and awarded to contractor Solares Electrical Services, Inc.

Table 3. Installed Grid-Tied Photovoltaic Systems in Miami-Dade County Parks

Park Name	Address	PV size (kW)	Electricity Produced* (kWh)	CO2 saved (tons)	Gasoline Saved (gallons)
Country Village Park	6550 N.W. 188 th Terrace	19	41,000	29	3,299
Westwind Lakes Park	6805 S.W. 152 nd Avenue	15	31,000	22	2,509

Martin Luther King Memorial Park	6160 N.W. 32 nd Court	15	28,000	20	2,266
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*Based on the last monitoring system data recorded from November 2011 to January 2013

The Parks, Recreation and Open Spaces Department also has two solar hot water systems at Tamiami and Tropical Parks.

4. MIAMI-DADE WATER AND SEWER DEPARTMENT (MDWASD)

A total of 1,755.9 acres at Miami-Dade Water and Sewer Department facilities have been identified for possible solar photovoltaic installations. However, it still needs to be determined how much area of the identified sites is available for solar project installations. At wastewater facilities, a potential total of 78.7 acres (50 percent - 39.3 acres) has been identified from available areas on ponds, parking lots, roof structures and land. At water treatment facilities, a total of 1,677 acres is potentially available for solar installations (50 percent - 838.62 acres). However, the majority of this acreage is located in the Northwest Wellfield and is primarily comprised of wetlands and would require further analysis as to the feasibility of this use. In Appendix D, a list identifies each site's address, available acres as determined in GIS, and a brief description of the location. Please note that site layouts will change considerably over the next 5-10 years as MDWASD's Consent Decree and Ocean Outfall Legislation projects develop and as other projects in the capital plan are implemented.

III. D. AMOUNT OF ELECTRICITY AND HOT WATER CONSUMED BY THE COUNTY

Using ECAP, the County's utility bill management software, it was determined Miami-Dade County consumed 1,234,844,938 kWh of electricity at a total cost of \$104,903,545.97 in calendar year 2017. The average per kWh price ranged from \$0.07 to \$0.22 including demand charges applied to commercial accounts. Demand charges are based on the maximum amount of electricity used at any time during the month to meet peak demand for electricity and can represent up to 30 percent of the utility bill. The unit cost of demand (kW) is always much higher than the unit cost of consumption (kWh). Consumption is typically charged at a few cents per kWh and demand is usually charged at a few to several dollars per kW.

Electricity usage and associated costs per County Department are depicted in the following tables and chart. This usage and cost data is derived from

accounts with Florida Power and Light and does not include the few electricity accounts the County has with the Homestead Public Services Energy/Electric Utility. However, the amount of electricity supplied to Miami-Dade County facilities by this electric utility provider is a very small percentage of Miami-Dade County's total electricity usage and as a result would not change ranking of Departments by cost or consumption.

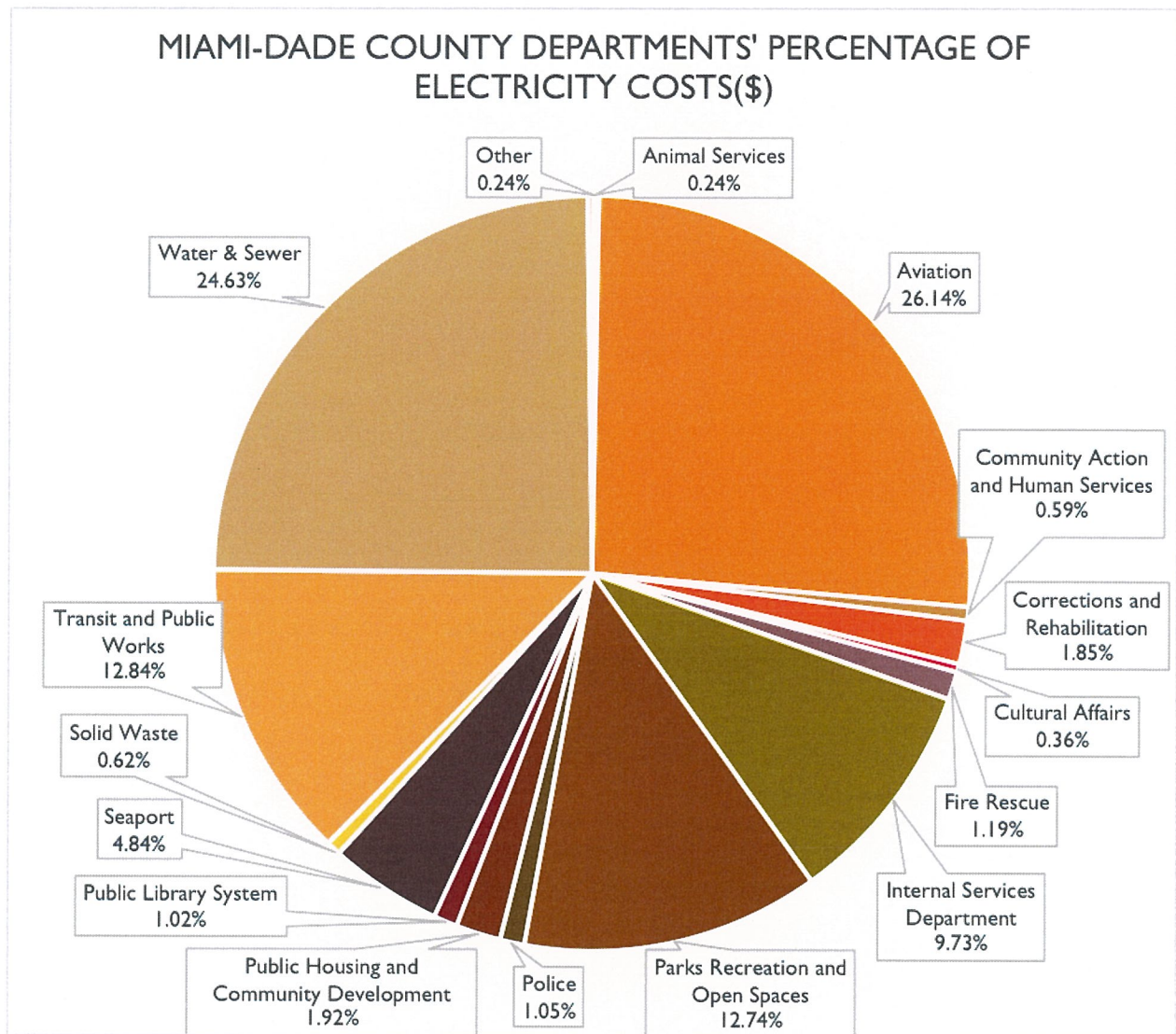
Table 4. County Departments Ranked by Electricity Usage

RANKING	DEPARTMENT	2017 ELECTRICITY USAGE - FPL (kWh)
1	Aviation	368,688,324
2	Water & Sewer	346,370,510
3	Transit and Public Works	147,060,912
4	Internal Services Department	140,096,978
5	Parks Recreation and Open Spaces	60,783,448
6	Seaport	58,892,400
7	Corrections and Rehabilitation	26,884,711
8	Public Housing and Community Development	21,918,411
9	Police	15,218,293
10	Fire Rescue	15,196,184
11	Public Library System	12,548,352
12	Community Action and Human Services	6,551,506
13	Solid Waste	5,008,568
14	Cultural Affairs	3,661,026
15	Animal Services	3,159,646
16	Other	2,805,669
TOTAL		1,234,844,938

Table 5. County Departments Ranked by Electricity Costs

RANKING	DEPARTMENT	2017 ELECTRICITY COST - FPL (\$)
1	Aviation	\$27,423,540.12
2	Water & Sewer	\$25,839,215.66
3	Transit and Public Works	\$13,471,487.95
4	Parks Recreation and Open Spaces	\$13,361,892.64
5	Internal Services Department	\$10,210,143.81
6	Seaport	\$5,073,717.42
7	Public Housing and Community Development	\$2,017,942.07
8	Corrections and Rehabilitation	\$1,942,627.52
9	Fire Rescue	\$1,253,503.15
10	Police	\$1,102,728.36
11	Public Library System	\$1,067,512.84
12	Solid Waste	\$645,443.34
13	Community Action and Human Services	\$620,287.70
14	Cultural Affairs	\$373,949.52
15	Animal Services	\$247,586.84
16	Other	\$251,967.03
TOTAL		\$104,903,545.97

Chart 1. Miami-Dade County Departments' Percentage of Electricity Costs (\$)



As previously explained, hot water usage is traditionally calculated by measuring water flow/volume from specific hot water delivery points. Since this type of monitoring is not in place at County buildings, it is not possible to determine the amount of hot water used by Miami-Dade County buildings at this time.

III. E. OPPORTUNITY TO NET-METER OUTPUT

Net metering is a metering and billing methodology whereby customer-owned renewable generation is allowed to offset the customer's electricity consumption on site. Rules for net-metering and interconnection for renewable energy systems for up to 2 megawatt (MW) in capacity is allowed by State of Florida Statutes implemented by the Florida Public Services Commission for Investor Owned Utilities such as FPL. To participate in *net metering*, a connection to the electricity grid is required. *Net metering* cannot be used for stand-alone photovoltaic systems (not connected to the grid) used to charge a bank of batteries. To request *net metering* for a particular FPL meter/account, the County must complete an application, execute an *interconnection agreement* between the County and FPL, and obtain proper permits. The *interconnection agreement* requires applicants, such as the County, to identify the size of the photovoltaic system that will be net metered. There are three tiers to choose from, all described in the table below (<https://www.fpl.com/clean-energy/net-metering/tiers.html>):

Table 6. FPL Net Metering Tiers

FPL Net Metering Tiers	Size (AC)	Application Fee	Proof of Insurance Value
Tier 1	≤10kW	\$0	Not required
Tier 2	>10kW and ≤100 kW	\$ 400	No less than \$1 million
Tier 3	>100 kW and ≤ 2,000 kW	\$1,000	No less than \$2 million

Regardless of the potential to generate renewable solar energy, photovoltaic systems must be properly sized to generate no more than 115 percent of the specific account's average annual kWh consumption.

(<https://www.fpl.com/clean-energy/net-metering/guidelines.html>)

Once a photovoltaic system is in place, the electricity it produces can be used to replace all or a part of the electricity that would normally be obtained from the electrical utility. If the photovoltaic system only supplies a portion of the electricity used on a monthly basis at that particular account/meter, then the County will still need to purchase the remainder of its electricity from the electric utility and will be charged for this electricity in accordance with FPL's normal

billing practices. However, if *net metering* is in place, and the County's photovoltaic system generates more electricity that month than the monthly electricity consumption at that particular account/meter, the excess electricity is delivered to the electrical grid. The County would then receive credit on the account's next monthly electricity bill for its net contribution of electricity to the electrical grid. The monetary value of the excess electricity supplied to the electrical grid is currently the same as the amount the County would pay for using electricity supplied by the electric utility. All excess electricity credits can be accumulated on a monthly basis and used to offset the County's electricity usage at the specific account/meter that is being net-metered, for a period not to exceed 12 months. In the last billing cycle month of each calendar year, if more electricity is produced than consumed and a surplus exists at the end of the year, FPL will apply a credit to the account's (next year) January bill based on the average annual cost of electricity generation which is less than the price the County pays for electricity. For this reason, *net metering* should not be viewed as an opportunity to generate revenue for the County and photovoltaic systems should be sized properly to meet, but not exceed, the electricity consumption needs at a particular meter.

The County has a few electricity accounts with the Homestead Public Services Energy/Electric Utility, a municipally-owned electric utility. However, municipally-owned utilities may have different *net metering* and interconnection standards. Since the amount of electricity supplied to Miami-Dade County facilities by this electric utility provider is very small, their *net metering* standards are not included in this analysis.

Using FPL's Net-Metering Tier system, the 238 photovoltaic systems analyzed were categorized as follows:

- Tier 1: 15 facilities with a total of 76 kW photovoltaic capacity
- Tier 2: 121 facilities with a total of 5,775 kW photovoltaic capacity
- Tier 3: 96 facilities with a total of 33,486 kW photovoltaic capacity
- Beyond Tier 3: six facilities with a total of 18,052 kW photovoltaic capacity.

However, the photovoltaic systems categorized by net-metering tiers above are based on maximizing the available roof plane and potential energy generation. If solar photovoltaic systems are designed to be smaller than the suitable roof plane allows, the project could fall under a lower net-metering tier category.

Net metering credits can be helpful in reducing the amount of money that the County spends on electricity purchased from its traditional utility electricity provider and for this reason, it is recommended that the County net meter all accounts/meters connected to a photovoltaic system.

For safety reasons, all renewable electricity generating systems (such as solar photovoltaic systems) that are tied to the electrical grid (grid-tied) must include a utility-interactive inverter, or other device certified pursuant to FPL's net-metering agreement, that performs the function of automatically isolating the customer-owned electricity generating equipment from the electrical grid in the event of a grid outage. This requirement is necessary to prevent dangerous back feed into the grid, which could endanger repair personnel who may be working to restore the grid. This also means that grid-tied photovoltaic system will not provide electricity to meters and associated facilities/buildings during electric grid failures. It is very important to understand that a grid-tied net-metered photovoltaic system can only function when the electric grid is down if the system has special equipment installed such as a specialized inverter on the customer side of the meter that will allow the system to operate to charge the battery back-up system. Only in this case and with the right equipment, can a photovoltaic system provide electricity to a County facility during electrical grid outage.

III. F. AVAILABLE FUNDING OPTIONS AND INNOVATIVE LOW-INTEREST FINANCING OPPORTUNITIES USING COUNTY PROPERTY AND ROOFTOPS

The demand for solar energy has increased dramatically and continued growth is expected. At the same time, funding local government solar projects is difficult because governments are unable to take advantage of tax incentives and grants that can be used to offset high initial (up-front) capital costs. However, there are many funding options available to finance solar photovoltaic projects that the County can apply for on a project-by-project basis such as:

- Direct ownership through cash purchasing, solar loans, or bonds
- *Energy Performance Contract* (EPC)
- Third party ownership (TPO) through solar leasing (recently approved by the Florida Public Service Commission in April 2018) and Private Public Partnerships
- Solar tax equity structures or other innovative funding solutions

F. a. DIRECT OWNERSHIP CASH PURCHASING, SOLAR LOANS, AND SOLAR BONDS

Direct cash purchases are the most direct procurement type but typically require significant upfront capital costs. The purchaser owns the solar energy system outright, and operation and maintenance costs are also the owner's responsibility. One advantage of cash purchases is that financing costs are avoided, resulting in a higher rate of return over the lifetime of the solar photovoltaic system. Solar-specific loans spread the cost of the solar system over a number of years. Some loan packages also include service packages to cover operation and maintenance costs. Lastly, bond financing is an option for raising revenue to finance solar purchases. Specifically, green bonds, which are an emerging subset of bonds dedicated to financing environment-related projects such as renewable energy. For example, green bonds are being used by Los Angeles, San Francisco and New York for low carbon transportation solutions (<https://www.climatebonds.net/standards/certification>). Also, the City of Albuquerque is installing 12 solar power systems using a bond that will be paid back with electricity savings (<https://pv-magazine-usa.com/2018/06/27/solar-bond-pays-for-12-solar-installations-tax-payers-nothing/>).

F. b. ENERGY PERFORMANCE CONTRACT (EPC)

In the State of Florida, local governments can also take advantage of an alternative funding mechanism known as Energy Performance Contracts (EPCs). These contracts are specifically designed to allow government agencies to pay for building upgrades, including energy and water efficiency and renewable energy improvements over time, using money saved on utility bills. Under the agreement, an *Energy Service Company* (ESCO) guarantees reduced utility expenses resulting from the projects. More details on Miami-Dade County's Energy Performance Contract overseen by the Internal Services Department can be found in the "Related County Programs and Policies that Support Renewable Solar Energy" Section of this report. Recently, through the Energy Performance Contracting Program, two Requests for Qualifications, RFQ No. 9 and RFQ No. 10, were solicited that included solar energy projects. Please refer to Section III. C. a. Current Efforts, paragraph 2, ISD, for more information.

F. c. THIRD PARTY OWNERSHIP (TPO) THROUGH SOLAR LEASING AND PRIVATE PUBLIC PARTNERSHIPS

Third Party Ownership (TPO) through Power Purchase Agreements (PPAs) is not allowed per State of Florida regulations. However, in April 2018, the Florida Public Service Commission (PSC) issued a statement that a fixed 20-year lease on solar energy equipment does not equate to selling electricity by the leasing company nor does it represent service by an electric utility. As a result, a fixed 20-year lease is an allowable legal contract and the lessee is allowed to make use of *net metering*. While solar leasing is a viable option, power purchase agreements are still not allowed in Florida because third party companies own the solar photovoltaic system and therefore, cannot sell electricity directly back to consumers as electricity sales must be regulated as a utility through the Florida Public Service Commission.

Another option being used to finance solar photovoltaic systems by local governments is Public Private Partnerships (P3s). Miami-Dade County has enabled P3s as a funding mechanism for infrastructure projects and therefore can be potentially used for solar photovoltaic systems.

F. d. TAX INCENTIVES AND CREDITS

Although a few financial options for acquiring solar energy systems are mentioned above, most renewable energy projects are financed through heavy reliance on significant tax incentives, typically exceeding 60 percent of the cost of a qualifying project in order to reduce high initial capital costs. As a result, solar project developers unable to take advantage of these savings opt to partner with "tax equity investors" in order to obtain funding for their projects. Tax equity investors are generally large tax-paying entities, such as banks, insurance companies, and utilities that will receive payments from the cash flow realized from the project and the tax benefits associated with renewable energy projects. The two main benefits are the 30 percent investment tax credit and the 85 percent tax deduction from the fair market value of the project. Based on these benefits, some tax equity investors set a price by quoting an amount per dollar of available investment tax credit. The amounts range from \$1.10 to \$1.32 per dollar of tax credit according to a [Norton Rose Fulbright](#) article published on September 10, 2015.

One of the main financial incentives for solar energy is the federal solar tax credit known as the Investment Tax Credit (ITC) which allows a 30 percent deduction for the cost of installing a solar system with no cap on its value. However, with the spending bill Congress passed in late December 2015, the tax credit based on the cost of the system for commercial solar energy systems will diminish as follows: through 2019 the tax credit remains 30 percent, in 2020 the tax credit is 26 percent, in 2021 the tax credit is 22 percent, and 2022 onwards the tax credit will be 10 percent. After the ITC phases down to 10 percent, many variables will determine if market conditions are favorable for solar projects.

Miami-Dade County government does not pay taxes and therefore is not eligible to participate in solar financing mechanisms that involve tax benefits or credits. However, it is possible that in the future the County might be able to enter into a creative partnership with other entities that can take advantage of these financing mechanisms and join with the County in funding *distributed* solar projects. For example, solar project developers may use one of three main [solar tax equity structures](#) to raise tax equity:

- A partnership flip uses tax equity benefits to negotiate for capital to build solar projects and typically raises 40 percent to 70 percent of the project value. In the partnership flip, the limited partner interest flips to a significantly reduced amount at the end of the credit recapture period at which time the general partner elects to exercise a call option to buy out the limited partner. For an example, the school district of New Berlin in Wisconsin solicited a Request for Proposal (RFP) using a partnership flip to maximize available tax credits, incentives, and grants to reduce the capital costs of the solar photovoltaic system and to avoid having the system considered a Third-party Owner (TPO) agreement under a Power Purchase Agreement (PPA) structure. As a result, the school district formed a single purpose Limited Liability Company (LLC) for the sole purpose of owning and operating solar energy projects. The newly formed company allows the partner investor to provide maximum value for the available tax credits and depreciation including any incentives, grants, or tax credits to reduce the up-front capital costs for the school district's solar projects. According to the RFP, the school district retains all Environmental Attributes including, but not limited to renewable energy credits (RECs) or certificates, carbon trading credits, emissions reduction credits, investment credits, and tradeable renewable credits, if and when

available. The partnership is structured with sufficient ownership interests to avoid being considered a Power Purchase Agreement with a third-party owner. In addition, the investor partner can propose options and timing to sell its interests in the solar projects to the school district in the future. For further details extracted from the New Berlin School District RFP related to the partnership flip, refer to Appendix E.

Regarding partnership flips, it is important to note the Internal Revenue Service has stated in an internal memo made public in June 2015 that its guidelines for tax equity partnership flip transactions do not apply to solar projects on which investment tax credits are claimed. Instead, it states that transactions involving investment credits should be tested under general partnership principles. Although it has its challenges, this should not cause the solar market to refrain from partnership flip transactions, but it may require the revision of how transactions in tax opinions are analyzed.

- Sales-leaseback can potentially raise 100 percent of the fair market value of a solar project. In a sale lease back, the solar developer sells the project to an investor and the investor leases the project back to the developer in exchange for lease payments. The solar company is usually required to prepay a percentage of the purchase price as prepaid rent. The prepayment is treated as a loan by the lessee to the lessor as offset over the lease term, but it accrues interest. This arrangement is called a "section 467 loan" after the section in the US tax code. The IRS has guidelines for leveraged leases and they are found in the Revenue Procedure 200-128. The guidelines limit the term of the leaseback and the lessee can purchase the project at the end of the lease with conditions. A possible disadvantage is tax equity investors pay too little at the beginning for the long-term value.
- Inverted leases, which are used mainly for rooftop installations, generally raise 20 percent to 45 percent of the project value. Inverted leases or pass-through are created for one entity to own a project and the second entity to operate it. The owner elects to pass-through the tax credits and benefits to the operator in exchange for lease payments or capital contributions. The inverted tax structure has no IRS guidelines, but it is common in historic tax credit deals.

- As another alternative to funding options above, it is possible to negotiate a one-on-one deal or a special contract offering mutual long-term benefits to both Miami-Dade County, a very large electricity customer, and Florida Power and Light, a regulated utility. According to the [World Resources Institute](#), one-on-one deals occurred between companies in six states and utilities such as Arizona Public Service, Alabama Power, and MidAmerican Energy. A one-on-one deal would help the regulated utility successfully meet the renewable energy needs of Miami-Dade County and represents a willingness of the utility provider and the Public Utility Service Commission to innovate and explore new options in providing renewable energy to customers. However, this opportunity requires negotiation to design a workable arrangement, followed by regulatory approval with high transaction costs and uncertainty.
- Another option to consider is to host the utility's solar energy projects on County land and facilities. With enough land and rooftop available for photovoltaic systems to generate electricity at competitive prices and still small enough to interconnect to existing grid, the solar systems can come on-line fairly quickly compared to utility scale solar. Because these facilities and lands are typically in close proximity to electricity load centers, power generation is close to usage, minimizing losses over transmission lines and strengthening the grid. The utility obtains good hosts for urban power plants and minimizes the impacts associated with power plant siting and the County produces a positive revenue stream from municipal land and rooftops. According to a report, [Solar Powering Your Community: A Guide for Local Governments, Second Edition](#), suitable sites included rooftops with a minimum of 17,000 square feet or tracts of land with a minimum of three acres and can be dedicated to solar production for at least 20 years. Some communities currently hosting utility solar projects include Suffolk County in New York and the City of Tucson in Arizona. Suffolk County hosts a 17 megawatt (MW) solar photovoltaic system on seven County parking lot carports and expects to make \$8.5 million over 20 years from lease payments. The City of Tucson leased 305 acres of former agricultural land for a 25 megawatt MW solar photovoltaic plant. The lease was determined after an independent appraisal for payments of \$127,000 per year as long as the plant is operational.

Regardless of the selected method to finance solar energy projects, funding options should be revisited and reviewed to ensure compliance with changing tax laws, available tax benefits and incentives, and changing market conditions. All options mentioned above require detailed evaluation on a project-by-project basis in order to ensure applicability and best outcomes to the County.

III.G. PRIORITIZED LIST OF COUNTY PROPERTIES RECOMMENDED FOR ADDITIONAL IN-DEPTH ANALYSIS

County properties recommended for additional in-depth analysis can be prioritized based on the following four criteria:

- 1) NREL's LCOE list
- 2) 100 percent offset of consumption
- 3) FPL net-metering tiers
- 4) High visibility sites or Department projects with available funding

The first widely used method of prioritizing building selection is based on *Levelized Cost of Energy* (LCOE). This method typically considers the energy a project generates and all total costs (Refer to "Executive Summary" Section of this report and glossary for details about LCOE). The top 25 buildings ranked by increasing LCOE are listed below in Table 7 and the complete list of County buildings analyzed can be found in Appendix F.

Table 7. Prioritized List of Top 25 County Properties Based on Lowest *Levelized Cost of Energy* (LCOE)

Facility Attributes				Results for the system with the minimum Levelized Cost of Energy (LCOE)			
Facility Ranking	Description	Department	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
1	1751 N. Cruise Blvd	Seaport	1751 N. Cruise Blvd	4464000	2096	3010412	0.200
2	FOOD SVC BUREAU	Corrections	3595 NW 72 Avenue	1459042	1016	1459042	0.216
3	Elections Headquarters	ISD	2700 NW 87 Avenue	2327760	958	1375774	0.217
4	Preston & Hialeah WTPs	WASD	1100 W 2nd Ave	62512348	981	1406097	0.217
5	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	1349400	939	1349400	0.217
6	1265 N. Cruise Blvd	Seaport	1265 N. Cruise Blvd	2812080	1125	1585642	0.218
7	Police Headquarters	Police	9101 NW 25th Street	8017680	786	1129191	0.220
8	Headquarters	Fire	9300 NW 41 Street	5339107	734	1054680	0.221

Facility Attributes				Results for the system with the minimum Levelized Cost of Energy (LCOE)			
Facility Ranking	Description	Department	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
9	1435 N. Cruise Blvd.	Seaport	1435 N. Cruise Blvd.	3305520	674	964800	0.223
10	Animal Services Building	Animal Services	3651 NW 79 Street	2529000	619	889107	0.224
11	North Dade Regional Library	Library	2455 NW 183RD ST.	992880	597	857644	0.224
12	ISD Trade Shops	ISD	3501 NW 46TH ST	749760	522	749760	0.226
13	Graham Building - State Attorney	ISD	1350 NW 12 Avenue	1886067	468	672666	0.227
14	Fleet Shop South	Fire	6000 SW 87th Avenue	890640	454	651925	0.227
15	Public Defenders	ISD	1320 NW 14 Street	916560	376	539554	0.229
16	Pre-Trial Det. Ctr.	Corrections	1321 NW 13 St.	6489600	376	539554	0.229
17	Medical Examiner Main Building	ISD	1851 NW 10th Ave	3553680	374	530387	0.232
18	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th Ave	499426	348	499426	0.234
19	Data Processing Center	ISD	5680 SW 87th Ave	7394400	508	703014	0.234
20	Overtown Transit Village South	ISD	702 NW 1 Ct.	4351440	343	488609	0.237
21	Overtown Transit Village North	ISD	701 NW 1 Ct.	4053600	343	488609	0.237
22	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	470760	328	470760	0.238
23	Richard E. Gerstein Criminal Jus	ISD	1351 NW 12th Street	7235200	322	460302	0.240
24	LeJeune Building	WASD	3575 SW 42ND AVE	2033520	313	448519	0.242
25	Caleb Center	ISD	5400 NW 22ND AVE	3179765	310	441948	0.243

The second possible criteria for prioritizing building selection is based on a goal of offsetting electricity consumption 100 percent with renewable solar energy. According to the initial NREL analysis of the County buildings considered, 58 buildings have the potential to generate 100 percent of the electricity consumption (kWh) with solar energy production for a net zero energy building. The top 25 buildings with the potential for solar energy production equal to electricity consumption ranked by increasing LCOE are listed below in Table 8. The full list can be reviewed in Appendix G.

Table 8. Prioritized List of 25 County Properties with 100 Percent Renewable Energy Production Potential Based on *Lowest Levelized Cost of Energy (LCOE)*

Facility Attributes				Results if a PV system is deployed that generates an amount equal to the facility's annual energy consumption			
Facility Ranking	Description	Department	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
1	FOOD SVC BUREAU	Corrections	3595 NW 72 AVENUE	1,459,042	1,016	1,459,042	0.216
2	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	1,349,400	939	1,349,400	0.217
3	ISD Trade Shops	ISD	3501 NW 46TH ST	749,760	522	749,760	0.226
4	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th Ave	499,426	348	499,426	0.234
5	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	470,760	328	470,760	0.238
6	514 Australia Way	Seaport	514 Australia Way	408,360	284	408,360	0.246
7	ISD Fleet Shop 1	ISD	2690 NW 7 AVE	381,951	267	381,951	0.250
8	SWM Engineering & Environmental Division	Solid Waste	6990 NW 97th Ave	266,114	185	266,114	0.265
9	Hickman Garage # 5	ISD	270 NW 2ND STREET	258,000	180	258,000	0.266
10	C&R WAREHOUSE	Corrections	7845/7855 NW 148 STREET	249,120	173	249,120	0.267
11	1122 Caribbean Way	Seaport	1122 Caribbean Way	225,900	157	225,900	0.270
12	Goulds Poolhouse (BUILDING)	PROS	21840 SW 114 AVE # POOL	184,020	128	184,020	0.275
13	HAZMAT Warehouse	Fire	8010 NW 60th Street	153,252	107	153,252	0.278
14	Metro Annex	ISD	850 NW 23 ST	152,320	106	152,320	0.280
15	Station 63 Highland Oaks	Fire	1655 NE 205TH Street	150,141	105	150,141	0.281
16	African Heritage Trailers	CUA	6161 NW 22nd AVE # 2 TRAILERS	130,320	91	130,320	0.281
17	Opa-locka Library	Library	780 FISHERMAN STREET	108,577	76	108,577	0.284
18	Virrick Park Library	Library	3255 PLAZA STREET	100,746	70	100,746	0.286
19	California Club Library	Library	850 IVES DAIRY ROAD	98,854	69	98,854	0.286
20	Station 22 Interama	Fire	15655 Biscayne Blvd	93,540	65	93,540	0.287
21	South Shore Library	Library	131 Alton Road	90,687	63	90,687	0.288

Facility Attributes				Results if a PV system is deployed that generates an amount equal to the facility's annual energy consumption			
Facility Ranking	Description	Department	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
22	Palm Springs North Library	Library	17601 NW 78 AVE	86,224	60	86,224	0.289
23	North Central Branch Library	Library	9590 NW 27TH AVE.	85,759	60	85,759	0.289
24	Sunset Library	Library	10855 SW 72ND ST	66,594	46	66,594	0.294
25	Headstart Center	CAHS	6121 SW 68th ST	65,560	46	65,560	0.295

The third criteria for selecting buildings for an additional in-depth analysis is based on Florida Power and Light's three net-metering tiers determined by the size (kW) of the solar photovoltaic system. As stated above, the three tiers selected to participate in the *net metering* program are:

- Tier 1: 10 kW AC or less
- Tier 2: 10 kW AC – 100 kW AC
- Tier 3: 100 kW AC – 2,000 kW AC

Listed in Table 9 below are the top 25 buildings based on the smallest Florida Power and Light (FPL) tier category and lowest LCOE. FPL offers Tier 1 net-metering and interconnection at no cost and therefore projects under this category are thought to be easier to implement. As the *net metering* tiers increase, the cost and requirements also increase and therefore as the tiers increase, the projects become more difficult for the County to implement. The full list can be reviewed in Appendix H.

Table 9. Prioritized List of Top 25 County Properties Based on the Smallest Florida Power and Light Tiers with Lowest LCOE

Facility Attributes				Results if facility's suitable roof area is filled		
Facility Ranking	Description	Department	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
1	Lillian M. Williams	CAHS	770 NW 83rd Street	9	0.337	1
2	Westwood Park	PROS	11350 SW 53RD TER	8	0.340	1

Facility Attributes				Results if facility's suitable roof area is filled		
Facility Ranking	Description	Department	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
3	Arcola Lakes Library	Library	8240 NW 7TH AVE	6	0.345	1
4	Olinda Park	PROS	2101 NW 51ST ST	6	0.348	1
5	Little River Park	PROS	10525 NW 24Th Ave	4	0.348	1
6	Palm Springs North TRC	Solid Waste	7870 NW 178th Street	4	0.349	1
7	Arch Creek Park	PROS	1855 NE 135Th ST	2	0.363	1
8	Miller Drive Park	PROS	5510 SW 94 CT	7	0.368	1
9	Palm Springs North Pool	PROS	7901 NW 176th ST	6	0.396	1
10	Station 51 Honey Hill	Fire	4775 NW 199 Street	3	0.400	1
11	West Little River TRC	Solid Waste	1830 NW 79th Street	4	0.407	1
12	Safe Space North	CAHS	7831 NE MIAMI CT	4	0.417	1
13	AD Barnes Park	PROS	3401 SW 72ND AVE	2	0.423	1
14	Pelican Harbor Dockmaster Building	PROS	1275 NE 79TH ST	5	0.429	1
15	Pelican Harbor Marina	PROS	1275 NE 79th ST	5	0.429	1
16	Tropical Park Police Memorial	Police	1030 NW 111th Avenue	270	0.258	2
17	Lift Station Only	Corrections	7000 NW 36 Street	98	0.280	2
18	Hispanic Library	Library	1398 SW 1st Street	97	0.281	2
19	Amelia Earhart Maintenance Building	PROS	201 W 74 PL	93	0.281	2
20	Station 35 Miami Springs	Fire	201 Westward Drive	91	0.281	2
21	Northwest District Station	Police	5975 Miami Lakes Dr East	85	0.282	2
22	LET Family Courthouse Center	ISD	175 NW 1 AVE	89	0.282	2
23	Intracoastal District Station	Police	15665 Biscayne Blvd	82	0.283	2
24	Station 22 Interama	Fire	15655 Biscayne Blvd	82	0.283	2
25	Kendall District Station	Police	7707 SW 117TH AVE	82	0.284	2

Lastly, some County properties lower on a list may be selected and prioritized for the next in-depth analysis by specific departments if specific resources and funding are available, if a building is considered to be in a highly visible site, or if a location is identified for education or outreach purposes. Additionally, buildings excluded from the initial NREL screening may rise on the list as these locations are analyzed.

IV. RELATED COUNTY PROGRAMS AND POLICIES THAT SUPPORT RENEWABLE SOLAR ENERGY

Florida ranks third in the nation in terms of its capacity to generate solar-based energy (solar potential), but despite this, it ranks twelfth in the nation in terms of the amount of energy currently being generated by installed photovoltaic systems. According to the U.S. Department of Energy, renewable energy accounted for almost 2.2 percent of Florida's utility-scale net electricity generation in 2016; however, most of this energy came from biomass sources such as green waste and sugarcane waste (U.S. Department of Energy, Energy Information Administration, Florida Profile, 2018).

Although an abundance of solar potential exists in Florida, neither the State of Florida nor Miami-Dade County have specific goals for solar renewable energy generation at County facilities or community-wide. A renewable energy goal is important and necessary to transition the County away from dependence on fuels such as natural gas and gasoline that create climate pollution when burned, are experiencing market volatility, and are often sourced from politically unstable countries.

IV. A. MIAMI-DADE COUNTY GREENHOUSE GASES/CLIMATE POLLUTION REDUCTION GOALS

The County has a long history of working internally and externally with the community to reduce greenhouse gases. Greenhouse gases (GHGs) result from burning fossil fuels to produce and use electricity and to run cars, trucks, and other vehicles and equipment. Greenhouse gases are a type of climate pollution and reductions of GHGs are directly related to an increase in the use of renewable energy.

Furthermore, the County has ambitious goals for GHG emission reductions and energy efficiency. The Miami-Dade County Board of County Commissioners (BCC) committed to reducing GHG climate pollution emissions from 2008 levels by 80 percent by 2050. Resolution No. R-1431-08, passed on December 16, 2008, expressed the Board's intention to reduce climate pollution through operational efficiencies in order to reduce the County's contributions to climate change, demonstrate regional leadership to achieve climate stabilization, help our local community become climate resilient, and seek assistance from the federal government to support the County's efforts.

Mayor Gimenez participated in the US-China 2015 Climate Leaders' Summit and signed the U.S.-China Climate Leaders' Declaration in September 2015, where he recommitted to the County's original 2008 GHG reduction goals above and created another interim goal to reduce emissions 20 percent relative to 2008 levels by 2020. Mayor Gimenez also signed a Compact of Mayor's commitment letter in November 2015, reiterating our existing 2050 target and pledging to transparently report our community-wide GHG emissions inventory as well as disclose climate risks and vulnerability assessments using a public registry.

Mayor Gimenez has also expressed his intention to make Miami-Dade County more resilient by expanding efforts focused on renewables and energy efficiency and decreasing Miami-Dade County's climate pollution.

IV. B. POLICIES SUPPORTING DEPLOYMENT OF RENEWABLE ENERGY

In June 2017, Miami-Dade County adopted a resolution in support of Solar Bulk Purchasing Cooperatives. In addition, Miami-Dade County earned SolSmart Bronze designation in April 2017 for adopting programs and practices to reduce soft costs and other barriers to going solar. Pending legislation, the County will seek SolSmart Gold designation. Furthermore, Miami-Dade County has approved two Property Assessed Clean Energy (PACE) providers (Florida Green Finance Authority / Renew Financial Group, LLC, and Green Corridor Property Assessment Clean Energy District / Ygrene) and is currently negotiating with two additional providers. PACE is a financing mechanism to help residential and commercial property owners implement energy efficiency and renewable energy improvements to properties. In addition to Solar Cooperatives (Coops) and PACE financing, Miami-Dade County participates in the regional GoSolar Florida grant program which focuses on streamlining permitting for some solar rooftop installations.

Other programs and policies that support the deployment of renewable energies are:

- Resolution No. R-315-15 to support expansion of solar photovoltaic energy and publication of the "Florida Solar Financing Action Plan, A Menu of Options."
- Published in 2010, Miami-Dade County's Sustainability Plan "GreenPrint" Cycle 1 included interim goals to reduce GHG emissions 10 percent below 2008 levels by 2015, reduce per capita non-renewable energy use to 20

percent below 2007 baseline by 2015, and to reduce the County's government electricity use by 20 percent from 2007 levels by 2014, in accordance with BCC legislation.

- The Electricity Master Plan was drafted in response to BCC Resolution No. R-228-09 which, directed the Mayor to develop a plan to reduce the County's electrical consumption for County buildings and operations by 20 percent from 2007 levels by 2014.
- The Comprehensive Development Master Plan (CDMP) and the Parks and Open Space Master Plan encourage sustainable and green development.
- Implementation of Energy Performance Contracts in several departments; installation of light-emitting diode (LED) bulbs at traffic lights throughout the County; purchasing hybrid vehicles for our fleet, and operation of the Resources Recovery Plant.

Since the passing of Resolution No. R-303-17 to study the capacity and feasibility for generating solar energy at County properties, Miami-Dade County has entered into a Joint Participation Agreement (JPA) with Florida Power & Light Company (FPL) to advance the application of renewable energy and innovative technologies within the County. The JPA has the goal of supporting the development of an array of energy-related projects (designated by FPL as Next Generation Energy Projects). These projects include: 1) utility-scale solar arrays (designated by FPL as *universal solar*), 2) *shared solar* (partnering with local governments to find suitable sites for solar projects), 3) solar arrays installed on lake surfaces (*floating solar*), 4) *SolarNow* (customer adds a monthly fee to the electricity bill to pay for community solar projects such as parking canopies and walkways, solar trees, etc.), 5) *battery storage*, and 6) *electric vehicles charging stations*, and a corridor to coordinate the installation of *electric vehicle* infrastructure. If implemented, these proposed projects would help advance the County's renewable energy efforts and support zero-emission power generation, offsetting the County's carbon footprint and greenhouse gas emissions reduction targets as a signatory of the Compact of the Mayors. For more information about the JPA, please refer to Appendix I.

IV. C. BENCHMARKING COUNTY BUILDINGS

In the building industry, tracking and disclosing water and electricity use (called benchmarking and transparency) creates standardized data metrics that help

building owners, managers, and investors compare performance between similar buildings, just as miles-per-gallon (MPG) is used to compare performance between cars. Benchmarking is an industry best practice that provides high-level building energy and water use information tracked over time that can flag inefficiencies like equipment failure or unexpected equipment operation, which are common causes of unnecessary high operating costs and energy or water waste. Without this data, these inefficiencies could go unnoticed for years.

Benchmarking also helps achieve direct financial savings and facilitates data-driven decision making such as how and where to invest in building efficiency improvements. When building owners and operators know how their buildings are performing, they can take informed steps to improve them. According to a [2012 United States Environmental Protection Agency \(US EPA\) study](#) that examined 35,000 buildings across the U.S. benchmarked over a three-year time span, it was concluded that these buildings reduced energy consumption by an average of 2.4 percent annually. This same analysis showed that buildings that were benchmarked for three years straight saved an average of seven percent over that time. In some places, the savings are even higher – in Washington, DC for example, buildings that benchmarked from 2010-2012 under the District's benchmarking ordinance reduced their energy use by nine percent on average, adjusting for weather.

In September of 2013, Miami-Dade County launched a new utility bill management software (ECAP) which enables the County to measure, manage, and monitor the performance of more than 1,500 County facilities. The software monitors over 4,500 electrical meters and is currently being expanded to include water meters. The ECAP software is also used by County staff to interface with the most widely-used online benchmarking tool, EnergyStar Portfolio Manager, allowing the County to benchmark the efficiency of its buildings. As of May 2018, the County has been working on benchmarking its own buildings, and to date has benchmarked several hundred buildings. Through the ECAP and benchmarking software applications, the County has saved more than \$2 million in electricity spending, representing two percent of the County's annual electricity expenses. Savings are anticipated to increase once water bills are integrated into the ECAP and benchmarking software tools.

In addition, improved building efficiency means less energy and water are required to operate County facilities during emergencies and disaster recovery.

This improves building and grid resilience by reducing the amount of energy storage, loads on generators, and fuel requirements needed to maintain operations at all times.

While building efficiency and associated savings are significant on their own, energy and water efficiency at County facilities is also important because it helps reduce the demand for electricity. Reducing the demand for electricity will allow the County to install smaller, and therefore less expensive, solar energy systems. Implementing energy efficiency measures first typically makes the installation of solar photovoltaic systems more economically viable. Smaller solar energy systems have the additional benefit of requiring less equipment and associated roof space. For example, if the County reduced 2017 electricity consumption 20 percent to 987,875,949 kWh, this would conserve 246,968,989 kWh hours of energy consumption and reduce GHG emissions without the need for any energy production.

Miami-Dade County's Building Efficiency 305 (BE305) program focuses on improving building performance through improvements in water and energy efficiency in large existing buildings in our community, both public and private. The BE305 suite of policies and programs is projected to reduce climate pollution while also reducing operational costs for building owners and saving money for tenants. Upon implementation of BE305, annual projected community-wide savings include \$98.8 million, 37.8 million gallons of water, 614,000 metric tons of climate pollution, and 9.9 million MMBTU (one million British Thermal Units) of electricity.

IV. D. SUSTAINABLE BUILDINGS PROGRAM

Miami-Dade County has been supporting green building since October 18, 2005, when the Board approved Resolution No. [R-1200-05](#) to incorporate sustainable building measures into the design, construction, renovation, and maintenance of buildings that are owned, financed, or operated by the County. The Sustainable Buildings Program was later created by Sustainable Buildings Program [Ordinance 07-65](#) in May 8, 2007, and the Board later approved Resolution No. 1309-07 authorizing approval of [Implementing Order \(IO\) 8-8](#) to establish guidelines and outline the mechanism for determining compliance with the Ordinance and established department responsibilities. The associated Ordinance requires construction of new County facilities to

attain Leadership in Energy and Environmental Design (LEED) Silver certification while major and non-major renovations are required to attain LEED Certified status. On June 6, 2017, the Board passed Resolution No. R-617-17, requiring Miami-Dade County funded civil infrastructure projects to incorporate the Envision rating system to meet sustainability goals.

The Sustainable Buildings Program and associated legislation and standards are not prescriptive, because each project is unique and many paths can lead to achieving the required certifications. Both LEED and Envision facilitate a shared, transparent framework to facilitate integrated planning, design, construction, and operation of capital improvement projects that are more sustainable and resilient. The use of these rating systems is intended to result in capital investments with long-term viability, lower operating costs, higher worker productivity, and fewer negative impacts on the community.

IV.E. ENERGY PERFORMANCE CONTRACTS (EPC)

Energy Performance Contracting (EPC) is a budget-neutral approach to making building improvements that reduce energy and water use and increase operational efficiency. By partnering with an *Energy Service Company* (ESCO), a facility owner can use an EPC to finance facility upgrades through projected building performance savings, thereby avoiding the need to tap into capital budgets. Performance contracting projects are designed to save energy and water and associated utility costs, and to decrease *operations and maintenance* costs. In the State of Florida, municipalities, school districts, higher education institutions, and community colleges can enter into performance-based contracts for both building efficiency and renewable energy generation projects (SB 1594, July 2013 - <https://www.cleanenergyauthority.com/solar-rebates-and-incentives/florida/energy-conservation-public-buildings>). The contracts must undergo investment-grade audits and must have a payback period of 20 years or less.

ESCOs are distinguished from other building performance/efficiency firms in that the ESCO's compensation is directly linked to project cost savings that the ESCO guarantees. The terms "Energy Performance Contracting" and "Energy Service Company" can be somewhat misleading as both may include or perform other types of building performance improvements related to water efficiency and not limited to conservation measures exclusive to energy. Energy Performance

Contracts can pay for facility upgrades including solar photovoltaic or solar hot water installations, as long as all of the measures implemented through the Performance Contract together reduce utility costs enough to pay for themselves within 20 years after the date of installation. For an ESCO to consider renewable solar energy technology as part of the EPC and guarantee savings, EPCs need to incorporate energy saving measures that have both long- and short-term returns on investment. The strategy to meet the payback terms requires a mix of technologies with shorter paybacks and proven savings in addition to a Board policy that prioritizes solar photovoltaics.

Miami-Dade County's Internal Services Department has oversight of the County's Energy Performance Contract program which can be accessed by all departments. From 2000 through 2016, Miami-Dade County energy performance contract (EPC) projects have collectively realized approximately 671,470,000 kWh of energy savings and over \$51.8 million in electrical cost reduction with an associated reduction of over 366 thousand metric tons of greenhouse gas emissions. Until recently, none of the County's EPC projects included renewable energy generation components. Currently, the first County EPCs that may include solar photovoltaic energy generation in the scope of work are in the process of being negotiated between the Internal Services Department and two vendors: Honeywell and Ameresco. Please refer to "Available Locations for Solar Photovoltaic and Solar Hot Water (Thermal) Installations" Section for more details on these contracts.

V. CONCLUSION

Various factors impact the feasibility of a solar project and each project requires a site-specific evaluation. However, the scope and intent of this report was to provide an initial screening of all County facilities to determine the feasibility for installation of solar photovoltaic systems at these locations. Records from 543 County facilities were submitted to the U.S. Department of Energy's National Renewable Energy Lab (NREL) for a solar feasibility analysis to quickly and efficiently identify potential priority solar photovoltaic projects. The NREL analysis provided an initial screening with the following results:

- 279 County facilities were analyzed
 - 92 percent, or 238 of the 279 County facilities analyzed, were determined to have suitable roof plane areas

- 41 (eight percent) of the facilities were determined as having unsuitable roof planes
- Photovoltaic panels at these 238 facilities were determined to have a total solar photovoltaic capacity of 61,725 kW and an annual solar energy production of 87,855,519 (87.8 million) kWh
- 264 buildings were excluded from the analysis because they were outside the boundaries of available lidar data (roofs installed after 2009) or facility addresses required additional correction or standardization
- Ground mounted photovoltaic systems and solar hot water assessments were also excluded from the NREL analysis.

Many methods can be used to prioritize County buildings for potential solar installations and vary depending on the goals and desired outcomes of each project or site. For the purposes of this report, buildings were prioritized based on the following criteria calculated using data obtained from NREL, FPL, and the County:

- Lowest Levelized Cost of Energy (LCOE)
- Opportunity to offset a building's electricity consumption by 100 percent with renewable solar energy and operate a zero-emission building
- FPL's Tier 1, 2, or 3 renewable energy generation categories (net-metering tiers)
- County Departments with available funding and resources for solar installations.

The results of this analysis are presented in the "Prioritized List of County Properties Recommended for Additional In-depth Analysis" section of this report and the Appendices at the end of the report.

While this initial screening of County sites is very beneficial and provides an initial indicator of viability to help focus future analyses and efforts, it does not provide the final list of suitable County sites where solar photovoltaic systems should be installed. As anticipated, a more in-depth Phase 2 analysis is needed to narrow down the list of suitable County sites and to explore additional options such as ground mounted photovoltaic systems which, were not included in this report. Lastly, financing of solar photovoltaic systems is usually done on a per project

basis. Therefore, the Phase 2 analysis should include a selection of a funding mechanism for each selected photovoltaic project.

VI. RECOMMENDED NEXT STEPS

After reviewing the NREL analysis and County Department objectives, the recommended next steps include:

- Further analysis of County facilities with the 50 lowest LCOE, regardless of the FPL net-metering tier and not excluding County buildings that cannot achieve zero-emissions with a roof-top solar system. This analysis must examine each roof suitable for solar photovoltaic installations to confirm the direction and pitch angle of the roof, size and shape of the roof, shading on the roof, age of the roof, material of the roof, roof warranty, historical significance, and any other criteria determined at the facility to be relevant to feasibility of a solar photovoltaic and/or *solar thermal* installation.
- An additional study to identify critical County buildings or facilities for potential solar plus *battery storage* and stand-alone operations during emergencies. Solar plus *battery storage* creates resilience and reduces power interruptions at critical County facilities. In addition, use of solar energy enables the County to create onsite power generation with storage to maintain power during outages due to weather events or security disruptions.
- Analyze those facilities with manufacturing or process energy usage which consume approximately 63 percent of the total energy used by the County to determine the feasibility of installing on-site solar energy generation systems.
- Identify additional available lands for ground-mount photovoltaic systems at County properties with sufficient exterior land. These projects should be prioritized for evaluation as they may save more money in the long term since they are not limited by the roof space and roof characteristics, and are easier to maintain and clean. If the County invests in solar photovoltaic systems, it could use solar energy to reduce peak loads thereby saving money and increasing reliability.

Additional recommendations include:

- Convene all County Departments to leverage capital, financial, and human resources to ensure County resources are maximized by purchasing solar photovoltaic systems in bulk. The best outcomes will be realized when

objectives, goals, and funding options are aligned amongst County departments.

- Require all County-owned facilities to complete a solar feasibility checklist for review prior to re-roofing, conducting major repairs, and for all buildings constructed or re-roofed after 2009 as an initial screening for possible solar photovoltaic or *solar thermal* installations. As such, it is recommended that a “solar” review be incorporated into the Sustainable Building Program guidelines. This standardized assessment, for the feasibility of both solar photovoltaic and solar hot water system installations, should be included as background information on any memos transmitted to the Mayor or commissioners to request capital funds for the project.
- All existing County facilities utilized during emergency management planning and disaster recovery should complete an analysis that considers adding solar photovoltaic energy generation and energy storage (battery backup) capacity as this will increase the County's resiliency during electrical grid disruption events. All photovoltaic systems installed in County facilities that need to maintain electricity when there may be electrical grid failures, in particular for emergency management planning and disaster recovery purposes, shall be designed to include (a) a utility-interactive inverter, a battery back-up inverter, and any additional equipment meeting FPL's requirements and (b) sufficient energy storage / battery backup systems to meet determined needs.
- Funding should be allocated to hire a private consultant to further analyze the 264 buildings that were submitted but ultimately excluded from the NREL analysis and any available land for ground mounted systems.
- The County Sustainable Buildings Program and Ordinance should be revised to require that all new County buildings, infrastructure projects, or renovation projects that involve the reconfiguration of water and electricity meters, should require one master meter for electricity and another master meter for water, as well as sub-meters for lease space.
- All County buildings or infrastructure projects with electricity or water meters shall benchmark whole building data for both water and electricity consumption using the free federal EnergyStar Portfolio Manager platform (even for building types that are only eligible to receive an Energy Intensity Use value).

- Although Florida does not have a Renewable Portfolio Standard (RPS), Miami-Dade County can and should create renewable energy goals with incremental targets that increase over time.
- Solar hot water generation has been historically used in Florida and has a very quick return on investment and therefore should be prioritized for County investment. Potential use of *solar thermal* at all County facilities should be re-evaluated after Water and Sewer Department water bills are integrated into the County's utility bill management software, and all County buildings with significant low water use are identified. This data will make it possible to conduct a preliminary screening for potential *solar thermal* opportunities to heat water, save money and reduce climate pollution linked to fossil fuel powered electricity generation. All County Energy Performance Contracts or similar building performance improvement contracts shall include solar hot water measures if the building uses at least 1,000 gallons of hot water per day. All County Energy Performance Contracts scopes of service should combine both quick return on investment measures (such as lighting retrofits) as well as longer return on investment measures (such as solar photovoltaic) to ensure aggregate electricity reductions and guarantee that projects can pay for themselves within 20 years after the date of installation. If these scopes only include measures with quick or moderate return on investment, it will be difficult for the County to find another financing mechanism to fund the longer-term building efficiency measures. In addition, solar photovoltaic shall be considered a priority measure in the County's Energy Performance Contracts that can only be excluded (opted out from) after receiving a waiver from the Office of Resilience.
- All County photovoltaic systems should be designed to meet no more than 115 percent of the specific facility / meter/account's yearly electricity needs.
- All County photovoltaic systems should include costs for *net metering* application, *interconnection agreements*, and permitting costs in the system pricing.
- *Net metering* applications, *interconnection agreements*, and permits for County photovoltaic systems should be submitted / executed prior to system completion and operation.
- New buildings or major renovations of buildings that use more than 1,000 gallons of hot water per day shall be upgraded to use a solar water heating system that provides at least 65 percent of hot water needs.

- Any new or major renovation community swimming pools shall be heated by either a waste heat recovery system or a solar energy system.
- Pursue creative partnerships that will enable innovative financing options for the county to install solar photovoltaic systems at its facilities and generate on-site electricity.
- Prioritize a legislative policy to support the expansion of existing *net metering* policies to allow for off-site or “virtual” net metering and prohibit the weakening of net metering and associated rates

VII. GLOSSARY

Alternating Current (AC): an electric current that reverses its direction many times a second, at regular intervals, typically used in power supplies

Battery storage (Solar): a device that is charged by a solar system and stores the energy for later consumption

Direct Current (DC): an electric current flowing in one direction only

Distributed energy: a private, small-scale energy producing system generating electricity near where it will be used and serving as a single structure or as part of a microgrid

Economies of Scale: a proportionate saving in costs gained by an increased level of production

Electric vehicles charging station: an infrastructure component that provides power for recharging electric vehicles with different speeds for charging also known as EV charging station, electric recharging point, charge point, and EVSE (electric vehicle supply equipment)

EnergyCAP (ECAP): a utility bill management software for energy management and energy accounting

Energy service company (ESCO): a qualified energy service company that develops, designs, builds, and funds projects to save energy, reduce energy costs, and decrease operations and maintenance costs. Using the performance-based contracting methodology, the ESCO's compensation is directly linked to the actual energy cost savings.

Energy Performance Contracting (EPC): an alternative financing mechanism that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures, allowing government agencies to procure energy savings and facility improvements with no up-front capital costs

Electric vehicle (EV): a vehicle propelled using electricity from rechargeable battery packs

Floating solar: a structure made up of an array of photovoltaic panels floating on a body of water

Implementing order (IO): legislation or policies established by the Miami-Dade County Board of County Commissioners that fall under their authority

Interconnection Agreement: a contract between the utility provider and a customer that sets the terms and conditions, allowing the customer to interconnect and operate its solar system in parallel with the electric grid with the intention to primarily offset part or all the customer's energy demands.

Investment Grade Audit (IGA): a detailed examination of a building, including energy and water use, for energy efficient improvement purposes and savings opportunities bundled with a financing plan and an implementation and savings verification plan

Kilowatt (kW): a measure of 1,000 watts of electrical power

Kilowatt hour (kWh): a unit of electrical energy equivalent to a power consumption of 1,000 watts for one hour

Levelized cost of energy (LCOE): a measure of lifetime costs divided by energy production allowing a comparison of different energy generating technologies of unequal scope

Megawatt (MW): a unit of power. One MW = 1,000 kilowatts = 1,000,000 watts

Metric tons carbon dioxide equivalent (MT CO₂e): a standard unit for measuring carbon footprints and used to express the impact of each different greenhouse gas in terms of the amount of CO₂ that would create the same amount of warming

Microgrid: a small network of electricity users with a local source of energy supply that is usually attached to a centralized national grid but can function independently

National Renewable Energy Lab (NREL): a federal laboratory dedicated to research, development, commercialization, and deployment of renewable energy and energy efficiency technologies.

Net Metering: a billing mechanism that credits solar energy system owners for the electricity they add to the grid through a system in which solar panels are connected to a public utility power grid and surplus power is transferred onto the grid offsetting the customer's cost of power drawn from the utility.

Operations and Maintenance (O&M): a set of technical activities that allow a solar system to perform at its best and function smoothly, maximizing the power system's production

Solar Photovoltaic (PV): photovoltaics is the science behind the process of converting sunlight (photons) into electricity (voltage), which is called the PV effect

Shared solar: a shared solar power plant whose electricity is shared by more than one household and sometimes referred to as a solar garden or community solar

SolarNow: in 2014, FPL received approval from the Florida Public Service Commission to launch a three-year voluntary solar partnership pilot program. The program, now known as FPL SolarNow, provides FPL customers with an easy way to support the development of solar energy systems in local Florida high visibility community spaces, without increasing costs on customers who are unable or choose not to participate. Customer agreed to add \$9 per month, to their electricity bill in order to help bring solar projects into local communities.

Solar thermal energy: a technology for harnessing thermal energy (heat) from the sun to heat water or other fluids

START corridor: an approach to coordinate the installation of future solar, battery, and electric vehicle infrastructure

FPL Tier: one of three levels used for interconnection agreement purposes based on a solar system's alternating current (AC) rating and related system size

Universal solar: used to describe large photovoltaic power plants also known as utility-scale solar

Watt (W): a standard unit of power, in the International System of Units (SI), corresponding to the power in an electric circuit

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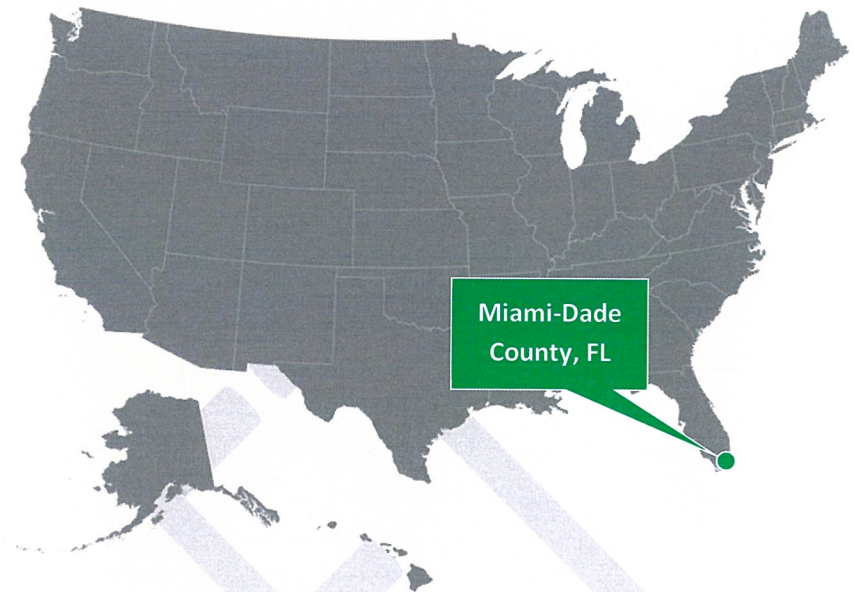
Appendix A. NREL Analysis for Miami-Dade County

Miami-Dade County, Florida: Comparing LCOE for Potential Rooftop Solar Photovoltaic Systems on County Facilities

The U.S. Department of Energy's (DOE's) Community Data Analysis (CDA) project pairs local governments with research staff at the National Renewable Energy Laboratory (NREL) to support localized energy efficiency data analysis and planning.

CDA Question

In Miami-Dade County, Florida, Resolution No. R-303-17 was passed on March 21, 2017, and "directs the Mayor or Mayor's designee to study and evaluate the capacity and feasibility of generating electricity ... using solar technology at County properties. ... The preliminary assessment should include a prioritized list of County properties that are recommended for additional in-depth analysis." To assist County staff in their response to Resolution R-303-17, NREL used light detection and ranging (lidar) data with photovoltaic (PV) productivity modeling to estimate the levelized cost of energy (LCOE) for potential rooftop PV systems on 279 County facilities. The County can combine LCOE rankings with other site-specific data to prioritize sites for more detailed analysis.



Analysis

The analysis generated LCOE rankings by accounting for site-specific differences in: (1) potential PV productivity per unit of roof area, given each roof plane's tilt and orientation; and (2) potential PV system size, because larger systems benefit from economies of scale and tend to have lower system unit costs (\$/W).

This document describes:

- Geographic information system (GIS) methods for processing lidar data and estimating the area and orientation of suitable roof surfaces
- PV productivity modeling methods
- How to interpret results
- Initial considerations for prioritizing facilities.

This analysis focused on rooftop PV system potential. Evaluation of other technologies, such as solar hot water and ground-mounted PV, was beyond the scope of this study.

Lidar Data

The team used a lidar dataset from the U.S. Department of Homeland Security's Homeland Security Infrastructure Program, which included data for Miami-Dade County from 2009. (These data are available to the public through the Geospatial Repository and Data Management [GRiD] System.) The dataset depicted the surface of the city at 1-m by 1-m resolution and included a corresponding shapefile with polygons delineating building footprints.

Matching Addresses to Building Footprints

For each applicable facility, the team geocoded its address and matched the associated point to the nearest building footprint. Most commonly, the address was geocoded directly on top of a building footprint—in these cases, the match is likely to be correct. However, this process also has some limitations and potential sources of error, such as:

- Due to the previously mentioned lidar data constraints, facilities constructed after 2009 were

excluded from this study as lidar data were not available. If any older facilities have had roof modifications since 2009, the changes were not captured in this analysis.

- If a facility consisted of multiple separate structures, the analysis may have only included the structure closest to the geocoded address.

Note that, out of the 543 facility records that were provided to NREL by Miami-Dade County staff, only 279 (51%) could be matched with sufficient data for this analysis. In the remaining cases, either the records were missing address information (144 records) or the facilities were outside the physical boundary of the available lidar coverage (120 facilities).

The results of the matching process used in this analysis is considered approximate. Manual verification of matches was beyond the scope of this analysis but could be considered in the future.

Characterizing Roof Planes

Once addresses had been matched to building footprints, the team determined the orientation of the roof planes and estimated the amount of roof area suitable for hosting a PV system. To do this, the team applied the methodology described in *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment* (Gagnon et al. 2016) and then used GIS tools to process lidar data. For each facility, the team excluded any roof areas that contained visible obstructions or were too close to roof edges or objects. Then, the team filtered the remaining roof area by three criteria: shading, tilt, and azimuth. The portion of the roof area that passed the three filters was labeled the “estimated suitable roof

area.” The estimated suitable area can be multiplied by a “rooftop coverage ratio” to determine the PV module area.

Shading: The team analyzed each square meter of roof area to estimate shading from neighboring trees or buildings. The PV production potential of each candidate square was compared to that of an unshaded square. If a candidate square was estimated to yield less than 80% of the solar energy that would be yielded annually by an unshaded square, the candidate square was excluded from the estimated suitable roof area.

Tilt: Any section of roof that had a tilt greater than 60 degrees from horizontal was excluded from the estimated suitable roof area.

Azimuth: Any roof area facing in a direction between northwest and northeast (within 45° of due north) was excluded from the estimated suitable roof area.

This filtering step resulted in a set of roof planes for each County facility address, with an orientation and an estimated suitable roof area for each roof plane. Note that this filtering only included criteria based on orientation and physical obstructions observable by lidar data. Estimates of available roof area may be improved in subsequent analyses.

Estimating the Levelized Cost of Energy

The team estimated the PV production potential and LCOE for each site using NREL’s System Advisor Model (SAM), a tool freely available to the public at <https://sam.nrel.gov>.

The technical and financial assumptions of the PV system model are listed in Table 1.

The analysis divided roof planes into two categories: tilted and horizontal.

The team modeled all tilted-roof PV arrays as installed flush with the roof with a maximum rooftop coverage ratio of 98%, which leaves only minimal room between modules for racking. The team modeled all horizontal-roof PV arrays as installed at a 15° tilt above horizontal, facing south, with a maximum rooftop coverage ratio of 70% to avoid excessive self-shading.

Within each category, relative LCOE rankings should not be sensitive to the assumptions in Table 1. Absolute estimates of LCOE are more sensitive to these assumptions and can be revisited in later stages of analysis.

To determine a PV system cost for each facility, the team utilized data from Lawrence Berkeley National Laboratory’s annual *Tracking the Sun* report, which summarizes trends in installed prices of grid-connected PV systems in the United States (Barbose et al. 2017). Specifically, the team used the trends in the median \$/W installed price of PV for non-residential systems installed in 2016 (displayed in Figure 1).

The LCOE for each facility was calculated using three different PV sizing methods:

- Method 1: Calculate the LCOE assuming the estimated suitable roof area is filled with PV using the appropriate maximum rooftop coverage ratio from Table 1.
- Method 2: Calculate the LCOE for a PV system that is sized to generate an amount of electricity equal to 100% of the facility’s annual energy consumption, provided that enough roof area is available.
- Method 3: Find the minimum LCOE that is possible without exceeding roof area limitations and without causing generation to exceed 100% of the facility’s annual energy consumption.

Table 1. Summary of the PV system technical and financial assumptions used in this analysis.

Parameter	Value
Module type	“Standard” option from SAM PVWatts model (crystalline silicon)
Module power density	168 W/m ²
System lifetime	25 years
Tilt and azimuth	Flush with roof if roof plane is sloped; 15° above horizontal and facing south if roof plane is horizontal
Maximum rooftop coverage ratio (ratio of module area to estimated suitable roof area)	98% if roof plane is sloped; 70% if roof plane is horizontal
Total system losses	14%
Weather data	TMY3 weather file for Miami International Airport ¹
DC to AC ratio (inverter loading ratio)	1.2
Inverter efficiency	96%
Discount rate (real)	8%
Operations and maintenance costs	\$15/kW-year (Fu et al. 2016)
Inflation	2.5%
Federal and state tax rates	None
Federal investment tax credit (ITC)	Not applied
Depreciation	Not applied
PV Cost	\$4.1/W to \$2.2/W depending on size

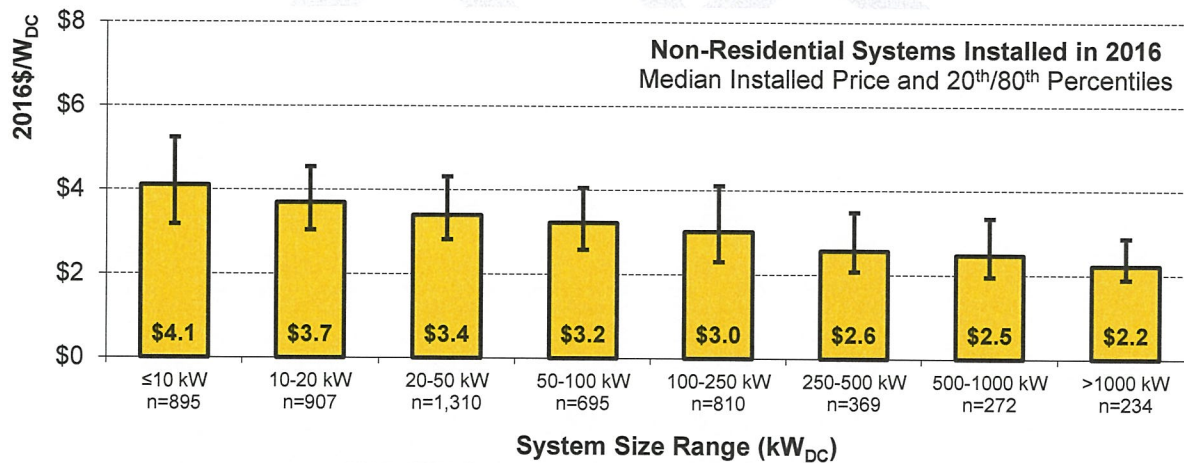


Figure 1. Economies of scale for non-residential PV systems installed in 2016.
(Reproduced with permission from Barbose and Darghouth 2017.)

¹ Typical Meteorological Year 3 (TMY3) weather files are representative solar resource and meteorological data derived from the National Solar Radiation Database (Wilcox and Marion 2008). The files were created by combining data from multiple years to create a single representative year of data.

For the purposes of helping Miami-Dade County staff meet the initial screening requirements of R-303-17, the team recommends using Method 3. Although revenue from utility bill savings was not explicitly calculated in this analysis, the team still recommends constraining the system size to not exceed annual consumption, as any additional generation would not be credited at the full retail rate, per Florida's Net Energy Metering regulations (DSIRE 2017).

Results: Rankings by LCOE

The team provided the County with a spreadsheet of results for all 279 analyzed facilities. Table 2 highlights results for the 20 facilities with the lowest estimated LCOE values, using Method 3 from the previous section. When comparing sites, lower LCOE values are favorable. The County can combine LCOE rankings with other site-specific data to prioritize sites for more detailed analysis.

Note that the LCOE values are higher here than they would be for comparable, privately-owned PV systems. This is due in large part to

the fact that, as a government entity, the County cannot depreciate PV system costs through the modified accelerated cost recovery system (MACRS) or receive an investment tax credit (ITC).² In future analyses, the County could explore alternative ownership structures that might allow these tax benefits to be monetized. However, if the County has any renewable generation goals, it also would need to consider whether such alternatives would allow the County to retain credit for the renewable generation.

Table 2. Highlighted results for the 20 facilities using Method 3 with the lowest estimates for levelized cost of energy (LCOE).

Rank by Lowest LCOE (Method 3)	Annual Energy Consumption (kWh/year)	Estimated Suitable Roof Area (ft ²)	Modeled PV Capacity (kW)	Modeled Annual PV Energy Production (kWh/year)	Estimated LCOE (¢/kWh)
1	4,464,000	264,400	2,096	3,010,412	20.0
2	1,459,042	121,400	1,016	1,459,042	21.6
3	2,327,760	87,700	958	1,375,774	21.7
4	62,512,348	88,700	981	1,406,097	21.7
5	1,349,400	264,400	939	1,349,400	21.7
6	2,812,080	90,900	1,125	1,585,642	21.8
7	8,017,680	72,300	786	1,129,191	22.0
8	5,339,107	67,200	734	1,054,680	22.1
9	3,305,520	59,900	674	964,800	22.3
10	2,529,000	58,400	619	889,107	22.4
11	992,880	54,600	597	857,644	22.4
12	749,760	67,300	522	749,760	22.6
13	1,886,067	42,900	468	672,666	22.7
14	890,640	42,100	454	651,925	22.7
15	916,560	35,100	376	539,554	22.9
16	6,489,600	35,100	376	539,554	22.9
17	3,553,680	32,900	374	530,387	23.2
18	499,426	306,800	348	499,426	23.4
19	7,394,400	41,400	508	703,014	23.4
20	4,351,440	30,700	343	488,609	23.7

² When combined, the ITC and MACRS depreciation schedule have a present-value equal to approximately half the total system cost.

Next Steps

To compare and prioritize sites for more detailed analysis, the County can combine relative LCOE rankings with other site-specific data, which may include one or more of the following:

- Utility costs: Sites with higher electrical energy costs tend to be better candidates for hosting PV systems. Utility cost data might be simplified at the screening stage (e.g., presented in terms of average annual \$/kWh) and then examined in greater detail in subsequent analyses.
- Rooftop age and replacement plans: The timing and scope of roof replacements may impact the feasibility of a PV installation.
- Structural limitations: If structural issues are known at this stage, they can be used to screen candidates. A more detailed structural assessment may be needed at a later stage of analysis.
- Historic building designation: It is possible to install PV on some historic buildings, but the County

may wish to focus first on other buildings in its portfolio.

- Expected changes to adjacent properties: The County may wish to screen out sites where future construction on adjacent properties is expected to block sunlight.

This analysis was restricted to rooftop-mounted systems, but the County may wish to consider ground-mounted systems as well. Although data allowing for comparison between roof and ground-mounted systems is relatively sparse, Barbose and Darghouth (2017) observe a slight premium for ground-mounted systems, potentially due to additional costs associated with trenching and foundation work. Economies of scale for ground-mounted systems are similar to those of roof-mounted systems, suggesting that large parcels of land (24,000+ ft² of suitable area) near buildings with significant energy consumption (360,000+ kWh/year) may be worth investigating.

Ranking potential ground-mounted systems relative to roof-mounted

systems is outside of the scope of this analysis, since their relative financial performance is particularly dependent on ground preparation costs that are not readily assessed from lidar data. Furthermore, the use of County land for hosting a PV system prevents the land from serving another purpose—the opportunity cost of the land use requires judgement from stakeholders within the County—and does not fit well into the economic analysis performed here.

With respect to solar hot water systems, the main reason it was excluded from the study was that, without detailed knowledge of the draw profiles for each building, it is not possible to size an appropriate system for the building. As a next step, the County may wish to examine solar hot water potential if it has the resources to gather the necessary information.

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Appendix B. Service Descriptions for Preventive Maintenance Selections Available in the PV O&M Cost Model Tool

Consult equipment manuals for maintenance activities and intervals as required by manufacturer.

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
General cleaning	General cleaning/veg mobilization	Cleaning	PV Array	Condition or study dependent	Mower/ Trimmer	N/A	Site
Array cleaning	Array cleaning	Cleaning	PV Array	Condition or study dependent	Cleaner	N/A	Acre
Snow cleaning	Snow removal	Cleaning	PV Module	Condition or study dependent	Cleaner	N/A	Acre
Dust cleaning	Dust removal: agricultural /industrial	Cleaning	PV Module	Condition or study dependent	Cleaner	N/A	Acre
Pollen cleaning	Pollen cleaning	Cleaning	PV Module	Condition or study dependent	Cleaner	N/A	Acre
Vegetation management	Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible. Remove any debris from behind collectors and from gutters.	Cleaning	PV Array	As needed	Mower/ Trimmer	N/A	Acres
Bird cleaning	Bird Cleaning	Cleaning	PV Array	Bi-annual	Cleaner	N/A	Acres

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Contractor response	Contractor available by email and phone 24x7x365	Emergency Response	PV Array	Ongoing	Administrator	N/A	System
Corrosion inspection	Inspect electrical boxes for corrosion or intrusion of water or insects. Seal boxes if required.	Inspection	AC Wiring	Annual	Inspector	N/A	Combiner Box
AC disconnect switch inspection	Check position of disconnect switches and breakers.	Inspection	AC Wiring	Annual	Inspector	N/A	Disconnect Box
Protection device inspection	Exercise operation of all protection devices.	Inspection	AC Wiring	Annual	Journeyman Electrician	N/A	
AC disconnect box inspection	AC disconnect box inspection	Inspection	Electrical	Annual	Electrician	N/A	Disconnect Box
Grounding inspection	Test system grounding with "megger"	Inspection	DC Wiring	Annual	Master Electrician	N/A	Strings
Cable inspection	Inspect cabling for signs of cracks, defects, pulling out of connections; overheating, arcing, short or open circuits, and ground faults.	Inspection	DC Wiring	Annual	Inspector	N/A	Strings
DC disconnect switch inspection	Check proper position of DC disconnect switches.	Inspection	DC Wiring	Annual	Inspector	N/A	
Combiner box inspection	Open each combiner box and check that no fuses have blown and that all electrical connections are tight. Check for water incursion and corrosion damage. Use an infrared	Inspection	DC Wiring	Annual	Journeyman Electrician	N/A	Combiner Box

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
	camera for identifying loose connections because they are warmer than good connections when passing current.						
Electrical box inspection	Look for any signs of intrusion by pests such as insects and rodents. Remove any nests from electrical boxes (junction boxes, pull boxes, combiner boxes) or around the array. Use safe sanitation practices because pests may carry disease.	Inspection	DC Wiring	Annual	Pest Control	N/A	
Inverter inspection	Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Compare current readings with diagnostic benchmark. Inspect inverter housing or shelter for physical maintenance required if present.	Inspection	Inverter (Electrical)	Annual	Inspector	N/A	Inverter
Instrument inspection	Spot-check monitoring instruments (e.g., pyranometer) with hand-	Inspection	Monitoring	Annual	Inspector	N/A	

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
	held instruments to ensure that they are operational and within specifications.						
String inspection	Test open-circuit voltage of series strings of modules	Inspection	PV Array	Annual	PV Module/ Array Specialist	N/A	Strings
Corrosion inspection	Check all hardware for signs of corrosion, and remove rust and re-paint if necessary.	Inspection	PV Array (Mechanical)	Annual	Inspector	N/A	Connection
Array inspection	Walk through each row of the PV array and check the PV modules for any damage. Report any damage to rack and damaged modules for warranty replacement. Note location and serial number of questionable modules.	Inspection	PV Array	Annual	Inspector	N/A	Acres
Mounting system inspection	Inspect ballasted, non-penetrating mounting system for abnormal movement	Inspection	PV Array	Annual	Inspector	N/A	Rows
Hot-spot inspection	Use infrared camera to inspect for hot spots; bypass diode failure	Inspection	PV Module	Annual	Inspector	N/A	Strings
Transformer inspection	Inspect transformer, oil and temperature gauges, include housing container, or concrete housing if present	Inspection	Transformer	Annual	Master Electrician	N/A	

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Tracker inspection	Check electrical connection and enclosure for tracking motor/controller	Inspection	Tracker	Annual	Inspector	N/A	Controller
Electrical connection inspection	Check electrical connections	Inspection	Tracker	Annual	Inspector	N/A	Motor
Grounding braids inspection	Check grounding braids for wear	Inspection	Tracker	Annual	Inspector	N/A	Structure
Switchgear inspection	Switchgear inspection	Inspection	Electrical	Annual	Inspector	N/A	Transformer
Anemometer inspection	Anemometer inspection	Inspection	Tracker	Annual	Inspector	N/A	
Driveshaft inspection	Driveshaft torque check and visual inspection	Inspection	Tracker	Annual	Inspector	N/A	Driveshaft
Inclinometer inspection	Inclinometer inspection	Inspection	Tracker	Annual	Inspector	N/A	
Limit switch inspection	Limit switch inspection	Inspection	Tracker	Annual	Inspector	N/A	Block
Module table inspection	Module table inspection	Inspection	Tracker	Annual	Inspector	N/A	Connection
Screw jack inspection	Screw jack inspection	Inspection	Tracker	Bi-annual	Inspector	N/A	Block
Slew gear inspection	Slew gear torque check and wear inspection	Inspection	Tracker	Annual	Inspector	N/A	Slew Gear
Torque inspection	Torque inspection	Inspection	Mechanical	Annual	Inspector	N/A	Block
Tracking controller inspection	Tracking controller inspection	Inspection	Tracker	Annual	Inspector	N/A	
Gear inspection	Universal joint inspection, gears, gear boxes, bearings	Inspection	Tracker	Annual	Inspector	N/A	Driveshaft

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
	as required or documented by manufacturer						
Module torque inspection	PV module torque check and visual inspection	Inspection	Mechanical	5 years	PV Module/Array Specialist	N/A	Rail/Fastener
Racking torque inspection	Racking torque check and inspection	Inspection	Mechanical	5 years	Inspector	N/A	Structure
Galvanization inspection	Galvanization inspection	Inspection	Mechanical	Annual	Inspector	N/A	Connection
Manage operations	daily operations and performance monitoring	Management	Asset Management	Ongoing	Administrator	N/A	
Manage alarms	Monitor alarms and site-specific alert parameters	Management	Asset Management	As needed	Administrator	N/A	
Manage inventory	Manage inventory of spare parts	Management	Asset Management	As needed	Administrator	Monitoring	
Manage service package	Monitoring annual service package	Management	Asset Management	Ongoing	Administrator	Monitoring	System
Manage O&M services	Document all O&M services in a workbook available to all service personnel	Management	Documents	Ongoing	Administrator	N/A	
Manage documentation	Confirm availability and take any measures to secure operating instructions, warranties and performance guarantees, and other project documentation.	Management	Documents	Annual	Administrator	N/A	
Manage O&M agreements	Review O&M agreements and ensure that services are actually provided	Management	Documents	As needed	Administrator	N/A	

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Manage preventive services	Update record with preventive maintenance services and track any problems or warranty issues and secure the record on site.	Management	Documents	Ongoing	Administrator	N/A	
Meet with site staff	Meet with key site staff to continue awareness, question any issues, and report on findings.	Management	Documents	Annual	Administrator	N/A	
Maintain log	Maintain a log of cumulative power delivery (kWh to date) and chart this value against date. Chart the value even for uneven or infrequent intervals. Explain variation by season or weather.	Management	Meter	Monthly	Administrator	N/A	
Mobilize electrical labor	Electrical labor mobilization	Management	Electrical	Annual	Master Electrician	EPC	Site
Mobilize mechanical labor	Mechanical labor mobilization	Management	Mechanical	Annual	Mechanic	EPC	Site
Check central SCADA	Check central SCADA/network manager, include software IT and IT hardware updates as required	Management	Electrical	Annual	Network/ IT	N/A	NCU
Re-torque AC connection	Re-torque all electrical connections on AC side of system.	Service	AC Wiring	Annual	Journeyman Electrician	N/A	

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Re-torque combiner box connections	Re-torque all electrical connections in combiner box	Service	DC Wiring	Annual	Electrician	N/A	Combiner Box
Replace weather sensors	Calibrate or replace weather sensors and meters	Service	Electrical	As per manuf.	Network/ IT	N/A	Weather Station
Replace transient voltage surge suppression device	Replace transient voltage surge suppression devices	Service	Inverter	As per manuf.	Master Electrician	Inverter	
Install software upgrades	Install any recent software upgrades to inverter programming or data acquisition and monitoring systems	Service	Electrical	As upgrades become available, max 5 years	Inverter Specialist	EPC	NCU
Dust cleaning from heat rejection fins	Clean (vacuum) dust from heat rejection fins	Service	Inverter	Annual	Cleaner	N/A	Inverter
Replace air filters	Replace any air filters on air-cooled equipment such as inverter.	Service	Inverter	As needed	Inverter Specialist	N/A	Inverter
Remove bird nest	Remove bird nests from array and rack area.	Service	PV Array	Annual	Pest Control	N/A	Acres
Tracker lubrication	Lubricate tracker mounting bearings/ gimbals as required by manufacturer	Service	Tracker	Annual	Mechanic	N/A	
Gearbox lubrication	Lubricate gearbox as required by manufacturer	Service	Tracker	Bi-annual	Mechanic	N/A	Block
Screw jack greasing	Screw jack greasing as required by manufacturer	Service	Tracker	Bi-annual	Mechanic	N/A	Block

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Slew gear lubrication	Slew gear lubrication as required by manufacturer	Service	Tracker	3 years	Mechanic	N/A	Slew Gear
Universal joint greasing	Universal joint greasing (zerk fitting) as required by manufacturer	Service	Tracker	Bi-annual	Mechanic	N/A	Driveshaft
Performance testing	Perform performance test: measure incident sunlight and simultaneously observe temperature and energy output. Calculate PV module efficiency as a function of temperature and calculate the balance-of-system efficiency. Compare readings with diagnostic benchmark (original efficiency of system).	Testing	Inverter	Annual	Inspector	N/A	
Overvoltage surge suppressor testing	Test overvoltage surge suppressors in inverter	Testing	Inverter	5 Years	Inverter Specialist	Inverter	Inverter
Module output testing	Test output of modules that exhibit cracked glass, bubble formation oxidation of busbars, discoloration of busbars, or PV module hot spots (bypass diode failure)	Testing	PV Module	5 years	Journeyman Electrician	N/A	Modules
Module testing	Test modules showing corrosion of ribbons to junction box	Testing	PV Module	5 years	Journeyman Electrician	N/A	Modules

Service Name	Service Description	Service Category	O&M Category	Interval	Service Provider	Warranty Type	Applicable Unit
Combiner box inspection	DC circuit test and combiner-box inspection	Testing	Electrical	Annual	PV Module/ Array Specialist	N/A	Combiner Box
Module electrical connection testing	PV module electrical connection check	Testing	Electrical	5 years	PV Module/ Array Specialist	N/A	PV Module
Grounding hardware testing	Check grounding hardware	Testing	Electrical	Annual	Master Electrician	N/A	Structure

Appendix C. Total Solar Photovoltaic Production (kWh) with Suitable Roof Area Filled on Two Hundred Thirty Nine County Buildings

Facility Attributes						Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	Total Suitable Roof Area (m^2)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
1	1751 N. Cruise Blvd	Seaport	1751 N. Cruise Blvd	4,464,000	24,562	3,082	4,385,766	0.202
2	FOOD SVC BUREAU	Corrections	3595 NW 72 AVENUE	1,459,042	11,276	1,330	1,906,822	0.211
3	Elections Headquarters	ISD	2700 NW 87 Avenue	2,327,760	8,152	962	1,381,209	0.217
4	Preston & Hialeah WTPs	WASD	1100 W 2nd Ave	62,512,348	8,240	1,024	1,460,642	0.218
5	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	1,349,400	24,562	3,082	4,385,766	0.202
6	1265 N. Cruise Blvd	Seaport	1265 N. Cruise Blvd	2,812,080	8,444	1,129	1,590,607	0.219
7	Police Headquarters	Police	9101 NW 25th Street	8,017,680	6,718	797	1,142,978	0.220
8	Headquarters	Fire	9300 NW 41 Street	5,339,107	6,244	734	1,054,680	0.221
9	1435 N. Cruise Blvd.	Seaport	1435 N. Cruise Blvd.	3,305,520	5,564	674	964,800	0.223
10	Animal Services Building	Animal Services	3651 NW 79 Street	2,529,000	5,430	646	924,461	0.224
11	North Dade Regional Library	Library	2455 NW 183RD ST.	992,880	5,077	597	857,644	0.224
12	ISD Trade Shops	ISD	3501 NW 46TH ST	749,760	6,249	735	1,055,457	0.221
13	Graham Building - State Attorney	ISD	1350 NW 12 Avenue	1,886,067	3,989	471	676,107	0.227
14	Fleet Shop South	Fire	6000 SW 87th Avenue	890,640	3,913	463	662,743	0.228
15	Public Defenders	ISD	1320 NW 14 Street	916,560	3,257	388	555,152	0.230
16	Pre-Trial Det. Ctr.	Corrections	1321 NW# 13 St.	6,489,600	3,257	388	555,152	0.230
17	Medical Examiner Main Building	ISD	1851 NW 10th AVE	3,553,680	3,061	374	530,387	0.232
18	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th ave	499,426	28,505	3,398	4,867,578	0.200
19	Data Processing Center	ISD	5680 SW 87th Ave	7,394,400	3,848	509	705,153	0.235
20	Overtown Transit Village South	ISD	702 NW 1 Ct.	4,351,440	2,849	343	488,609	0.237
21	Overtown Transit Village North	ISD	701 NW 1 Ct.	4,053,600	2,849	343	488,609	0.237
22	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	470,760	5,046	622	886,758	0.225
23	Richard E. Gerstein Criminal Jus	ISD	1351 NW 12th Street	7,235,200	2,663	322	460,302	0.240
24	LeJeune Building	WASD	3575 SW 42ND AVE	2,033,520	2,636	313	448,519	0.242
25	Caleb Center	ISD	5400 NW 22ND AVE	3,179,765	2,573	310	441,948	0.243
26	West Dade Regional Library	Library	9445 SW CORAL WAY	982,080	2,511	296	424,534	0.244
27	Youth and Family	CAHS	1701 N.W. 30TH AVENUE	874,125	2,477	294	421,728	0.245
28	514 Australia Way	Seaport	514 Australia Way	408,360	3,364	396	568,218	0.229
29	Doral Police Department Bomb Squad	Police	1505 NW 79TH Ave	655,477	2,419	286	409,772	0.246
30	Downtown Government Center	ISD	111 NW 1st Street	30,606,341	2,280	289	410,649	0.248
31	Douglas Building	WASD	3071 SW 38TH AVE	4,617,840	2,268	267	383,084	0.250
32	ISD Fleet Shop 1	ISD	2690 NW 7 AVE	381,951	2,257	268	384,364	0.250
33	Frankie S. Rolle Center	CAHS	3750 S. Dixie Hwy	478,320	2,151	260	372,738	0.251
34	North Dade Justice Center	ISD	15555 Biscayne Boulevard	951,840	2,011	243	347,310	0.255
35	Coral Gables Library	Library	3443 SEGOVIA STREET	578,400	2,005	237	339,133	0.256
36	Central Transfer Station	Solid Waste	1150 NW 20th Street	648,840	1,977	233	333,960	0.256
37	Miami-Dade County Auditorium	CUA	2901 W Flagler ST	906,894	1,883	226	323,609	0.258
38	TGK CORRECTIONAL	Corrections	7000 NW 41 STREET	8,690,800	1,904	225	322,308	0.258
39	1050 Caribbean Way	Seaport	1050 Caribbean Way	4,672,320	1,901	228	325,414	0.258
40	1080 Caribbean Way	Seaport	1080 Caribbean Way	5,268,480	1,767	209	299,595	0.260
41	Colonel H Zubkoff Head Start	CAHS	55 N.W. 199 STREET	460,920	1,740	211	301,738	0.261
42	Alexander Orr WTP	WASD	6800 SW 87TH AVE	41,274,800	1,753	221	311,295	0.263
43	Miami Beach Regional Library	Library	227 22nd Street	2,029,440	1,615	190	272,782	0.264
44	SWM Engineering & Environmental Division	Solid Waste	6990 NW 97th Ave	266,114	28,505	3,398	4,867,578	0.200
45	Hickman Garage # 5	ISD	270 NW 2ND STREET	258,000	2,637	322	458,101	0.242
46	CDWWTP	WASD	3 VIRGINIA KEY	33,280,800	1,495	176	252,558	0.267
47	TTC Correction Facility/Jail	Corrections	6950 NW 41st ST	2,416,976	1,482	174	250,328	0.267
48	C&R WAREHOUSE	Corrections	7845/7855 NW 148 STREET	249,120	4,559	536	770,095	0.225
49	ETSD Radio Shop	ISD	6100 SW 87 Ave.	854,880	1,618	199	279,598	0.268
50	ISD Fleet Shop 2	ISD	6100 SW 87 AVENUE	700,469	1,618	199	279,598	0.268
51	Hialeah Courthouse	ISD	11 East 6th Street	723,240	1,421	168	240,436	0.268
52	1122 Caribbean Way	Seaport	1122 Caribbean Way	225,900	5,033	598	857,905	0.224
53	African Heritage Center	CUA	2166 NW 62ND ST	373,920	1,355	161	229,941	0.271
54	1040 Caribbean Way	Seaport	1040 Port Blvd.	427,620	1,322	157	225,368	0.270
55	Miami Gardens N Sr. Center	CAHS	16405 NW 25 Ave	978,360	1,316	161	230,485	0.270
56	Coral Gables Courthouse	ISD	3100 Ponce de Leon	467,760	1,355	164	233,387	0.272
57	Hickman Building	ISD	275 NW 2nd Street	1,030,920	1,187	140	201,266	0.273
58	Professional Compliance Bureau	Police	18805 NW 27th ave	753,730	1,191	143	204,430	0.273
59	Kendall Library	Library	9101 SW 97TH AVENUE	252,600	1,134	134	192,297	0.274
60	Goulds Poolhouse (BUILDING)	PROS	21840 SW 114 AVE # POOL	184,020	22,979	2,733	3,919,088	0.200
61	Fleet Shop North	Fire	8141 NW 80 Street	236,400	1,063	128	183,716	0.275
62	South Miami Library	Library	6000 SUNSET DRIVE	376,860	1,000	122	173,699	0.278
63	HAZMAT Warehouse	Fire	8010 NW 60th Street	153,252	4,435	535	760,217	0.228
64	Tropical Park (SITE)	PROS	7900 SW 40TH ST	728,538	859	101	145,108	0.279
65	ISD Fleet Shop 3A	ISD	18701 NE 6th Avenue	155,173	859	101	145,073	0.279
66	Northeast Transfer Station	Solid Waste	18701 NE 6th Avenue	411,936	859	101	145,073	0.279
67	Metro Annex	ISD	850 NW 23 ST	152,320	861	114	162,799	0.278
68	Station 63 Highland Oaks	Fire	1655 NE 205TH Street	150,141	865	107	151,626	0.281
69	Hispanic Library	Library	1398 SW 1st Street	224,687	811	97	138,549	0.281
70	WDC Correction Facility/Jail	Corrections	1401 NW 7 Ave	1,272,240	816	100	142,369	0.281
71	Amelia Earhart Maintenance Building (BUILDING)	PROS	201 W 74 PL	136,464	789	93	133,198	0.281
72	African Heritage Trailers	CUA	6161 NW 22nd AVE # 2	130,320	1,217	147	209,566	0.273
73	LET Family Courthouse Center	ISD	175 NW 1 AVE	3,690,720	751	89	127,129	0.282
74	Northwest District Station	Police	5975 Miami Lakes Dr East	511,200	725	85	122,488	0.282
75	Kendall District Station	Police	7707 SW 117TH AVE	764,332	682	82	117,247	0.284
76	Intracoastal District Station	Police	15665 Biscayne Blvd	577,920	682	82	116,912	0.283
77	Public Safety Training Institute	Police	9601 NW 58th Street	1,333,812	624	77	110,980	0.284
78	Opa-locka Library	Library	780 FISHERMAN STREET	108,577	1,359	160	229,576	0.269

Appendix C. Total Solar Photovoltaic Production (kWh) with Suitable Roof Area Filled on Two Hundred Thirty Nine County Buildings

Facility Attributes						Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	Total Suitable Roof Area (m ²)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
79	Virrick Park Library	Library	3255 PLAZA STREET	100,746	1,057	128	181,968	0.277
80	Coordinated Victims Assistance C	ISD	2400 S. Dixie Hwy	200,040	589	69	99,531	0.286
81	California Club Library	Library	850 IVES DAIRY ROAD	98,854	19,843	2,359	3,383,520	0.200
82	Station 22 Interama	Fire	15655 Biscayne Blvd	93,540	682	82	116,912	0.283
83	Martin Luther King Memorial Park (SITE)	PROS	6160 NW 32ND CT	153,173	654	94	130,370	0.290
84	South Shore Library	Library	131 Alton Road	90,687	705	90	125,951	0.288
85	Station 48 Fontainebleau	Fire	8825 NW 18TH TERR	176,785	539	65	93,395	0.288
86	Crandon Golf Course (BUILDING)	PROS	6700 Crandon Blvd	849,200	1,212	199	260,276	0.289
87	Miami Lakes Library	Library	6699 WINDMILL GATE RD	174,395	821	125	169,400	0.291
88	Palm Springs North Library	Library	17601 NW 78 AVE	86,224	2,460	289	415,473	0.245
89	North Central Branch Library	Library	9590 NW 27TH AVE.	85,759	1,781	214	305,385	0.261
90	Station 32 Uleta	Fire	358 NE 168th Street	139,088	513	64	91,243	0.290
91	Little River Library	Library	160 N.E. 79TH STREET	125,209	499	61	86,680	0.290
92	Station 54 Bunche Park	Fire	15250 NW 27 Avenue	133,145	480	58	83,685	0.290
93	Station 26 Opa-Locka	Fire	3190 NW 119th Street	108,996	541	67	93,828	0.293
94	ISD Shop 3 Auto	ISD	8801 NW 58th Street	424,321	476	56	80,452	0.291
95	Fairlawn Library	Library	6376 SW 8TH STREET	95,187	473	56	79,821	0.291
96	Station 39 Port of Miami	Fire	641 Europe Way	143,447	471	55	79,589	0.291
97	Country Club of Miami (SITE)	PROS	6801 NW 186 st	937,916	955	154	205,694	0.291
98	Station 07 West Little River	Fire	9350 NW 22 Avenue	131,569	479	73	101,704	0.294
99	Golden Glades Library	Library	100 NE 166 STREET	333,293	547	77	106,772	0.292
100	Station 21 Haulover	Fire	10500 Collins Avenue	155,640	532	66	93,190	0.293
101	Station 20 No Miami East	Fire	13000 NE 16th Avenue	133,871	443	55	79,304	0.292
102	Marva Y. Bannerman Park (SITE)	PROS	4830 NW 24TH AVE	161,059	442	52	74,718	0.292
103	International Mall Library	Library	10315 NW 12th Street	308,259	506	67	93,911	0.293
104	Shelter 1	Animal Services	7401 NW 74 Street	572,880	332	54	77,008	0.293
105	Station 19 No Miami West	Fire	650 NW 131st Street	108,637	527	67	93,544	0.293
106	Station 47 Westchester	Fire	9361 SW 24TH Street	115,027	423	52	73,890	0.293
107	Station 29 Sweetwater	Fire	351 SW 107TH Avenue	117,900	412	50	71,346	0.293
108	Lemon City Library	Library	430 N.E. 61ST STREET	137,268	416	49	70,267	0.294
109	Station 14 South Miami	Fire	5860 SW 70TH Street	150,586	451	61	84,799	0.298
110	Station 10 Sunny Isles	Fire	17775 North Bay Rd.	155,520	473	76	104,933	0.294
111	Station 45 Doral	Fire	9710 NW 58TH Street	104,216	481	60	84,127	0.296
112	Station 11 Miami Gardens	Fire	18705 NW 27th Avenue	115,254	455	58	80,186	0.300
113	Northeast Dade/ Aventura Library (Northeast Regional)	Library	2930 AVENTURA BLVD.	544,560	492	62	86,839	0.296
114	Station 08 Aventura	Fire	2900 Aventura Blvd.	138,180	492	62	86,839	0.296
115	Kendall Complex	CAHS	11025 SW 84th Street	224,124	700	101	137,890	0.294
116	West Transfer Station	Solid Waste	2900 SW 72 Avenue	409,680	1,063	168	219,998	0.294
117	Station 46 Medley	Fire	10200 NW 116 Way	114,506	358	48	68,316	0.294
118	Fire Station 01 Miami Lakes	Fire	16699 NW 67th Avenue	113,820	373	47	67,229	0.294
119	Sunset Library	Library	10855 SW 72ND ST	66,594	7,191	850	1,218,461	0.219
120	Fire Station 02 Model Cities	Fire	6460 NW 27 Avenue	189,600	401	49	69,313	0.295
121	Headstart Center	CAHS	6121 SW 68th ST	65,560	1,024	126	176,701	0.281
122	Allapattah Library	Library	1799 N.W. 35TH STREET	97,927	372	45	64,901	0.295
123	Doral Library	Library	10785 NW 58 STREET	63,416	6,300	765	1,087,720	0.223
124	27th Avenue Teen Center (SITE)	PROS	6940 NW 27TH AVE	61,500	698	93	127,308	0.294
125	Station 76 Bay Harbor	Fire	9665 Bay Harbor Terr	138,571	348	42	60,173	0.296
126	USAR (Training Site 37)	Fire	7900 SW 107 Avenue	65,932	350	41	59,092	0.296
127	Station 23 Suniland/Pinecrest	Fire	7825 SW 104TH Street	112,320	415	52	72,854	0.299
128	Station 33 Aventura South	Fire	2601 Point East Drive	58,397	559	66	94,782	0.288
129	Key Biscayne Library	Library	299 CRANDON BLVD	147,238	337	40	56,999	0.297
130	Concord Library	Library	3882 SW 112 AVENUE	53,587	1,740	207	296,386	0.262
131	Corrections and Rehabilitation	Corrections	1321 NW 13 Street	53,520	3,257	388	555,152	0.230
132	NDDC Correction Facility/Jail	Corrections	15801 State Road 9	50,150	689	84	119,454	0.285
133	2580 Port Blvd.	Seaport	2580 Port Blvd.	2,549,130	281	33	47,516	0.301
134	2575 Port Blvd	Seaport	2575 Port Blvd	566,400	281	33	47,516	0.301
135	Station 03 Tropical Park	Fire	3911 SW 82 Avenue	120,499	274	33	47,585	0.301
136	Woman's Park (SITE)	PROS	10251 W FLAGLER ST # PRK	107,361	340	56	77,634	0.301
137	Country Village Park (SITE)	PROS	6550 NW 188 Ter	191,008	381	63	85,889	0.302
138	Station 17 Virginia Gardens	Fire	7050 NW 36 Street	97,020	273	33	46,893	0.302
139	Sunset Kendall TRC	Solid Waste	8000 SW 107th Ave	231,377	443	62	83,048	0.310
140	Gwen Cherry Park (SITE)	PROS	2591 NW 71st St	50,655	270	32	45,620	0.303
141	West Flagler Library	Library	5050 WEST FLAGLER STREET	120,698	430	60	81,492	0.305
142	Edison Library	Library	531 N.W. 62ND STREET	136,842	251	30	42,417	0.306
143	West Dade Adult Day Care	CAHS	6950 N. Waterway Dr.	73,441	256	42	58,536	0.306
144	Southern Estates Park (SITE)	PROS	12199 SW 34TH ST	39,493	823	114	157,476	0.288
145	North Shore Library	Library	7501 COLLINS AVE.	102,502	250	30	42,967	0.310
146	Station 44 Palm Springs North	Fire	7700 NW 186 Street	136,519	418	58	78,092	0.311
147	Ives Estates Park (SITE)	PROS	20901 NE 16TH AVE	269,898	304	50	67,465	0.312
148	1180 S. America Way	Seaport	1180 S. America Way	45,992	211	25	35,645	0.311
149	Equestrian Center (BUILDING)	PROS	7900 Bird Rd # Equestrian	316,076	477	79	102,579	0.312
150	Cultural Center	ISD	101 W Flagler St.	34,524	7,622	1,048	1,452,021	0.224
151	Shenandoah Library	Library	2111 S.W. 19TH STREET	228,752	252	40	54,063	0.315
152	Station 31 No Miami Beach	Fire	17050 NE 19TH Avenue	33,802	1,035	122	174,843	0.276
153	No. Dade Adult Day Care Center	CAHS	60 NE 166 ST	68,391	260	41	55,126	0.314
154	Miami Springs Library	Library	401 WESTWARD DRIVE	102,603	192	23	32,490	0.314
155	Haitian American Senior Center	CAHS	5080 Biscayne Boulevard	30,430	1,879	226	322,916	0.259
156	Station 28 Hialeah Gardens	Fire	8790 NW 103rd Street	127,646	189	23	33,059	0.317

Appendix C. Total Solar Photovoltaic Production (kWh) with Suitable Roof Area Filled on Two Hundred Thirty Nine County Buildings

Facility Attributes						Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	Total Suitable Roof Area (m^2)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
157	Allapatah Center	CAHS	1897 NW 20 ST	29,832	1,168	139	198,985	0.275
158	Amelia Earhart Farm (BUILDING)	PROS	4401 NW 119 ST	151,158	125	21	29,479	0.317
159	Records Center	ISD	9350 NW 12 Street	612,413	247	35	47,447	0.317
160	Station 09 Kendall	Fire	7777 SW 117 Avenue	135,960	329	54	70,991	0.317
161	Coral Estates Park (SITE)	PROS	1405 SW 97 Ave	28,576	198	23	33,384	0.313
162	Hialeah Gardens Library	Library	11300 NW 87 COURT	28,266	4,525	546	779,502	0.227
163	Station 15 Key Biscayne	Fire	2 Crandon Blvd	73,689	191	32	43,138	0.318
164	North County (HS)	CAHS	3201 NW 207 ST	31,721	176	21	29,942	0.321
165	Coconut Grove Library	Library	2875 McFARLENE ROAD	152,266	226	36	48,601	0.319
166	Culmer Community Center	CAHS	1600 NW 3 Ave	715,440	158	19	26,732	0.319
167	Station 40 West Miami	Fire	975 SW 62 Avenue	169,744	203	26	36,703	0.319
168	Arcola Lakes Park (SITE)	PROS	1301 NW 83RD ST	931,587	337	55	72,515	0.320
169	Kendall Indian Hammocks Park (SITE)	PROS	11395 SW 79TH ST	319,465	169	21	29,047	0.327
170	Station 67 Arcola	Fire	1275 NE 79 Street, Pelican Harbor	78,072	146	17	24,629	0.321
171	Station 69 Doral North	Fire	11151 NW 74 Street	189,600	367	60	78,206	0.321
172	Community Action and Human Services	CAHS	395 N.W. 1ST STREET	23,376	1,161	137	196,177	0.273
173	Brothers to the Rescue Memorial Park (SITE)	PROS	7250 SW 24TH ST	103,370	150	18	25,659	0.329
174	Fac Mgmt Trailers	Corrections	3595 NW 72 Ave	52,157	171	24	33,322	0.324
175	Station 38 Norland	Fire	575 NW 199th Street	102,240	168	28	37,049	0.330
176	South Dade Government Campus	ISD	3300 NW 27th Avenue	21,120	4,868	576	825,920	0.225
177	Indian Hammocks Field House (BUILDING)	PROS	8000 SW 107TH AVE	51,393	135	22	31,017	0.325
178	Tamiami Rec Center (BUILDING)	PROS	11201 SW 24TH ST	74,220	305	45	58,995	0.326
179	Tamiami Park (SITE)	PROS	11201 SW 24th ST	1,206,991	305	45	58,995	0.326
180	Lift Station Only	Corrections	7000 NW 36 Street	20,612	830	98	140,125	0.280
181	Station 30 Miami Shores/El Portal	Fire	9500 NE 2ND Avenue	117,892	254	42	54,610	0.325
182	New Directions Residential Treatment Program	CAHS	3140 NW 76 ST	59,495	143	21	29,175	0.331
183	Partners Park (SITE)	PROS	5536 NW 21st ave	18,697	3,367	399	572,419	0.229
184	Ojus Park (SITE)	PROS	18995 W Dixie Hwy	57,479	198	28	37,291	0.329
185	Vehicle Impound Lot	Police	9111 NW 25th Street	17,445	4,708	559	798,821	0.226
186	Continental Park (SITE)	PROS	10000 SW 82ND AVE	125,749	108	18	24,840	0.330
187	Station 64 Miami Lakes West	Fire	8205 Commerce Way	160,320	101	12	17,060	0.331
188	Jefferson Reaves Sr Park (SITE)	PROS	3100 NW 50TH ST	52,492	153	24	32,978	0.331
189	Snapper Creek TRC	Solid Waste	2200 SW 117th Ave.	15,649	516	72	96,714	0.306
190	Amelia Earhart Sm Maint Bldg	PROS	191 W 74 PL	17,346	91	11	15,371	0.334
191	Amelia Earhart Park (SITE)	PROS	401 E 65 Street	27,584	62	10	14,659	0.336
192	Tropical Park Police Memorial	Police	1030 NW 111th Avenue	14,353	1,641	270	374,870	0.258
193	Tropical Estates Park (SITE)	PROS	10201 SW 48TH ST	100,190	108	18	24,261	0.336
194	Lillian M. Williams	CAHS	770 NW 83rd Street	263,888	76	9	12,893	0.337
195	Rockway Park (SITE)	PROS	9460 SW 27TH DR	127,080	170	28	36,365	0.339
196	1630 Bahama Drive	Seaport	1630 Bahama Drive	547,560	151	24	31,755	0.339
197	Westwood Park (SITE)	PROS	11350 SW 53RD TER	61,385	68	8	11,484	0.340
198	1790 Port Blvd.	Seaport	1790 Port Blvd.	432,360	147	23	30,684	0.343
199	Golden Glades TRC	Solid Waste	140 NW 160th Street	13,940	93	14	18,485	0.356
200	Arcola Lakes Library	Library	8240 NW 7TH AVE	473,142	48	6	8,040	0.345
201	Fleet Management	ISD	6100 SW 87 AVE	7,653	1,618	199	279,598	0.268
202	Blue Lakes Park (SITE)	PROS	4225 SW 92ND AVE	35,698	136	22	29,223	0.347
203	Olinda Park (SITE)	PROS	2101 NW 51ST ST	97,665	36	6	8,510	0.348
204	Little River Park (SITE)	PROS	10525 NW 24Th Ave	34,466	36	4	6,035	0.348
205	Palm Springs North TRC	Solid Waste	7870 NW 178th Street	19,122	26	4	6,170	0.349
206	Crandon Beach (BUILDING)	PROS	4000 Crandon Blvd	149,672	85	14	18,690	0.350
207	Norman & Jean Reach Park (SITE)	PROS	7895 NW 176TH ST	11,445	160	26	34,972	0.335
208	North Glade Park (SITE)	PROS	17355 NW 52ND AVE	4,850	168	20	28,353	0.318
209	MILITARY TRAIL PARK (SITE)	PROS	825 NE 89TH ST	4,768	81	12	16,211	0.340
210	Miller Drive Park (SITE)	PROS	5510 SW 94 CT	77,611	50	7	9,732	0.368
211	Soar Park (SITE)	PROS	120 NW 83RD ST	2,112	205	25	35,446	0.312
212	Palm Springs North Pool (SITE)	PROS	7901 NW 176th ST	242,486	38	6	7,826	0.396
213	Gladeview Park (SITE)	PROS	6815 NW 31ST AVE	2,022	841	116	159,626	0.288
214	Melrose Park (SITE)	PROS	3050 NW 35TH ST	2,016	1,517	232	315,913	0.270
215	Rocky Creek Park (SITE)	PROS	3305 NW 48TH TER	1,879	73	10	14,111	0.354
216	Highland Oaks Park (SITE)	PROS	20300 NE 24TH AVE	26,449	68	11	13,855	0.371
217	West Little River Park (SITE)	PROS	2450 NW 84TH ST	1,472	607	71	102,516	0.285
218	New Opportunity Transitional Living	CAHS	777 NW 30 ST	1,074	231	27	39,049	0.308
219	Bill Bird Marina (SITE)	PROS	10800 Collins Ave	266	177	28	37,697	0.332
220	Arch Creek Park (SITE)	PROS	1855 NE 135TH ST	14,838	11	2	2,515	0.363
221	Amelia Earhart Office (BUILDING)	PROS	4701 NW 119TH ST	95,733	164	27	32,439	0.370
222	Country Lake Park (SITE)	PROS	19525 NW 87TH AVE	46,315	98	16	20,092	0.371
223	Downtown Motor Pool Building	ISD	201 NW 1st Street	67,625	60	10	12,650	0.379
224	Spanish Lake (SITE)	PROS	19345 NW 82ND AVE	68	87	14	17,708	0.377
225	Station 51 Honey Hill	Fire	4775 NW 199 Street	160,018	19	3	4,009	0.400
226	West Little River TRC	Solid Waste	1830 NW 79th Street	29,378	26	4	5,251	0.407
227	Safe Space North	CAHS	7831 NE MIAMI CT	424,920	27	4	5,365	0.417
228	AD Barnes Park (SITE)	PROS	3401 SW 72ND AVE	587,961	14	2	2,819	0.423
229	Pelican Harbor Dockmaster Building	PROS	1275 NE 79TH ST	86,413	27	5	5,245	0.429
230	Pelican Harbor Marina (SITE)	PROS	1275 NE 79th ST	652,681	27	5	5,245	0.429
231	Station 59 MIA Northside	Fire	5680 NW 36 Street	no meter data	1,514	186	262,929	0.269
232	Station 27 North Bay Village	Fire	7903 East Drive	no meter data	582	72	101,905	0.287
233	Station 35 Miami Springs	Fire	201 Westward Drive	no meter data	770	91	130,053	0.281
234	Cultural Center	cultural_center	101 W. Flagler Street 33128	7,010,800	7,622	1,048	1,452,021	0.224

Appendix C. Total Solar Photovoltaic Production (kWh) with Suitable Roof Area Filled on Two Hundred Thirty Nine County Buildings

Facility Attributes						Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	Total Suitable Roof Area (m^2)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
	West Dade Permit & Inspection Building	ISD	11805 SW 26 Street	1,992,120	36,552	4,337	6,217,666	0.200
235	Station 25 Opa-Locka Airport	Fire	4600 NW 148TH ST, BLDG 107	no meter data	3,957	466	669,119	0.227
236	Station 42 Fisher Island	Fire	65 Fisher Island Drive	no meter data	219	31	43,059	0.317
237	Station 13 East Kendall	Fire	6000 SW 87th Avenue	no meter data	3,913	463	662,743	0.228
238		Animal Services	1320 NW 62ND ST	no meter data	176	21	29,799	0.317
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Appendix D. Potential WASD Sites for Solar Photovoltaics

Water Treatment Plants and Wellfields

LOCATION NAME	AREA (acres)	50% of total Area	LOCATION	Address	Description
Preston WTP Reservoir	2.04	1.02	Roof	1100 W 2nd Ave	W 3rd ave and W 9 st, SW corner, grey area
Preston WTP Reservoir	0.20	0.10	Parking Lot	1100 W 2nd Ave	Located E, near W 2nd St.
Hialeah WTP Reservoir	0.82	0.41	Roof	700 W 2nd Ave	Okeechobee road and W 2nd ave (SW corner)
Hialeah WTP Reservoir	0.30	0.15	Parking Lot	700 W 2nd Ave	Located E, near W 2nd St.
Alexander Orr WTP Reservoir 1	3.56	1.78	Roof	6800 SW 87 Ave	Next to parking lots, south of SW 64 ST
Alexander Orr WTP Reservoir 2	7.77	3.89	Roof	6800 SW 87 Ave	South of SW 64 St
Alexander Orr WTP	0.50	0.25	Parking Lot	6800 SW 87 Ave	SE corner, next to SW 87th Ave
Snapper Creek Wells	1.17	0.59	Land	7888 SW 102 Pl	Open field, north of SW 76 st and tennis courts, reaching creek
West Wellfield	7.77	3.89	Land	7200 SW 172nd Ave	Open field, long green area between SW 72nd St and SW 172nd Ave
SouthWest Wellfield 1	15.7	7.85	Land	8601 SW 127 Ave	Rectangular area between SW 123rd Ave and SW 122 Ave, SW 78th St cuts across, two lots 123, two lots
Southwest Wellfield 2	20.1	10.05	Land	8601 SW 127 Ave	East to SW 123rd Ave, corner lots shaped like a triangle
Northwest Wellfield	1,617.3	808.65	Land	13700 NW 58 ST	Big lot next to the 6 wells
TOTAL	1,677	838.62			

Wastewater Treatment Plants

LOCATION NAME	AREA (acres)	50% of total Area	LOCATION	Address	Description
SDWWTP	15.33	7.67	Ponds	8950 SW 232nd Ave	Pond 10 (10 acres) - best location 97 Ave as it has some FPL lines. However, no processes are near Pond 10. The other pond identified is the one located in the SE corner, near processes (5 acres)
SDWWTP	1.41	0.71	parking space	8950 SW 232nd Ave	Parking space surrounding admin between SW 88th Ave and SW 89th Ave. Solar energy can power maintenance and admin building as they are nearby
SDWWTP	1.0	0.52	Roof	8950 SW 232nd Ave	The roof of the maintenance building (0.7 acres) and admin building (0.2 acres)
CDWWTP	1.37	0.69	Roof	3989 Rickenbacker Cswy, Sewage Plant road	The roof of the maintenance building (0.79 acres), dewatering building/centrifuge and control room/repurposing building (0.58 acres)
CDWWTP	0.75	0.38	parking space	3989 Rickenbacker Cswy, Sewage Plant road	East of maintenance building (0.55 acres) + admin building (0.2 acres)
NDWWTP	1.0	0.50	Roof	2575 NE 156 St	Maintenance shop/ old maintenance shop/lunch room (0.5 acres), switchgear blg (0.21 acres), chlorine blg (0.39 acres), effluent pump station (0.19 acres), injection well pump station (0.13 acres), admin blg
NDWWTP	0.4	0.20	concrete platform on injection wells	2575 NE 156 St	East side of plant
NDWWTP	0.38	0.19	parking space	2575 NE 156 St	Next to admin building on NW side of plant
WRF Plant (Water Reclamation Facility)	36.0	18.00	Land	23700 SW 97 Ave	Land purchased for future project - the County was considering building a Water Reclamation Facility. The facility was not constructed. Located to the west of the Blackpoint plant. Bridge over creek, a rectangular area to the west of 97th ave bordering SW 240 St.
Consent/OOL New Bldgs	6.0	3.00	Roof	3 plants	This is an estimated number of acres for total construction built on all 3 plants
Perimeter fencing at Plants	15.0	7.50	Land		
TOTAL	78.7	39.34			

Total Acres in WTP & WWTP	1,755.9	877.95
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Appendix E. Example of Partnership Flip Structure from New Berlin Go Solar Program ("Project") Request For Proposals ("RFP") (pages 38-40)

6. INVESTOR RESPONDENT

- 6.1. **Objective.** The Selected Investor shall finance all costs of the Project that are in addition to the funds provided by the District pursuant to Section 4.3.2. As noted in Section 4.3.2, the District will make up to 50% of the Project costs, but not to exceed \$1 million, available for the Project as a prepayment for electricity and Environmental Attributes and partial ownership of the solar systems. If the Focus on Energy incentives or other non-tax incentives are received by the District for the Project, they will be included in the up to \$1 million of funding from the District. The Selected Investor shall provide maximum value for the investment tax credits available to solar projects, the depreciation available to such projects and other incentives, including full value for any Focus on Energy incentives, thereby reducing the net installed cost of the Project to the District to the maximum extent feasible.
- 6.2. **Incorporation of Contractor Respondent Proposals.** Investor Respondents may utilize any Contractor Respondent's Proposal in developing and submitting the Investor Respondent's financing Proposal. Thus, Investor Respondents may utilize a Proposal from a Contractor Respondent that is either related to or unrelated to the Investor Respondent, so long as the Contractor Respondent has submitted its Proposal by the due date for Contractor Respondents.
- 6.3. **Formation of Single Purpose Limited Liability Company ("LLC").** The Selected Investor shall form a single purpose LLC that is created for the sole purpose of owning and operating the Project and providing energy and Environmental Attributes only to the District and to no other entity. The District shall receive an ownership interest in the Project sufficient to avoid having the systems being considered owned by a third-party under a Power Purchase Agreement structure.
- 6.4. **Credit for any Grants or Other Incentives for the Project.** Investor Respondents should indicate their willingness to allow and help ensure that the District receives full value for any grants or other non-tax incentives available for the Project.
- 6.5. **Environmental Attributes.** The School District shall receive all Environmental Attributes associated with the Project and its production of electricity.

"Environmental Attributes" means any and all credits, benefits, emissions reductions, offsets, and allowances, howsoever entitled, attributable to the System, the production of electrical energy from the System and its displacement of conventional energy generation, including (a) any avoided emissions of pollutants to the air, soil or water such as sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO) and other pollutants; (b) any avoided emissions of carbon dioxide (CO₂), methane (CH₄), nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride and other greenhouse gases (GHGs) that have been determined by the United Nations Intergovernmental Panel on Climate Change, or otherwise by law, to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere; and (c) the reporting rights related to these avoided emissions, such as Green Tag Reporting Rights and Renewable Energy Credits. Green Tag Reporting Rights are the right of a party to report the ownership of accumulated Green Tags in compliance with federal or state law, if applicable, and to a federal or state agency or any other party, and include Green Tag Reporting Rights accruing under Section 1605(b) of The Energy Policy Act of 1992 and any present or future federal, state, or local law, regulation or bill, and international or foreign emissions trading program. Without limiting the generality of the foregoing, Environmental Attributes include carbon trading credits, renewable energy credits or certificates, emissions reduction credits, investment credits, emissions allowances, green tags, tradeable renewable credits and Green-e® products.

6.6. **Specific Submissions by Investor Respondents.** In their response to this RFP, Investor Respondents shall submit the following:

- 6.6.1 The total gross installed cost of the solar facilities.
- 6.6.2 The net cost to the District of the solar facilities with the involvement of the Investor and its sharing of the value of the investment tax credit and depreciation available to solar projects.
- 6.6.3 The willingness of the Investor Respondent to finance all remaining costs of the Project beyond the amount the District makes available pursuant to Section 4.3.2. This statement should include the willingness of the Investor to pay for the District's legal and technical costs associated with the Project.
- 6.6.4 A thirty-year financial model that shows the expenses, expenses and returns for both the Selected Investor and the District for the Project.

- 6.6.5 The net cost savings to the District per year and over a thirty-year timeframe compared to its present and expected future utility costs, assuming a 2.5% increase per year for utility rates.
- 6.6.6 The Investors after tax rate of return from its investment in the Project over the initial five years, the initial ten years, the initial twenty years and the initial thirty years.
- 6.6.7 The Investor Respondent's proposed terms for the District's buy out of the Investor Respondent's interests in the Project. Investor Respondents shall state the timing that they propose for options to sell and purchase occur and the terms of those proposed options.

Appendix E. Example of Partnership Flip Structure from New Berlin Go Solar Program ("Project") Request For Proposals ("RFP") (pages 38-40)

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Appendix F. Ranking by Lowest Levelized Cost of Energy (LCOE)

Facility Attributes					Results for the system with the minimum Levelized Cost of Energy (LCOE)		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
1	1751 N. Cruise Blvd	Seaport	1751 N. Cruise Blvd	4,464,000	2,096	3,010,412	0.200
2	FOOD SVC BUREAU	Corrections	3595 NW 72 AVENUE	1,459,042	1,016	1,459,042	0.216
3	Elections Headquarters	ISD	2700 NW 87 Avenue	2,327,760	958	1,375,774	0.217
4	Preston & Hialeah WTPs	WASD	1100 W 2nd Ave	62,512,348	981	1,406,097	0.217
5	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	1,349,400	939	1,349,400	0.217
6	1265 N. Cruise Blvd	Seaport	1265 N. Cruise Blvd	2,812,080	1,125	1,585,642	0.218
7	Police Headquarters	Police	9101 NW 25th Street	8,017,680	786	1,129,191	0.220
8	Headquarters	Fire	9300 NW 41 Street	5,339,107	734	1,054,680	0.221
9	1435 N. Cruise Blvd.	Seaport	1435 N. Cruise Blvd.	3,305,520	674	964,800	0.223
10	Animal Services Building	Animal Services	3651 NW 79 Street	2,529,000	619	889,107	0.224
11	North Dade Regional Library	Library	2455 NW 183RD ST.	992,880	597	857,644	0.224
12	ISD Trade Shops	ISD	3501 NW 46TH ST	749,760	522	749,760	0.226
13	Graham Building - State Attorney	ISD	1350 NW 12 Avenue	1,886,067	468	672,666	0.227
14	Fleet Shop South	Fire	6000 SW 87th Avenue	890,640	454	651,925	0.227
15	Public Defenders	ISD	1320 NW 14 Street	916,560	376	539,554	0.229
16	Pre-Trial Det. Ctr.	Corrections	1321 NW 13 St.	6,489,600	376	539,554	0.229
17	Medical Examiner Main Building	ISD	1851 NW 10th AVE	3,553,680	374	530,387	0.232
18	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th ave	499,426	348	499,426	0.234
19	Data Processing Center	ISD	5680 SW 87th Ave	7,394,400	508	703,014	0.234
20	Overtown Transit Village South	ISD	702 NW 1 Ct.	4,351,440	343	488,609	0.237
21	Overtown Transit Village North	ISD	701 NW 1 Ct.	4,053,600	343	488,609	0.237
22	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	470,760	328	470,760	0.238
23	Richard E. Gerstein Criminal Jus	ISD	1351 NW 12th Street	7,235,200	322	460,302	0.240
24	LeJeune Building	WASD	3575 SW 42ND AVE	2,033,520	313	448,519	0.242
25	Caleb Center	ISD	5400 NW 22ND AVE	3,179,765	310	441,948	0.243
26	West Dade Regional Library	Library	9445 SW CORAL WAY	982,080	296	424,534	0.244
27	Youth and Family	CAHS	1701 N.W. 30TH AVENUE	874,125	294	421,728	0.245
28	514 Australia Way	Seaport	514 Australia Way	408,360	284	408,360	0.246
29	Doral Police Department Bomb Squad	Police	1505 NW 79TH Ave	655,547	286	409,772	0.246
30	Downtown Government Center	ISD	111 NW 1st Street	30,606,371	289	410,649	0.248
31	Douglas Building	WASD	3071 SW 38TH AVE	4,617,840	267	383,084	0.250
32	ISD Fleet Shop 1	ISD	2690 NW 7 AVE	381,951	267	381,951	0.250
33	Frankie S. Rolle Center	CAHS	3750 S. Dixie Hwy	478,320	260	372,738	0.251
34	North Dade Justice Center	ISD	15555 Biscayne Boulevard	951,840	243	347,310	0.255
35	Coral Gables Library	Library	3443 SEGOVIA STREET	578,400	237	339,133	0.256
36	Central Transfer Station	Solid Waste	1150 NW 20th Street	648,840	233	333,960	0.256
37	Miami-Dade County Auditorium	CUA	2901 W Flagler ST	906,894	226	323,609	0.258
38	TGK CORRECTIONAL	Corrections	7000 NW 41 STREET	8,690,800	221	317,168	0.258
39	1050 Caribbean Way	Seaport	1050 Caribbean Way	4,672,320	228	325,414	0.258
40	1080 Caribbean Way	Seaport	1080 Caribbean Way	5,268,480	209	299,595	0.260
41	Colonel H Zubkoff Head Start	CAHS	55 N.W. 199 STREET	460,920	211	301,738	0.261
42	Alexander Orr WTP	WASD	6800 SW 87TH AVE	41,274,800	221	311,295	0.263
43	Miami Beach Regional Library	Library	227 22nd Street	2,029,440	190	272,782	0.264
44	SWM Engineering & Environmental Division	Solid Waste	6990 NW 97th Ave	266,114	185	266,114	0.265
45	Hickman Garage # 5	ISD	270 NW 2ND STREET	258,000	180	258,000	0.266
46	CDWWTP	WASD	3 VIRGINIA KEY	33,280,800	176	252,558	0.267
47	TTC Correction Facility/Jail	Corrections	6950 NW 41st ST	2,416,976	174	250,328	0.267
48	C&R WAREHOUSE	Corrections	7845/7855 NW 148 STREET	249,120	173	249,120	0.267
49	ETSD Radio Shop	ISD	6100 SW 87 Ave.	854,880	180	256,757	0.267
50	ISD Fleet Shop 2	ISD	6100 SW 87 AVENUE	700,469	180	256,757	0.267
51	Hialeah Courthouse	ISD	11 East 6th Street	723,240	166	238,057	0.268
52	1122 Caribbean Way	Seaport	1122 Caribbean Way	225,900	157	225,900	0.270
53	African Heritage Center	CUA	2166 NW 62ND ST	373,920	155	222,890	0.270
54	1040 Caribbean Way	Seaport	1040 Port Blvd.	427,620	157	225,368	0.270
55	Miami Gardens N. Sr. Center	CAHS	16405 NW 25 Ave	978,360	161	230,485	0.270
56	Coral Gables Courthouse	ISD	3100 Ponce de Leon	467,760	153	219,409	0.271
57	Hickman Building	ISD	275 NW 2nd Street	1,030,920	140	201,266	0.273
58	Professional Compliance Bureau	Police	18805 NW 27th ave	753,730	143	204,430	0.273
59	Kendall Library	Library	9101 SW 97TH AVENUE	252,600	134	192,297	0.274
60	Goulds Poolhouse	PROS	21840 SW 114 AVE # POOL	184,020	128	184,020	0.275
61	Fleet Shop North	Fire	8141 NW 80 Street	236,400	128	183,716	0.275
62	South Miami Library	Library	6000 SUNSET DRIVE	376,860	114	163,964	0.277
63	HAZMAT Warehouse	Fire	8010 NW 60th Street	153,252	107	153,252	0.278
64	Tropical Park	PROS	7900 SW 40TH ST	728,538	101	145,108	0.279
65	ISD Fleet Shop 3A	ISD	18701 NE 6th Avenue	155,173	101	145,073	0.279
66	Northeast Transfer Station	Solid Waste	18701 NE 6th Avenue	411,936	101	145,073	0.279
67	Metro Annex	ISD	850 NW 23 ST	152,320	106	152,320	0.280
68	Station 63 Highland Oaks	Fire	1655 NE 205TH Street	150,141	98	140,945	0.280
69	Hispanic Library	Library	1398 SW 1st Street	224,687	97	138,549	0.281
70	WDC Correction Facility/Jail	Corrections	1401 NW 7 Ave	1,272,240	98	140,017	0.281
71	Amelia Earhart Maintenance Building	PROS	201 W 74 PL	136,464	93	133,198	0.281

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Facility Attributes					Results for the system with the minimum Levelized Cost of Energy (LCOE)		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
72	African Heritage Trailers	CUA	6161 NW 22nd AVE # 2 TRAILERS	130,320	91	130,320	0.281
73	LET Family Courthouse Center	ISD	175 NW 1 AVE	3,690,720	87	124,981	0.282
74	Northwest District Station	Police	5975 Miami Lakes Dr East	511,200	85	122,488	0.282
75	Kendall District Station	Police	7707 SW 117TH AVE	764,332	80	115,074	0.283
76	Intracoastal District Station	Police	15665 Biscayne Blvd	577,920	79	113,428	0.283
77	Public Safety Training Institute	Police	9601 NW 58th Street	1,333,812	77	110,980	0.284
78	Opa-locka Library	Library	780 FISHERMAN STREET	108,577	76	108,577	0.284
79	Virrick Park Library	Library	3255 PLAZA STREET	100,746	70	100,746	0.286
80	Coordinated Victims Assistance C	ISD	2400 S. Dixie Hwy	200,040	69	99,531	0.286
81	California Club Library	Library	850 IVES DAIRY ROAD	98,854	69	98,854	0.286
82	Station 22 Interama	Fire	15655 Biscayne Blvd	93,540	65	93,540	0.287
83	Martin Luther King Memorial Park	PROS	6160 NW 32ND CT	153,173	65	93,766	0.288
84	South Shore Library	Library	131 Alton Road	90,687	63	90,687	0.288
85	Station 48 Fontainebleau	Fire	8825 NW 18TH TERR	176,785	65	93,395	0.288
86	Crandon Golf Course	PROS	6700 Crandon Blvd	849,200	199	260,276	0.289
87	Miami Lakes Library	Library	6699 WINDMILL GATE ROAD	174,395	75	105,383	0.289
88	Palm Springs North Library	Library	17601 NW 78 AVE	86,224	60	86,224	0.289
89	North Central Branch Library	Library	9590 NW 27TH AVE.	85,759	60	85,759	0.289
90	Station 32 Uleta	Fire	358 NE 168th Street	139,088	64	91,243	0.290
91	Little River Library	Library	160 N.E. 79TH STREET	125,209	61	86,680	0.290
92	Station 54 Bunche Park	Fire	15250 NW 27 Avenue	133,145	58	83,685	0.290
93	Station 26 Opa-Locka	Fire	3190 NW 119th Street	108,996	56	80,758	0.291
94	ISD Shop 3 Auto	ISD	8801 NW 58th Street	424,321	56	80,452	0.291
95	Fairlawn Library	Library	6376 SW 8TH STREET	95,187	56	79,821	0.291
96	Station 39 Port of Miami	Fire	641 Europe Way	143,447	55	79,589	0.291
97	Country Club of Miami	PROS	6801 NW 186 st	937,916	151	201,841	0.291
98	Station 07 West Little River	Fire	9350 NW 22 Avenue	131,569	55	79,005	0.292
99	Golden Glades Library	Library	100 NE 166 STREET	333,293	63	89,882	0.292
100	Station 21 Haulover	Fire	10500 Collins Avenue	155,640	54	76,885	0.292
101	Station 20 No Miami East	Fire	13000 NE 16th Avenue	133,871	55	79,304	0.292
102	Bannerman Park	PROS	4830 NW 24TH AVE	161,059	52	74,718	0.292
103	International Mall Library	Library	10315 NW 12th Street	308,259	61	86,655	0.292
104	Shelter 1	Animal Services	7401 NW 74 Street	572,880	54	77,008	0.293
105	Station 19 No Miami West	Fire	650 NW 131st Street	108,637	50	72,402	0.293
106	Station 47 Westchester	Fire	9361 SW 24TH Street	115,027	52	73,890	0.293
107	Station 29 Sweetwater	Fire	351 SW 107TH Avenue	117,900	50	71,346	0.293
108	Lemon City Library	Library	430 N.E. 61ST STREET	137,268	49	70,267	0.294
109	Station 14 South Miami	Fire	5860 SW 70TH Street	150,586	50	72,194	0.294
110	Station 10 Sunny Isles	Fire	17775 North Bay Rd.	155,520	76	104,933	0.294
111	Station 45 Doral	Fire	9710 NW 58TH Street	104,216	48	68,916	0.294
112	Station 11 Miami Gardens	Fire	18705 NW 27th Avenue	115,254	48	68,945	0.294
113	Northeast Dade/ Aventura Library (Northeast Regional)	Library	2930 AVENTURA BLVD.	544,560	48	68,345	0.294
114	Station 08 Aventura	Fire	2900 Aventura Blvd.	138,180	48	68,345	0.294
115	Kendall Complex	CAHS	11025 SW 84th Street	224,124	101	137,890	0.294
116	West Transfer Station	Solid Waste	2900 SW 72 Avenue	409,680	168	219,998	0.294
117	Station 46 Medley	Fire	10200 NW 116 Way	114,506	48	68,316	0.294
118	Fire Station 01 Miami Lakes	Fire	16699 NW 67th Avenue	113,820	47	67,229	0.294
119	Sunset Library	Library	10855 SW 72ND ST	66,594	46	66,594	0.294
120	Fire Station 02 Model Cities	Fire	6460 NW 27 Avenue	189,600	47	67,209	0.295
121	Headstart Center	CAHS	6121 SW 68th ST	65,560	46	65,560	0.295
122	Allapattah Library	Library	1799 N.W. 35TH STREET	97,927	45	64,901	0.295
123	Doral Library	Library	10785 NW 58 STREET	63,416	44	63,416	0.295
124	27th Avenue Teen Center	PROS	6940 NW 27TH AVE	61,500	43	61,500	0.296
125	Station 76 Bay Harbor	Fire	9665 Bay Harbor Terr	138,571	42	60,173	0.296
126	USAR (Training Site 37)	Fire	7900 SW 107 Avenue	65,932	41	59,092	0.296
127	Station 23 Suniland/Pinecrest	Fire	7825 SW 104TH Street	112,320	41	58,943	0.296
128	Station 33 Aventura South	Fire	2601 Point East Drive	58,397	41	58,397	0.297
129	Key Biscayne Library	Library	299 CRANDON BLVD	147,238	40	56,999	0.297
130	Concord Library	Library	3882 SW 112 AVENUE	53,587	37	53,587	0.298
131	Corrections and Rehabilitation	Corrections	1321 NW 13 Street	53,520	37	53,520	0.298
132	NDDC Correction Facility/Jail	Corrections	15801 State Road 9	50,150	35	50,150	0.299
133	2580 Port Blvd.	Seaport	2580 Port Blvd.	2,549,130	33	47,516	0.301
134	2575 Port Blvd	Seaport	2575 Port Blvd	566,400	33	47,516	0.301
135	Station 03 Tropical Park	Fire	3911 SW 82 Avenue	120,499	33	47,585	0.301
136	Woman's Park	PROS	10251 W FLAGLER ST # PRK	107,361	56	77,634	0.301
137	Country Village Park	PROS	6550 NW 188 Ter	191,008	34	48,599	0.301
138	Station 17 Virginia Gardens	Fire	7050 NW 36 Street	97,020	33	46,893	0.302
139	Sunset Kendall TRC	Solid Waste	8000 SW 107th Ave	231,377	35	49,913	0.303
140	Gwen Cherry Park	PROS	2591 NW 71st ST	50,655	32	45,620	0.303
141	West Flagler Library	Library	5050 WEST FLAGLER STREET	120,698	37	51,941	0.304
142	Edison Library	Library	531 N.W. 62ND STREET	136,842	30	42,417	0.306

Appendix F. Ranking by Lowest Levelized Cost of Energy (LCOE)

Facility Attributes					Results for the system with the minimum Levelized Cost of Energy (LCOE)		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
143	West Dade Adult Day Care	CAHS	6950 N. Waterway Dr.	73,441	42	58,536	0.306
144	Southern Estates Park	PROS	12199 SW 34TH ST	39,493	27	39,493	0.308
145	North Shore Library	Library	7501 COLLINS AVE.	102,502	27	38,380	0.309
146	Station 44 Palm Springs North	Fire	7700 NW 186 Street	136,519	26	37,858	0.309
147	Ives Estates Park	PROS	20901 NE 16TH AVE	269,898	36	49,101	0.310
148	1180 S. America Way	Seaport	1180 S. America Way	45,992	25	35,645	0.311
149	Equestrian Center	PROS	7900 Bird Rd # Equestrian	316,076	79	102,579	0.312
150	Cultural Center	ISD	101 W Flagler St.	34,524	24	34,524	0.312
151	Shenandoah Library	Library	2111 S.W. 19TH STREET	228,752	35	47,939	0.313
152	Station 31 No Miami Beach	Fire	17050 NE 19TH Avenue	33,802	24	33,802	0.313
153	No. Dade Adult Day Care Center	CAHS	60 NE 166 ST	68,391	41	55,126	0.314
154	Miami Springs Library	Library	401 WESTWARD DRIVE	102,603	23	32,490	0.314
155	Haitian American Senior Center	CAHS	5080 Biscayne Boulevard	30,430	21	30,430	0.316
156	Station 28 Hialeah Gardens	Fire	8790 NW 103rd Street	127,646	22	30,944	0.316
157	Allapatah Center	CAHS	1897 NW 20 ST	29,832	21	29,832	0.316
158	Amelia Earhart Farm	PROS	4401 NW 119 ST	151,158	21	29,479	0.317
159	Records Center	ISD	9350 NW 12 Street	612,413	35	47,447	0.317
160	Station 09 Kendall	Fire	7777 SW 117 Avenue	135,960	54	70,991	0.317
161	Coral Estates Park	PROS	1405 SW 97 Ave	28,576	20	28,576	0.318
162	Hialeah Gardens Library	Library	11300 NW 87 COURT	28,266	20	28,266	0.318
163	Station 15 Key Biscayne	Fire	2 Crandon Blvd	73,689	32	43,138	0.318
164	North County (HS)	CAHS	3201 NW 207 ST	31,721	19	27,806	0.318
165	Coconut Grove Library	Library	2875 McFARLENE ROAD	152,266	36	48,601	0.319
166	Culmer Community Center	CAHS	1600 NW 3 Ave	715,440	19	26,732	0.319
167	Station 40 West Miami	Fire	975 SW 62 Avenue	169,744	26	36,703	0.319
168	Arcola Lakes Park	PROS	1301 NW 83RD ST	931,587	55	72,515	0.320
169	Kendall Indian Hammocks Park	PROS	11395 SW 79TH ST	319,465	17	24,690	0.321
170	Station 67 Arcola	Fire	1275 NE 79 Street, Pelican Harbor	78,072	17	24,629	0.321
171	Station 69 Doral North	Fire	11151 NW 74 Street	189,600	60	78,206	0.321
172	Community Action and Human Services	CAHS	395 N.W. 1ST STREET	23,376	16	23,376	0.322
173	Brothers to the Rescue Memorial Park	PROS	7250 SW 24TH ST	103,370	15	22,254	0.323
174	Fac Mgmt Trailers	Corrections	3595 NW 72 Ave	52,157	17	24,738	0.324
175	Station 38 Norland	Fire	575 NW 199th Street	102,240	16	23,479	0.324
176	South Dade Government Campus	ISD	3300 NW 27th Avenue	21,120	15	21,120	0.324
177	Indian Hammocks Field House	PROS	8000 SW 107TH AVE	51,393	22	31,017	0.325
178	Tamiami Rec Center	PROS	11201 SW 24TH ST	74,220	36	46,923	0.325
179	Tamiami Park	PROS	11201 SW 24th ST	1,206,991	36	46,923	0.325
180	Lift Station Only	Corrections	7000 NW 36 Street	20,612	14	20,612	0.325
181	Station 30 Miami Shores/El Portal	Fire	9500 NE 2ND Avenue	117,892	42	54,610	0.325
182	New Directions Residential Treatment Program	CAHS	3140 NW 76 ST	59,495	17	23,444	0.328
183	Partners Park	PROS	5536 NW 21st ave	18,697	13	18,697	0.328
184	Ojus Park	PROS	18995 W Dixie Hwy	57,479	20	28,349	0.329
185	Vehicle Impound Lot	Police	9111 NW 25th Street	17,445	12	17,445	0.330
186	Continental Park	PROS	10000 SW 82ND AVE	125,749	18	24,840	0.330
187	Station 64 Miami Lakes West	Fire	8205 Commerce Way	160,320	12	17,060	0.331
188	Jefferson Reaves Sr Park	PROS	3100 NW 50TH ST	52,492	24	32,978	0.331
189	Snapper Creek TRC	Solid Waste	2200 SW 117th Ave.	15,649	11	15,649	0.333
190	Amelia Earhart Sm Maint Bldg	PROS	191 W 74 PL	17,346	11	15,371	0.334
191	Amelia Earhart Park	PROS	401 E 65 Street	27,584	10	14,659	0.336
192	Tropical Park Police Memorial	Police	1030 NW 111th Avenue	14,353	10	14,353	0.336
193	Tropical Estates Park	PROS	10201 SW 48TH ST	100,190	18	24,261	0.336
194	Lillian M. Williams	CAHS	770 NW 83rd Street	263,888	9	12,893	0.337
195	Rockway Park	PROS	9460 SW 27TH DR	217,080	28	36,365	0.339
196	1630 Bahama Drive	Seaport	1630 Bahama Drive	547,560	24	31,755	0.339
197	Westwood Park	PROS	11350 SW 53RD TER	61,385	8	11,484	0.340
198	1790 Port Blvd.	Seaport	1790 Port Blvd.	432,360	23	30,684	0.343
199	Golden Glades TRC	Solid Waste	140 NW 160th Street	13,940	6	8,478	0.345
200	Arcola Lakes Library	Library	8240 NW 7TH AVE	473,142	6	8,040	0.345
201	Fleet Management	ISD	6100 SW 87 AVE	7,653	5	7,653	0.346
202	Blue Lakes Park	PROS	4225 SW 92ND aVE	35,698	22	29,223	0.347
203	Olinda Park	PROS	2101 NW 51ST ST	97,665	6	8,510	0.348
204	Little River Park	PROS	10525 NW 24Th Ave	34,466	4	6,035	0.348
205	Palm Springs North TRC	Solid Waste	7870 NW 178th Street	19,122	4	6,170	0.349
206	Crandon Beach	PROS	4000 Crandon Blvd	149,672	14	18,690	0.350
207	Norman & Jean Reach Park	PROS	7895 NW 176TH ST	11,445	8	11,445	0.350
208	North Glade Park	PROS	17355 NW 52ND AVE	4,850	3	4,850	0.350
209	MILITARY TRAIL PARK	PROS	825 NE 89TH ST	4,768	3	4,768	0.350
210	Miller Drive Park	PROS	5510 SW 94 CT	77,611	2	3,209	0.353
211	Soar Park	PROS	120 NW 83RD ST	2,112	1	2,112	0.355
212	Palm Springs North Pool	PROS	7901 NW 176th ST	242,486	2	2,723	0.355
213	Gladeview Park	PROS	6815 NW 31ST AVE	2,022	1	2,022	0.355

Appendix F. Ranking by Lowest Levelized Cost of Energy (LCOE)

Facility Attributes					Results for the system with the minimum Levelized Cost of Energy (LCOE)		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	LCOE (\$/kWh)
214	Melrose Park	PROS	3050 NW 35TH ST	2,016	1	2,016	0.355
215	Rocky Creek Park	PROS	3305 NW 48TH TER	1,879	1	1,879	0.355
216	Highland Oaks Park	PROS	20300 NE 24TH AVE	26,449	1	1,858	0.355
217	West Little River Park	PROS	2450 NW 84TH ST	1,472	1	1,472	0.356
218	New Opportunity Transitional Living	CAHS	777 NW 30 ST	1,074	1	1,074	0.356
219	Bill Bird Marina	PROS	10800 Collins Ave	266	0	266	0.357
220	Arch Creek Park	PROS	1855 NE 135Th ST	14,838	2	2,515	0.363
221	Amelia Earhart Office	PROS	4701 NW 119TH ST	95,733	27	32,439	0.370
222	Country Lake Park	PROS	19525 NW 87TH AVE	46,315	16	20,092	0.371
223	Downtown Motor Pool Building	ISD	201 NW 1st Street	67,625	10	12,650	0.379
224	Spanish Lake	PROS	19345 NW 82ND AVE	68	0	68	0.394
225	Station 51 Honey Hill	Fire	4775 NW 199 Street	160,018	3	4,009	0.400
226	West Little River TRC	Solid Waste	1830 NW 79th Street	29,378	4	5,251	0.407
227	Safe Space North	CAHS	7831 NE MIAMI CT	424,920	4	5,365	0.417
228	AD Barnes Park	PROS	3401 SW 72ND AVE	587,961	2	2,819	0.423
229	Pelican Harbor Dockmaster Building	PROS	1275 NE 79TH ST	86,413	5	5,245	0.429
230	Pelican Harbor Marina	PROS	1275 NE 79th ST	652,681	5	5,245	0.429

Appendix G. Ranking of County Buildings with Potential Net Zero Energy Consumption by Levelized Cost of Energy (LCOE)

Facility Attributes					Results if a PV system is deployed that generates an amount equal to the facility's annual energy consumption		
Ranking	Description	Type	Address	Facility Annual Energy Consumption (kWh/year)	PV Capacity (kW)	Annual energy production (kWh/year)	Levelized Cost of Energy (LCOE) (\$/kWh)
1	FOOD SVC BUREAU	Corrections	3595 NW 72 AVENUE	1,459,042	1,016	1,459,042	0.216
2	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	1,349,400	939	1,349,400	0.217
3	ISD Trade Shops	ISD	3501 NW 46TH ST	749,760	522	749,760	0.226
4	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th ave	499,426	348	499,426	0.234
5	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	470,760	328	470,760	0.238
6	514 Australia Way	Seaport	514 Australia Way	408,360	284	408,360	0.246
7	ISD Fleet Shop 1	ISD	2690 NW 7 AVE	381,951	267	381,951	0.250
8	SWM Engineering & Environmental Division	Solid Waste	6990 NW 97th Ave	266,114	185	266,114	0.265
9	Hickman Garage # 5	ISD	270 NW 2ND STREET	258,000	180	258,000	0.266
10	C&R WAREHOUSE	Corrections	7845/7855 NW 148 STREET	249,120	173	249,120	0.267
11	1122 Caribbean Way	Seaport	1122 Caribbean Way	225,900	157	225,900	0.270
12	Goulds Poolhouse (BUILDING)	PROS	21840 SW 114 AVE # POOL	184,020	128	184,020	0.275
13	HAZMAT Warehouse	Fire	8010 NW 60th Street	153,252	107	153,252	0.278
14	Metro Annex	ISD	850 NW 23 ST	152,320	106	152,320	0.280
15	Station 63 Highland Oaks	Fire	1655 NE 205TH Street	150,141	105	150,141	0.281
16	African Heritage Trailers	CUA	6161 NW 22nd AVE # 2 TRAILERS	130,320	91	130,320	0.281
17	Opa-locka Library	Library	780 FISHERMAN STREET	108,577	76	108,577	0.284
18	Virrick Park Library	Library	3255 PLAZA STREET	100,746	70	100,746	0.286
19	California Club Library	Library	850 IVES DAIRY ROAD	98,854	69	98,854	0.286
20	Station 22 Interama	Fire	15655 Biscayne Blvd	93,540	65	93,540	0.287
21	South Shore Library	Library	131 Alton Road	90,687	63	90,687	0.288
22	Palm Springs North Library	Library	17601 NW 78 AVE	86,224	60	86,224	0.289
23	North Central Branch Library	Library	9590 NW 27TH AVE.	85,759	60	85,759	0.289
24	Sunset Library	Library	10855 SW 72ND ST	66,594	46	66,594	0.294
25	Headstart Center	CAHS	6121 SW 68th ST	65,560	46	65,560	0.295
26	Doral Library	Library	10785 NW 58 STREET	63,416	44	63,416	0.295
27	27th Avenue Teen Center	PROS	6940 NW 27TH AVE	61,500	43	61,500	0.296
28	Station 33 Aventura South	Fire	2601 Point East Drive	58,397	41	58,397	0.297
29	Concord Library	Library	3882 SW 112 AVENUE	53,587	37	53,587	0.298
30	Corrections and Rehabilitation	Corrections	1321 NW 13 Street	53,520	37	53,520	0.298
31	NDDC Correction Facility/Jail	Corrections	15801 State Road 9	50,150	35	50,150	0.299
32	Southern Estates Park	PROS	12199 SW 34TH ST	39,493	27	39,493	0.308
33	Cultural Center	ISD	101 W Flagler St.	34,524	24	34,524	0.312
34	Station 31 No Miami Beach	Fire	17050 NE 19TH Avenue	33,802	24	33,802	0.313
35	Haitian American Senior Center	CAHS	5080 Biscayne Boulevard	30,430	21	30,430	0.316
36	Allapatah Center	CAHS	1897 NW 20 ST	29,832	21	29,832	0.316
37	Coral Estates Park	PROS	1405 SW 97 Ave	28,576	20	28,576	0.318
38	Hialeah Gardens Library	Library	11300 NW 87 COURT	28,266	20	28,266	0.318
39	Community Action and Human Services	CAHS	395 N.W. 1ST STREET	23,376	16	23,376	0.322
40	South Dade Government Campus	ISD	3300 NW 27th Avenue	21,120	15	21,120	0.324
41	Lift Station Only	Corrections	7000 NW 36 Street	20,612	14	20,612	0.325
42	Partners Park	PROS	5536 NW 21st ave	18,697	13	18,697	0.328
43	Vehicle Impound Lot	Police	9111 NW 25th Street	17,445	12	17,445	0.330
44	Snapper Creek TRC	Solid Waste	2200 SW 117th Ave.	15,649	11	15,649	0.333
45	Tropical Park Police Memorial	Police	1030 NW 111th Avenue	14,353	10	14,353	0.336
46	Golden Glades TRC	Solid Waste	140 NW 160th Street	13,940	10	13,940	0.354
47	Fleet Management	ISD	6100 SW 87 AVE	7,653	5	7,653	0.346
48	Norman & Jean Reach Park	PROS	7895 NW 176TH ST	11,445	8	11,445	0.350
49	North Glade Park	PROS	17355 NW 52ND AVE	4,850	3	4,850	0.350
50	MILITARY TRAIL PARK	PROS	825 NE 89TH ST	4,768	3	4,768	0.350
51	Soar Park	PROS	120 NW 83RD ST	2,112	1	2,112	0.355
52	Gladeview Park	PROS	6815 NW 31ST AVE	2,022	1	2,022	0.355
53	Melrose Park	PROS	3050 NW 35TH ST	2,016	1	2,016	0.355
54	Rocky Creek Park	PROS	3305 NW 48TH TER	1,879	1	1,879	0.355
55	West Little River Park	PROS	2450 NW 84TH ST	1,472	1	1,472	0.356
56	New Opportunity Transitional Living	CAHS	777 NW 30 ST	1,074	1	1,074	0.356
57	Bill Bird Marina	PROS	10800 Collins Ave	266	0	266	0.357
58	Spanish Lake	PROS	19345 NW 82ND AVE	68	0	68	0.394

Appendix H. Ranking of County Buildings by FPL Tier Categories

Facility Attributes				Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
1	Lillian M. Williams	CAHS	770 NW 83rd Street	9	0.337	1
2	Westwood Park	PROS	11350 SW 53RD TER	8	0.340	1
3	Arcola Lakes Library	Library	8240 NW 7TH AVE	6	0.345	1
4	Olinda Park	PROS	2101 NW 51ST ST	6	0.348	1
5	Little River Park	PROS	10525 NW 24Th Ave	4	0.348	1
6	Palm Springs North TRC	Solid Waste	7870 NW 178th Street	4	0.349	1
7	Arch Creek Park	PROS	1855 NE 135Th ST	2	0.363	1
8	Miller Drive Park	PROS	5510 SW 94 CT	7	0.368	1
9	Palm Springs North Pool	PROS	7901 NW 176th ST	6	0.396	1
10	Station 51 Honey Hill	Fire	4775 NW 199 Street	3	0.400	1
11	West Little River TRC	Solid Waste	1830 NW 79th Street	4	0.407	1
12	Safe Space North	CAHS	7831 NE MIAMI CT	4	0.417	1
13	AD Barnes Park	PROS	3401 SW 72ND AVE	2	0.423	1
14	Pelican Harbor Dockmaster Building	PROS	1275 NE 79TH ST	5	0.429	1
15	Pelican Harbor Marina	PROS	1275 NE 79th ST	5	0.429	1
16	Tropical Park Police Memorial	Police	1030 NW 111th Avenue	270	0.258	2
17	Lift Station Only	Corrections	7000 NW 36 Street	98	0.280	2
18	Hispanic Library	Library	1398 SW 1st Street	97	0.281	2
19	Amelia Earhart Maintenance Building	PROS	201 W 74 PL	93	0.281	2
20	Station 35 Miami Springs	Fire	201 Westward Drive	91	0.281	2
21	Northwest District Station	Police	5975 Miami Lakes Dr East	85	0.282	2
22	LET Family Courthouse Center	ISD	175 NW 1 AVE	89	0.282	2
23	Intracoastal District Station	Police	15665 Biscayne Blvd	82	0.283	2
24	Station 22 Interama	Fire	15655 Biscayne Blvd	82	0.283	2
25	Kendall District Station	Police	7707 SW 117TH AVE	82	0.284	2
26	Public Safety Training Institute	Police	9601 NW 58th Street	77	0.284	2
27	West Little River Park	PROS	2450 NW 84TH ST	71	0.285	2
28	NDDC Correction Facility/Jail	Corrections	15801 State Road 9	84	0.285	2
29	Coordinated Victims Assistance C	ISD	2400 S. Dixie Hwy	69	0.286	2
30	Station 27 North Bay Village	Fire	7903 East Drive	72	0.287	2
31	Station 33 Aventura South	Fire	2601 Point East Drive	66	0.288	2
32	South Shore Library	Library	131 Alton Road	90	0.288	2
33	Station 48 Fontainebleau	Fire	8825 NW 18TH TERR	65	0.288	2
34	Station 32 Uleta	Fire	358 NE 168th Street	64	0.290	2
35	Little River Library	Library	160 N.E. 79TH STREET	61	0.290	2
36	Martin Luther King Memorial Park	PROS	6160 NW 32ND CT	94	0.290	2
37	Station 54 Bunche Park	Fire	15250 NW 27 Avenue	58	0.290	2
38	ISD Shop 3 Auto	ISD	8801 NW 58th Street	56	0.291	2
39	Fairlawn Library	Library	6376 SW 8TH STREET	56	0.291	2
40	Station 39 Port of Miami	Fire	641 Europe Way	55	0.291	2
41	Station 20 No Miami East	Fire	13000 NE 16th Avenue	55	0.292	2
42	Golden Glades Library	Library	100 NE 166 STREET	77	0.292	2
43	Marva Y. Bannerman Park	PROS	4830 NW 24TH AVE	52	0.292	2
44	Shelter 1	Animal Services	7401 NW 74 Street	54	0.293	2
45	Station 26 Opa-Locka	Fire	3190 NW 119th Street	67	0.293	2
46	Station 21 Haulover	Fire	10500 Collins Avenue	66	0.293	2
47	International Mall Library	Library	10315 NW 12th Street	67	0.293	2
48	Station 19 No Miami West	Fire	650 NW 131st Street	67	0.293	2
49	Station 47 Westchester	Fire	9361 SW 24TH Street	52	0.293	2
50	Station 29 Sweetwater	Fire	351 SW 107TH Avenue	50	0.293	2
51	Lemon City Library	Library	430 N.E. 61ST STREET	49	0.294	2
52	Station 07 West Little River	Fire	9350 NW 22 Avenue	73	0.294	2
53	Station 10 Sunny Isles	Fire	17775 North Bay Rd.	76	0.294	2
54	27th Avenue Teen Center	PROS	6940 NW 27TH AVE	93	0.294	2
55	Station 46 Medley	Fire	10200 NW 116 Way	48	0.294	2
56	Fire Station 01 Miami Lakes	Fire	16699 NW 67th Avenue	47	0.294	2
57	Allapattah Library	Library	1799 N.W. 35TH STREET	45	0.295	2
58	Fire Station 02 Model Cities	Fire	6460 NW 27 Avenue	49	0.295	2
59	Northeast Dade/ Aventura Library (Northeast Regional)	Library	2930 AVENTURA BLVD.	62	0.296	2
60	Station 08 Aventura	Fire	2900 Aventura Blvd.	62	0.296	2
61	Station 45 Doral	Fire	9710 NW 58TH Street	60	0.296	2
62	Station 76 Bay Harbor	Fire	9665 Bay Harbor Terr	42	0.296	2

Appendix H. Ranking of County Buildings by FPL Tier Categories

Facility Attributes				Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
63	USAR (Training Site 37)	Fire	7900 SW 107 Avenue	41	0.296	2
64	Key Biscayne Library	Library	299 CRANDON BLVD	40	0.297	2
65	Station 14 South Miami	Fire	5860 SW 70TH Street	61	0.298	2
66	Station 23 Suniland/Pinecrest	Fire	7825 SW 104TH Street	52	0.299	2
67	Station 11 Miami Gardens	Fire	18705 NW 27th Avenue	58	0.300	2
68	2580 Port Blvd.	Seaport	2580 Port Blvd.	33	0.301	2
69	2575 Port Blvd	Seaport	2575 Port Blvd	33	0.301	2
70	Station 03 Tropical Park	Fire	3911 SW 82 Avenue	33	0.301	2
71	Woman's Park	PROS	10251 W FLAGLER ST # PRK	56	0.301	2
72	Station 17 Virginia Gardens	Fire	7050 NW 36 Street	33	0.302	2
73	Country Village Park	PROS	6550 NW 188 Ter	63	0.302	2
74	Gwen Cherry Park	PROS	2591 NW 71st ST	32	0.303	2
75	West Flagler Library	Library	5050 WEST FLAGLER STREET	60	0.305	2
76	Edison Library	Library	531 N.W. 62ND STREET	30	0.306	2
77	Snapper Creek TRC	Solid Waste	2200 SW 117th Ave.	72	0.306	2
78	West Dade Adult Day Care	CAHS	6950 N. Waterway Dr.	42	0.306	2
79	New Opportunity Transitional Living	CAHS	777 NW 30 ST	27	0.308	2
80	Sunset Kendall TRC	Solid Waste	8000 SW 107th Ave	62	0.310	2
81	North Shore Library	Library	7501 COLLINS AVE.	30	0.310	2
82	Station 44 Palm Springs North	Fire	7700 NW 186 Street	58	0.311	2
83	1180 S. America Way	Seaport	1180 S. America Way	25	0.311	2
84	Soar Park	PROS	120 NW 83RD ST	25	0.312	2
85	Equestrian Center	PROS	7900 Bird Rd # Equestrian	79	0.312	2
86	Ives Estates Park	PROS	20901 NE 16TH AVE	50	0.312	2
87	Coral Estates Park	PROS	1405 SW 97 Ave	23	0.313	2
88	No. Dade Adult Day Care Center	CAHS	60 NE 166 ST	41	0.314	2
89	Miami Springs Library	Library	401 WESTWARD DRIVE	23	0.314	2
90	Shenandoah Library	Library	2111 S.W. 19TH STREET	40	0.315	2
91	Station 28 Hialeah Gardens	Fire	8790 NW 103rd Street	23	0.317	2
92		Animal Services	1320 NW 62ND ST	21	0.317	2
93	Station 42 Fisher Island	Fire	65 Fisher Island Drive	31	0.317	2
94	Amelia Earhart Farm	PROS	4401 NW 119 ST	21	0.317	2
95	Records Center	ISD	9350 NW 12 Street	35	0.317	2
96	Station 09 Kendall	Fire	7777 SW 117 Avenue	54	0.317	2
97	North Glade Park	PROS	17355 NW 52ND AVE	20	0.318	2
98	Station 15 Key Biscayne	Fire	2 Crandon Blvd	32	0.318	2
99	Coconut Grove Library	Library	2875 McFARLENE ROAD	36	0.319	2
100	Culmer Community Center	CAHS	1600 NW 3 Ave	19	0.319	2
101	Station 40 West Miami	Fire	975 SW 62 Avenue	26	0.319	2
102	Arcola Lakes Park	PROS	1301 NW 83RD ST	55	0.320	2
103	Station 67 Arcola	Fire	1275 NE 79 Street, Pelican Harbor	17	0.321	2
104	North County (HS)	CAHS	3201 NW 207 ST	21	0.321	2
105	Station 69 Doral North	Fire	11151 NW 74 Street	60	0.321	2
106	Fac Mgmt Trailers	Corrections	3595 NW 72 Ave	24	0.324	2
107	Indian Hammocks Field House	PROS	8000 SW 107TH AVE	22	0.325	2
108	Station 30 Miami Shores/El Portal	Fire	9500 NE 2ND Avenue	42	0.325	2
109	Tamiami Rec Center	PROS	11201 SW 24TH ST	45	0.326	2
110	Tamiami Park	PROS	11201 SW 24th ST	45	0.326	2
111	Kendall Indian Hammocks Park	PROS	11395 SW 79TH ST	21	0.327	2
112	Ojus Park	PROS	18995 W Dixie Hwy	28	0.329	2
113	Brothers to the Rescue Memorial Park	PROS	7250 SW 24TH ST	18	0.329	2
114	Station 38 Norland	Fire	575 NW 199th Street	28	0.330	2
115	Continental Park	PROS	10000 SW 82ND AVE	18	0.330	2
116	Station 64 Miami Lakes West	Fire	8205 Commerce Way	12	0.331	2
117	New Directions Residential Treatment Program	CAHS	3140 NW 76 ST	21	0.331	2
118	Jefferson Reaves Sr Park	PROS	3100 NW 50TH ST	24	0.331	2
119	Bill Bird Marina	PROS	10800 Collins Ave	28	0.332	2
120	Amelia Earhart Sm Maint Bldg	PROS	191 W 74 PL	11	0.334	2
121	Norman & Jean Reach Park	PROS	7895 NW 176TH ST	26	0.335	2
122	Amelia Earhart Park	PROS	401 E 65 Street	10	0.336	2
123	Tropical Estates Park	PROS	10201 SW 48TH ST	18	0.336	2
124	Rockway Park	PROS	9460 SW 27TH DR	28	0.339	2

Appendix H. Ranking of County Buildings by FPL Tier Categories

Facility Attributes				Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
125	1630 Bahama Drive	Seaport	1630 Bahama Drive	24	0.339	2
126	MILITARY TRAIL PARK	PROS	825 NE 89TH ST	12	0.340	2
127	1790 Port Blvd.	Seaport	1790 Port Blvd.	23	0.343	2
128	Blue Lakes Park	PROS	4225 SW 92ND aVE	22	0.347	2
129	Crandon Beach	PROS	4000 Crandon Blvd	14	0.350	2
130	Rocky Creek Park	PROS	3305 NW 48TH TER	10	0.354	2
131	Golden Glades TRC	Solid Waste	140 NW 160th Street	14	0.356	2
132	Amelia Earhart Office	PROS	4701 NW 119TH ST	27	0.370	2
133	Country Lake Park	PROS	19525 NW 87TH AVE	16	0.371	2
134	Highland Oaks Park	PROS	20300 NE 24TH AVE	11	0.371	2
135	Spanish Lake	PROS	19345 NW 82ND AVE	14	0.377	2
136	Downtown Motor Pool Building	ISD	201 NW 1st Street	10	0.379	2
137	FOOD SVC BUREAU	Corrections	3595 NW 72 AVENUE	1330	0.211	3
138	Elections Headquarters	ISD	2700 NW 87 Avenue	962	0.217	3
139	Preston & Hialeah WTPs	WASD	1100 W 2nd Ave	1024	0.218	3
140	1265 N. Cruise Blvd	Seaport	1265 N. Cruise Blvd	1129	0.219	3
141	Sunset Library	Library	10855 SW 72ND ST	850	0.219	3
142	Police Headquarters	Police	9101 NW 25th Street	797	0.220	3
143	ISD Trade Shops	ISD	3501 NW 46TH ST	735	0.221	3
144	Headquarters	Fire	9300 NW 41 Street	734	0.221	3
145	Doral Library	Library	10785 NW 58 STREET	765	0.223	3
146	1435 N. Cruise Blvd.	Seaport	1435 N. Cruise Blvd.	674	0.223	3
147	Cultural Center	ISD	101 W Flagler St.	1048	0.224	3
148	Cultural Center	Cultural Center	101 W. Flagler Street 33128	1048	0.224	3
149	Animal Services Building	Animal Services	3651 NW 79 Street	646	0.224	3
150	North Dade Regional Library	Library	2455 NW 183RD ST.	597	0.224	3
151	1122 Caribbean Way	Seaport	1122 Caribbean Way	598	0.224	3
152	South Dade Government Campus	ISD	3300 NW 27th Avenue	576	0.225	3
153	1303 N. Cruise Blvd.	Seaport	1303 N. Cruise Blvd.	622	0.225	3
154	C&R WAREHOUSE	Corrections	7845/7855 NW 148 STREET	536	0.225	3
155	Vehicle Impound Lot	Police	9111 NW 25th Street	559	0.226	3
156	Hialeah Gardens Library	Library	11300 NW 87 COURT	546	0.227	3
157	Graham Building - State Attorney	ISD	1350 NW 12 Avenue	471	0.227	3
158	Station 25 Opa-Locka Airport	Fire	4600 NW 148TH ST, BLDG 107	466	0.227	3
159	Fleet Shop South	Fire	6000 SW 87th Avenue	463	0.228	3
160	Station 13 East Kendall	Fire	6000 SW 87th Avenue	463	0.228	3
161	HAZMAT Warehouse	Fire	8010 NW 60th Street	535	0.228	3
162	514 Australia Way	Seaport	514 Australia Way	396	0.229	3
163	Partners Park	PROS	5536 NW 21st ave	399	0.229	3
164	Public Defenders	ISD	1320 NW 14 Street	388	0.230	3
165	Pre-Trial Det. Ctr.	Corrections	1321 NW 13 St.	388	0.230	3
166	Corrections and Rehabilitation	Corrections	1321 NW 13 Street	388	0.230	3
167	Medical Examiner Main Building	ISD	1851 NW 10th AVE	374	0.232	3
168	Data Processing Center	ISD	5680 SW 87th Ave	509	0.235	3
169	Overtown Transit Village South	ISD	702 NW 1 Ct.	343	0.237	3
170	Overtown Transit Village North	ISD	701 NW 1 Ct.	343	0.237	3
171	Richard E. Gerstein Criminal Jus	ISD	1351 NW 12th Street	322	0.240	3
172	LeJeune Building	WASD	3575 SW 42ND AVE	313	0.242	3
173	Hickman Garage # 5	ISD	270 NW 2ND STREET	322	0.242	3
174	Caleb Center	ISD	5400 NW 22ND AVE	310	0.243	3
175	West Dade Regional Library	Library	9445 SW CORAL WAY	296	0.244	3
176	Youth and Family	CAHS	1701 N.W. 30TH AVENUE	294	0.245	3
177	Palm Springs North Library	Library	17601 NW 78 AVE	289	0.245	3
178	Doral Police Department Bomb Squad	Police	1505 NW 79TH Ave	286	0.246	3
179	Downtown Government Center	ISD	111 NW 1st Street	289	0.248	3
180	Douglas Building	WASD	3071 SW 38TH AVE	267	0.250	3
181	ISD Fleet Shop 1	ISD	2690 NW 7 AVE	268	0.250	3
182	Frankie S. Rolle Center	CAHS	3750 S. Dixie Hwy	260	0.251	3
183	North Dade Justice Center	ISD	15555 Biscayne Boulevard	243	0.255	3
184	Coral Gables Library	Library	3443 SEGOVIA STREET	237	0.256	3
185	Central Transfer Station	Solid Waste	1150 NW 20th Street	233	0.256	3
186	Miami-Dade County Auditorium	CUA	2901 W Flagler ST	226	0.258	3

Appendix H. Ranking of County Buildings by FPL Tier Categories

Facility Attributes				Results if facility's suitable roof area is filled		
Ranking	Description	Type	Address	PV Capacity (kW)	LCOE (\$/kWh)	FPL Tier Categories (1, 2, 3)
187	TGK CORRECTIONAL	Corrections	7000 NW 41 STREET	225	0.258	3
188	1050 Caribbean Way	Seaport	1050 Caribbean Way	228	0.258	3
189	Haitian American Senior Center	CAHS	5080 Biscayne Boulevard	226	0.259	3
190	1080 Caribbean Way	Seaport	1080 Caribbean Way	209	0.260	3
191	Colonel H Zubkoff Head Start	CAHS	55 N.W. 199 STREET	211	0.261	3
192	North Central Branch Library	Library	9590 NW 27TH AVE.	214	0.261	3
193	Concord Library	Library	3882 SW 112 AVENUE	207	0.262	3
194	Alexander Orr WTP	WASD	6800 SW 87TH AVE	221	0.263	3
195	Miami Beach Regional Library	Library	227 22nd Street	190	0.264	3
196	CDWWTP	WASD	3 VIRGINIA KEY	176	0.267	3
197	TTC Correction Facility/Jail	Corrections	6950 NW 41st ST	174	0.267	3
198	ETSD Radio Shop	ISD	6100 SW 87 Ave.	199	0.268	3
199	ISD Fleet Shop 2	ISD	6100 SW 87 AVENUE	199	0.268	3
200	Fleet Management	ISD	6100 SW 87 AVE	199	0.268	3
201	Hialeah Courthouse	ISD	11 East 6th Street	168	0.268	3
202	Station 59 MIA Northside	Fire	5680 NW 36 Street	186	0.269	3
203	Opa-locka Library	Library	780 FISHERMAN STREET	160	0.269	3
204	Melrose Park	PROS	3050 NW 35TH ST	232	0.270	3
205	1040 Caribbean Way	Seaport	1040 Port Blvd.	157	0.270	3
206	Miami Gardens N Sr. Center	CAHS	16405 NW 25 Ave	161	0.270	3
207	African Heritage Center	CUA	2166 NW 62ND ST	161	0.271	3
208	Coral Gables Courthouse	ISD	3100 Ponce de Leon	164	0.272	3
209	African Heritage Trailers	CUA	6161 NW 22nd AVE # 2 TRAILERS	147	0.273	3
210	Hickman Building	ISD	275 NW 2nd Street	140	0.273	3
211	Professional Compliance Bureau	Police	18805 NW 27th ave	143	0.273	3
212	Community Action and Human Services	CAHS	395 N.W. 1ST STREET	137	0.273	3
213	Kendall Library	Library	9101 SW 97TH AVENUE	134	0.274	3
214	Allapatah Center	CAHS	1897 NW 20 ST	139	0.275	3
215	Fleet Shop North	Fire	8141 NW 80 Street	128	0.275	3
216	Station 31 No Miami Beach	Fire	17050 NE 19TH Avenue	122	0.276	3
217	Virrick Park Library	Library	3255 PLAZA STREET	128	0.277	3
218	South Miami Library	Library	6000 SUNSET DRIVE	122	0.278	3
219	Metro Annex	ISD	850 NW 23 ST	114	0.278	3
220	Tropical Park	PROS	7900 SW 40TH ST	101	0.279	3
221	ISD Fleet Shop 3A	ISD	18701 NE 6th Avenue	101	0.279	3
222	Northeast Transfer Station	Solid Waste	18701 NE 6th Avenue	101	0.279	3
223	Headstart Center	CAHS	6121 SW 68th ST	126	0.281	3
224	Station 63 Highland Oaks	Fire	1655 NE 205TH Street	107	0.281	3
225	WDC Correction Facility/Jail	Corrections	1401 NW 7 Ave	100	0.281	3
226	Gladeview Park	PROS	6815 NW 31ST AVE	116	0.288	3
227	Southern Estates Park	PROS	12199 SW 34TH ST	114	0.288	3
228	Crandon Golf Course	PROS	6700 Crandon Blvd	199	0.289	3
229	Miami Lakes Library	Library	6699 WINDMILL GATE ROAD	125	0.291	3
230	Country Club of Miami	PROS	6801 NW 186 st	154	0.291	3
231	Kendall Complex	CAHS	11025 SW 84th Street	101	0.294	3
232	West Transfer Station	Solid Waste	2900 SW 72 Avenue	168	0.294	3
233	California Club Library	Library	850 IVES DAIRY ROAD	2359	0.200	>3
234	Goulds Poolhouse	PROS	21840 SW 114 AVE # POOL	2733	0.200	>3
235	West Dade Permit & Inspection Building	ISD	11805 SW 26 Street	4337	0.200	>3
236	SWM Resources Recovery Plant	Solid Waste	6990 NW 97th ave	3398	0.200	>3
237	SWM Engineering & Environmental Division	Solid Waste	6990 NW 97th Ave	3398	0.200	>3
238	1751 N. Cruise Blvd	Seaport	1751 N. Cruise Blvd	3082	0.202	>3
239	1509 N. Cruise Blvd.	Seaport	1509 N. Cruise Blvd.	3082	0.202	>3

Exhibit B

**JOINT PARTICIPATION AGREEMENT
BETWEEN
MIAMI-DADE COUNTY
AND
FLORIDA POWER & LIGHT COMPANY**

PROVIDING FOR DEVELOPMENT OF NEXT GENERATION ENERGY PROJECTS

This Joint Participation Agreement (the “**Agreement**”) is entered into as of _____, 2018 (the “**Effective Date**”) between Miami-Dade County, a political subdivision of the State of Florida (hereinafter the “**County**”) and Florida Power & Light Company, a Florida Corporation (hereinafter “**FPL**”). The County and FPL are jointly referred to as the (“**Parties**”) and individually as a (“**Party**”).

RECITALS

WHEREAS, FPL and the County embrace a shared vision of next generation water and energy use for the citizens of the County to allow the County and FPL to lead the way forward toward the next generation of energy in the United States; and

WHEREAS, in an effort to advance the application of renewable energy and innovative technologies within the County, FPL has worked with County staff to identify a series of solar and technology initiatives within the County (collectively, the “**Next Generation Energy Projects**”); and

WHEREAS, the Parties desire to enter into this Agreement in order to advance the development of the proposed Next Generation Energy Projects.

NOW, THEREFORE, for and in consideration of these premises, the mutual undertakings and agreements herein contained and assumed, and good and valuable consideration, the receipt and sufficiency of which the Parties hereby acknowledge, and subject to the terms and conditions hereinafter set forth, the County and FPL hereby covenant and agree as follows:

ARTICLE I
DEFINITIONS

The following terms, when used herein, shall have the meanings set forth below.

“**Agreement**” has the meaning specified in the preamble hereto, and includes all exhibits, schedules, appendices attached hereto.

“**Applicable Laws**” means any and all federal, state, regional or local statutes, laws, municipal charter provisions, regulations, ordinances, rules, mandates, judgments, orders, decrees, governmental approvals, codes, licenses or permit requirements or other governmental requirements or restrictions, or any interpretation or administration of any of the foregoing by any Governmental Authority that apply to the facilities, services or obligations of either Party under this Agreement, whether now or hereafter in effect.

"Business Day" means any day on which Federal Reserve Member Banks in Miami, Florida are open for business.

"County" has the meaning specified in the preamble to this Agreement.

"Dispute" has the meaning specified in Section 7.3.

"FPSC" means the Florida Public Service Commission.

"FPL" has the meaning specified in the preamble to this Agreement.

"Governmental Authority" means any national, state, regional or local government (whether domestic or foreign), any political subdivision thereof or any other governmental, quasi-governmental, judicial, executive, legislative, administrative, public or statutory instrumentality, authority, body, agency, department, bureau or entity or any arbitrator with authority to bind a party at law.

"Institution" has the meaning specified in Section 7.8.

"Parties" has the meaning specified in the preamble to this Agreement.

"Term" has the meaning specified in Section 2.3.

ARTICLE II

PURPOSE; TERM

2.1 Purpose. This Agreement sets forth the mutually agreed to terms and conditions pursuant to which the Parties intend to develop the Next Generation Energy Projects. The Parties understand that additional discussions and negotiations with respect to the development of the Next Generation Energy Projects will be required and that neither Party will be bound to proceed with the development of the Next Generation Energy Projects unless and until mutually acceptable definitive agreements for the individual projects are negotiated, approved and executed and all regulatory conditions have been satisfied.

2.2 Next Generation Energy Projects. The Next Generation Energy Projects include the following:

- (1) Universal Solar: The development, construction, and operation of at least 223.5 MW (ac) of photovoltaic electricity generating facilities owned and operated by FPL to provide electric service to its customers, to be located within the County.
- (2) Shared Solar: The development, construction, and operation of a Shared Solar project on County owned or contributed land.
- (3) Floating Solar: The development, construction, and operation of a Floating

Solar pilot program within the County to assess the viability and challenges of this novel approach.

- (4) SolarNow: The development, construction, and operation of multiple SolarNow projects in highly-visible community spaces throughout the County.
- (5) Battery Storage: The development, construction, and operation of two battery storage projects within the County – one of which will support Metrorail systems.
- (6) Electric Vehicle Charging Stations: The development, construction, and operation of several electric vehicle charging stations at or adjacent to County buildings.
- (7) START Corridor: A “START corridor” concept to coordinate the installation of future solar, battery and electric vehicle infrastructure

2.3 Term and Right of Termination. The term of this Agreement (the “Term”) shall commence on the Effective Date and shall terminate upon execution of definitive agreements for each of the Next Generation Energy Projects; provided, either FPL or the County shall have the right to terminate this Agreement for its convenience in whole or in part at any time, and for any or no reason, upon thirty (30) days' written notice to the other Party. Upon termination of this Agreement, the Parties shall have no further obligations, duties or liabilities hereunder other than those obligations which expressly survive the termination of this Agreement.

ARTICLE III **RESPONSIBILITIES; EXPENSES**

3.1 General Responsibilities of the Parties. During the Term, each of the Parties agree to (a) make available the personnel and resources reasonably necessary to complete such Party's responsibilities hereunder, and (b) support those activities reasonably necessary to secure other components of value associated with the Next Generation Energy Projects including, without limitation, any applicable credits, offsets and environmental mitigation

3.2 Responsibilities of FPL. FPL will undertake all reasonably necessary and appropriate development activities related to designing, engineering, permitting, constructing, operating, and maintaining, the Next Generation Energy Projects (subject to obtaining sites and securing all applicable permits, administrative and budgetary approvals). FPL's activities will primarily involve the following:

3.2.1 FPL will pursue site acquisition and permitting in order to develop and construct at least 223.5 MW (ac) of Universal projects within the County.

3.2.2 FPL will file a petition with the FPSC with the objective of authorizing a Shared Solar project on real property owned by the County.

3.2.3 FPL will develop a Floating Solar pilot project within the County to assess the viability and challenges of this approach.

3.2.4 FPL will develop and construct multiple SolarNow projects in highly-visible community spaces throughout the County.

3.2.5 FPL will develop and construct multiple electric vehicle charging stations within the County.

3.2.6 FPL will work with the County on a "START corridor" concept to develop the vision for the installation of future solar, battery and electric vehicle infrastructure within the County.

3.2.7 FPL will pursue all permits, approvals, and licenses from all applicable Governmental Authorities as may be necessary for the Next Generation Energy Projects.

3.3 Responsibilities of the County. The County will undertake such reasonably necessary and appropriate activities related to supporting the development of the Next Generation Energy Projects as set forth herein. The County's activities will involve the following:

3.3.1 Identify County-owned real property suitable for potential use in conjunction with a Next Generation Energy Project or other similar solar power projects.

3.3.2 Identify real property not owned by the County and suitable to be secured by FPL for Next Generation Energy Projects.

3.3.3 Consult and coordinate with FPL to assist FPL in the design of Next Generation Energy Projects which satisfy all necessary permits, approvals, and licenses, subject to the limitations set forth in Section 7.6.

3.4 Expenses. Each Party shall bear its own costs and expenses (including fees of counsel and outside advisors) in connection with the preparation, negotiation and execution of this Agreement, in connection with performing its obligations under this Agreement, and in connection with the negotiation, authorization, execution and delivery of any definitive agreements and regulatory filings associated with the Next Generation Energy Projects.

ARTICLE IV **INFORMATION; CONFIDENTIALITY**

4.1 Access to Information. The Parties shall exercise reasonable efforts in order to provide each other data, documents, and any other information in its possession regarding the development of the Next Generation Energy Projects as reasonably necessary and pertinent to permit each Party to perform its obligations under this Agreement; provided, however, neither Party shall have any obligation to provide the other Party any information which it determines is internal confidential or proprietary information of such Party or would give the other party an advantage in any potential competitive process necessary to accomplish the goals of this Agreement or any other government purpose.

FPL acknowledges that the County, as a public entity, is subject to Florida's public records law. Said law establishes a right of access to any public record made or received in connection with the official business of any public body, except those records specifically exempted or made confidential by Florida law. The County agrees to use reasonable efforts to notify FPL of any request for disclosure. Failure of FPL to provide written objection to such disclosure within 48 hours shall be considered a waiver of any confidentiality to the requested information and consent to the disclosure. In the event FPL objects to the disclosure, FPL shall within 48 hours of notice seek an injunction restricting disclosure of the information. This provision shall survive termination of this Agreement.

ARTICLE V INDEMNIFICATION; LIMITS

5.1 FPL and the County shall each be responsible for its own facilities, for protection of its own systems, and for ensuring adequate safeguards for FPL and the County customers, and the personnel and equipment of the County and FPL. The County, to the extent permitted by law, and subject to the limitations set forth in Section 768.28, Florida Statutes, shall indemnify, defend and hold FPL harmless, and FPL shall indemnify, defend and hold the County harmless, from any and all claims, demands, costs or expenses, for loss, damage or injury to persons or property caused by, arising out of, or resulting from: (a) any act or omission by the respective Party or that Party's contractors, agents, servants and employees in connection with the development, construction or operation of that Party's facilities or systems, or the operation thereof in connection with the other Party's facilities or systems, (b) any defect in, failure of, or fault related to, a Party's facilities or systems, or (c) the negligence of the respective Party or negligence of that Party's contractors, agents, servants or employees. The respective Party shall pay all claims, costs, damages and losses in connection with (a), (b) or (c) above, and shall investigate and defend all claims, suits or actions of any kind or nature in the name of the other Party, where applicable, including appellate proceedings and shall pay all costs, judgment and attorney's fees that may issue thereon. The foregoing indemnification shall not constitute a waiver of sovereign immunity beyond the limits set forth in Section 768.28, Florida Statutes, nor shall the same be construed to constitute agreement by either Party to indemnify the other Party for such other Party's negligent, willful, or intentional acts or omissions. The provisions of this Section 5.1 shall survive termination, cancellation, suspension, completion or expiration of this Agreement.

5.2 To the fullest extent permitted by law, neither the County nor FPL, nor their respective officers, directors, agents, employees, members, parents, subsidiaries or affiliates, successors or assigns, or their respective officers, directors, agents, employees, members, parents, subsidiaries or affiliates, successors or assigns, shall be liable to the other party or their respective officers, directors, agents, employees, members, parents, subsidiaries or affiliates, successors or assigns, for claims, suits, actions or causes of action for incidental, indirect, special, punitive, multiple or consequential damages connected with or resulting from performance or non-performance of this Agreement, or any actions undertaken in connection with or related to this Agreement, including without limitation, any such damages which are based upon causes of action for breach of contract, tort (including negligence and misrepresentation), breach of warranty, strict liability, statute, operation of law, under any indemnity provision or any other theory of recovery. If no remedy or measure of damages is expressly provided herein, the obligor's liability shall be limited to direct damages only, and such direct damages shall be the sole and exclusive measure of damages and all other remedies or damages at law or in equity are waived; provided, however, that this sentence shall not apply

to limit the liability of a party whose actions giving rise to such liability constitute gross negligence or willful misconduct. The provisions of this Section 5.2 shall apply regardless of fault and shall survive termination, cancellation, suspension, completion or expiration of this Agreement. Nothing contained in this Agreement shall be deemed to be a waiver of a party's right to seek injunctive relief.

ARTICLE VI

COMPLIANCE WITH CERTAIN REQUIREMENTS

6.1 Compliance with Certain Legal Requirements. Each Party shall comply and cause its contractors and consultants to comply with Applicable Laws in performing their respective duties, responsibilities and obligations pursuant to this Agreement. The Parties shall not unlawfully discriminate in the performance of their respective duties under this Agreement. Such laws include but are not limited to the following: Miami-Dade County Resolution No. R-385-95, which creates a policy prohibiting contracts with firms violating the Americans with Disabilities Act of 1990 ("ADA") and other laws prohibiting discrimination on the basis of disability, Miami-Dade County Ordinance No. 72-82 (Conflict of Interest), Resolution No. R-1049 93 (Affirmative Action Plan Furtherance and Compliance), Resolution No. R.-185-00 (Domestic Leave Ordinance) and Ordinance No. 02-68 (Security).

6.2 Inspections. FPL acknowledges that the Office of the Miami-Dade County Inspector General ("IG") has the authority and power to review past, present and proposed County programs, accounts, records, contracts and transactions pursuant to Section 2-1076 of the Miami-Dade County Code.

ARTICLE VII

MISCELLANEOUS

7.1 Representations and Warranties. Each Party represents and warrants that (a) it is an entity duly organized, validly existing and in good standing under the laws of the jurisdiction in which it is organized and is qualified to do business in all jurisdictions where it is required to be qualified; (b) it has the necessary power and authority to enter into and perform its obligations under this Agreement; (c) it has duly authorized the person(s) signing this Agreement to execute this Agreement on its behalf; and (d) the execution and delivery of this Agreement and its performance by such Party will not violate, result in a breach of or conflict with any law, rule, regulation, order or decree applicable to such Party, its organizational documents or the terms of any other agreement binding on such Party.

7.2 Notice. All notices required under this Agreement shall be in writing unless expressly specified otherwise herein, and shall be delivered in person, by certified mail or by a nationally recognized overnight courier, return receipt requested, or by facsimile transmission or electronic mail, if an electronic mail address is provided, with confirmation by voice or automatic answer-back service promptly following such facsimile transmission or electronic mail, as specified below:

As to the County:
Carlos Gimenez, Miami-Dade County Mayor

Stephen P. Clark Center
111 N.W. 1st Street, 29th Floor
Miami, Florida 33128
Facsimile: (305) 375-3618

With a copy to:

Mayor's Designee
Stephen P. Clark Center
111 N.W. 1st Street, 29th Floor
Miami, Florida 33128
Facsimile: (305) 375-1262

Miami-Dade County Attorney
Stephen P. Clark Center
111 N.W. 1st Street, 28th Floor
Miami, Florida 33128
Facsimile: (305) 375-5634

As to FPL:

Florida Power & Light Company
700 Universe Boulevard
Juno Beach, Florida 33408
Facsimile: (561) 304-5233
Attention: Vice President of FPL Development

With a copy to:

Florida Power & Light Company
Law Department (Law/IB)
700 Universe Boulevard
Juno Beach, Florida 33408
Facsimile: (561) 691-7305
Attention: Managing Attorney-Commercial Transactions

Notices shall be effective upon receipt; provided, that in the event a Party fails to notify the other of the correct person and address for notices pursuant to Section 7.2, any notice to that Party shall be deemed effective on the third day following the date such notice is sent to the person and address last provided by such Party. Either Party may, at any time, by notice designate any different person(s) or different address(es) or phone number(s) for receipt of notices and correspondence.

7.3 Disputes. In the event of any dispute, controversy or claim between the Parties arising out of or relating to this Agreement (collectively, a "Dispute"), the applicable project managers shall attempt in the first instance to resolve such Dispute through friendly consultations between the Parties. If such consultations do not result in a resolution of the Dispute within fifteen (15) days after notice of the Dispute has been delivered to either Party,

then such Dispute shall be referred to the director of WASD and VP of FPL Development of the Parties for resolution. If the Dispute has not been resolved within twenty (20) Business Days after such referral to the Mayor's Designee and VP of FPL Development of the Parties, then either Party may pursue all available remedies. The Parties agree to attempt to promptly resolve all Disputes promptly, equitably, and in a good faith manner.

7.4 Governing Law; Submission to Jurisdiction.

7.4.1 This Agreement and the rights and the obligations of the Parties hereunder shall be construed under, and in accordance with, the laws of the State of Florida.

7.4.2 Any litigation between the Parties shall be conducted in the courts of the State of Florida in the Circuit Court for Miami-Dade County, Florida, or the United States District Court for the Southern District of Florida and the parties hereby submit to the exclusive jurisdiction of such courts. The Parties irrevocably waive any objection that any of them may now or hereafter have to the bringing of any such action or proceeding in such respective jurisdictions, including any objection to the laying of venue based on the grounds of *forum non conveniens* and any objection based on the grounds of lack of *in personam* jurisdiction.

7.4.3 In any litigation arising from or related to the Agreement, the Parties hereto each hereby knowingly, voluntarily and intentionally waive the right each may have to a trial by jury with respect to any litigation based hereon, or arising out of, under or in connection with the Agreement, or any course of conduct, course of dealing, statements (whether oral or written) or actions of either Party to the Agreement. This provision is a material inducement for the County and FPL to enter into this Agreement.

7.5 Relationship of Parties.

The Parties understand and agree that no Party is an agent, employee, contractor, vendor, representative or partner of any other Party, that (except as expressly set forth in writing) no Party shall owe a fiduciary duty to any other Party, that no Party shall hold itself out as such to third parties and that no Party is capable of binding any other Party to any obligation or liability without the prior written consent of the other Party. Neither the execution and delivery of this Agreement, nor consummation of the transactions contemplated hereby, shall create or constitute a partnership, joint venture or any other form of business organization or arrangement among the Parties.

7.6 **County as Sovereign.** It is expressly understood that notwithstanding any provision of this Agreement and the County's status thereunder:

The County retains all of its sovereign prerogatives and rights as a county under Florida laws and shall in no way be estopped from withholding or refusing to issue any approvals of applications for building, zoning, planning or development under present or future laws and regulations of whatever nature applicable to the planning, design, construction and development of the FPL Facilities or the operation thereof, or be liable for the same; and

The County shall not by virtue of this Agreement be obligated to grant FPL any approvals of applications for building, zoning, planning or development under present or future laws and ordinances of whatever nature applicable to the planning, design, construction, development and/or operation of the FPL Facilities.

Notwithstanding and prevailing over any contrary provision in this Agreement, any County covenant or obligation that may be contained herein, including but not limited to the following:

(a) to cooperate with, or provide good faith, diligent, reasonable or other similar efforts to assist FPL regardless of the purpose required for such cooperation;

(b) to execute documents or give approvals, regardless of the purpose required for such execution or approvals;

(c) to apply for or assist FPL in applying for any County, City or third party permit or needed approval; or

(d) to contest, defend against, or assist FPL in contesting or defending against any challenge of any nature;

shall not bind the Board, the Regulatory and Economic Resources Department (RER) or its successor(s) or any other County, federal or state department or authority, committee or agency to grant or leave in effect any zoning changes, variances, permits, waivers, contract amendments, or any other approvals that may be granted, withheld or revoked in the discretion of the County or other applicable governmental agencies in the exercise of its police power; and the County shall be released and held harmless, by FPL from any liability, responsibility, claims, consequential or other damages, or losses to FPL or to any third parties resulting from denial, withholding or revocation (in whole or in part) of any zoning or other changes, variances, permits, waivers, amendments, or approvals of any kind or nature whatsoever. Without limiting the foregoing, the Parties recognize that the approval of development approvals and permits will require the County to exercise its quasi-judicial or police powers. Notwithstanding any other provision of this Agreement, the County shall have no obligation to approve, in whole or in part, any application for a development entitlement. The County's obligation to use reasonable good faith efforts in the processing and obtaining of such development approvals and permits shall not extend to any exercise of quasi-judicial or police powers, and shall be limited solely to ministerial actions, including the timely acceptance and processing of any applications. Moreover, in no event shall a failure of the County to adopt any of the development approvals and permits be construed a breach or default of this Agreement.

7.7 Remedies.

7.7.1 In the event of any breach or threatened breach of this Agreement by any Party hereto, the other Party shall be entitled to equitable relief through an injunction in addition to any other rights and remedies available to it.

7.7.2 Except with respect to rights and remedies expressly declared to be exclusive in this Agreement, the rights and remedies of the Parties are cumulative and the exercise by any Party of one or more of such rights or remedies shall not preclude the exercise by it, at the same or different times, of any other rights or remedies for the same default or any other default.

7.7.3 Any failure of a Party to exercise any right or remedy as provided in this Agreement shall not be deemed a waiver by that Party of any claim for damages it may have by

reason of the default. Any waiver shall be limited to the particular right so waived and shall not be deemed a waiver of the same right at a later time or of any other right under this Agreement. Waiver by either Party of any breach of any provision of this Agreement shall not be considered as or constitute a continuing waiver or a waiver of any other breach of the same or any other provision of this Agreement.

7.8 Assignment or Sale, Etc. Neither Party may assign any of its rights or obligations under this Agreement without the prior written consent of the other Party; provided, that without the prior consent of FPL, the County may assign its rights and interests under this Agreement to a financial institution (the "Institution") as collateral security, or create a security interest in favor of the Institution over its rights and interests in this Agreement. Any attempt by a Party to make any assignment, sale, lease, transfer or other disposition described in this Section 7.8 in violation of this Section 7.8 shall be void ab initio and shall not be effective.

7.9 Amendments. This Agreement shall not be amended or modified, and no waiver of any provision hereof shall be effective, unless set forth in a written instrument authorized and executed by the Parties. This Agreement, as it may be amended from time to time, shall be binding upon, and inure to the benefit of, the Parties' respective successors-in-interest and permitted assigns.

7.10 Survival. The obligations, rights, and remedies of the Parties hereunder, which by their nature survive the termination of this Agreement, shall survive such termination and inure to the benefit of the Parties.

7.11 Construction of Agreement. The Parties expressly agree that no provision of this Agreement should be construed against or interpreted to the disadvantage of any Party by any court or other governmental or judicial authority by reason of such Party having been deemed to have structured or dictated such provision.

7.12 Complete Agreement. This Agreement is intended as the complete and exclusive statement of the agreement with respect to the subject matter hereof between the Parties. Parol or extrinsic evidence shall not be used to vary or contradict the express terms of this Agreement and recourse may not be had to alleged prior drafts, negotiations, prior dealings, usage of trade, course of dealing or course of performance to explain or supplement the express terms of this Agreement. Except as specifically set forth in this Agreement, there shall be no warranties, representations or other agreements among the Parties in connection with the subject matter hereof.

7.13 Counterparts. This Agreement may be executed and delivered in counterparts, and may be delivered by facsimile transmission.

7.14 Integration. The terms and provisions contained in this Agreement constitute the entire agreement between the Parties with respect to the subject matter hereof. This Agreement supersedes and terminates all previous undertakings, representations and agreements, both oral and written, between the Parties with respect to the Next Generation Energy Projects.

7.15 General Interpretive Provisions. Whenever the context may require, terms used in this Agreement shall include the singular and plural forms, and any pronoun shall include the corresponding masculine and feminine forms. The term "including", whenever used in any provision of this Agreement, means including but without limiting the generality of any

(description preceding or succeeding such term. Each reference to a Person shall include a reference to such Person's successors and assigns. All references to "Sections" shall be references to the Sections to this Agreement, except to the extent that any such reference specifically refers to another document. Each of the Parties has agreed to the use of the particular language of the provisions of this Agreement and any questions of doubtful interpretation shall not be resolved by any rule or interpretation against the draftsman.

7.16 Absence of Third-Party Beneficiaries. Nothing in this Agreement, express or implied, is intended to (a) confer upon any person other than the Parties and their permitted successors and assigns any rights or remedies under or by reason of this Agreement as a third-party beneficiary or otherwise except as specifically provided in this Agreement; or (b) authorize anyone not a party to this Agreement to maintain an action pursuant to or based upon this Agreement.

7.17 Headings. Captions and headings in this Agreement are included for ease of reference only and do not constitute a part of this Agreement and shall not affect the meaning or interpretation of any provisions herein.

7.18 Time of Essence. Time is of the essence with respect to the performance of each of the covenants and obligations contained in this Agreement.

[signatures on following page]

IN WITNESS WHEREOF, the COUNTY and FPL, by their duly authorized officials, have executed this Agreement as of the day and year above.

ATTEST:

MIAMI-DADE COUNTY

By: _____
Clerk (Seal)

By: _____
County Mayor

ATTEST:

FLORIDA POWER & LIGHT COMPANY

By: Alene D. Alank
Witness

By: [Signature]
Name: Eric Silagy
Title: President and CEO, Florida Power & Light

Approved as to form
and legal sufficiency:

Assistant County Attorney