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March 1, 2019

-VIA ELECTRONIC FILING -

Adam Teitzman
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 20190001-EI

Dear Mr. Teitzman:

I attach for electronic filing in the above referenced docket (i) Florida Power & Light Company's ("FPL") Petition for Approval of Solar Base Rate Adjustment To Be Effective 2020; and (ii) the prepared testimony and exhibits of FPL witnesses William F. Brannen and Juan E. Enjamio in support of the Solar Base Rate Adjustment.

Please contact me if you have or your Staff has any questions regarding this filing.

Sincerely,

s/ Maria J. Moncada
Maria J. Moncada

Attachments
cc: Counsel for Parties of Record (w/attachments)

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Fuel and purchase power cost recovery clause with generating performance incentive factor	Docket No: 20190001-EI Date: March 1, 2019

FLORIDA POWER & LIGHT COMPANY'S PETITION FOR APPROVAL OF SOLAR BASE RATE ADJUSTMENT TO BE EFFECTIVE 2020

Florida Power & Light Company ("FPL" or the "Company"), pursuant to the Stipulation and Settlement approved by this Commission in Order No. PSC-16-0560-AS-EI, dated December 15, 2016 (the "FPL Rate Settlement" or "Settlement"), hereby requests that the Florida Public Service Commission ("Commission") find that the proposed new solar generation described herein satisfies the requirements for a solar base rate adjustment ("SoBRA"). The proposed solar generation, which consists of four universal solar energy centers scheduled to be placed in service by May 1, 2020 (the "2020 Project"), meets the cost requirements established in the FPL Rate Settlement and is cost-effective. FPL further requests that the Commission authorize FPL to implement a SoBRA upon the commercial operation date of the 2020 Project.

In support of the Petition, FPL states as follows:

1. The name and address of the Petitioner is:

   Florida Power & Light Company
   700 Universe Boulevard
   Juno Beach, Florida 33408

Any pleading, motion, notice, order or other document required to be served upon the petitioner or filed by any party to this proceeding should be served upon the following individuals:

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2. The Commission has jurisdiction pursuant to Sections 366.04, 366.05 and 366.06, Florida Statutes.

3. FPL is a corporation organized and existing under the laws of the State of Florida and is an electric utility as defined in section 366.02(2), Florida Statutes.

4. This Petition is being filed consistent with Rule 28-106.201, Florida Administrative Code. The agency affected is the Florida Public Service Commission, located at 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399. This case does not involve reversal or modification of an agency decision or an agency's proposed action. Therefore, subparagraph (c) and portions of subparagraphs (b), (e), (f) and (g) of subsection (2) of that rule are not applicable to this Petition. In compliance with subparagraph (d), FPL states that it is not known which, if any, of the issues of material fact set forth in the body of this Petition may be disputed by any others who may plan to participate in this proceeding. The discussion below demonstrates how the petitioner's substantial interests will be affected by the agency determination.

5. Pursuant to the FPL Rate Settlement, FPL may construct up to 300 megawatts ("MW") of solar photovoltaic ("PV") generation annually through 2020. To the extent that FPL receives approval for less than 300 MW in a year, the surplus capacity can be carried over to the succeeding years. FPL is authorized to recover the costs of the solar generation project through a SoBRA when the generation is placed in service if the project is determined to be cost-effective and the costs are reasonable and do not exceed $1,750 per kilowatt alternating current ("kW_{AC}"). The Settlement provides that the issues for determination are limited to (i) the cost effectiveness of the project, (ii) the amount of revenue requirements and (iii) the appropriate percentage increase in base rates needed to collect the estimated revenue requirements.

6. Pursuant to this mechanism, FPL has constructed three cost-effective 298-MW-solar projects: one entered service in 2017, another one entered service in 2018, and the most recent one commenced commercial operation January 31, 2019. *See* Order Nos. PSC-2018-0028-FOF-EI and PSC-2018-0610-FOF-EI. As contemplated by the FPL Rate Settlement, the Company is undertaking construction of four additional centers totaling 298 MW that will be placed into commercial operation in 2020, each one generating enough energy to serve the annual energy needs of about 14,500 homes. Accordingly, FPL files this Petition, along with the testimony and exhibits of William Brannen and Juan Enjamio, to demonstrate that the costs of the 2020 Project are reasonable and fall well below $1,750 per kW_{AC} and that adding this solar generation to FPL's system is cost-effective. FPL will include in its projection filing in this docket (scheduled to be filed September 3, 2019) testimony to support the revenue requirement and appropriate percentage increase in base rates associated with the 2020 Project.

The 2020 Universal Solar Energy Centers

Technology and Equipment

7. The 2020 Project is comprised of four solar energy centers scheduled to enter commercial operation by May 1, 2020. Those centers are: (i) Hibiscus (located in Palm Beach County), (ii) Okeechobee (located in Okeechobee County), (iii) Southfork (located in Manatee County) and (iv) Echo River (located in Suwannee County). Collectively, these sites will generate a total of 298 MW_{AC} (nameplate capacity). The designs described in this Petition and in the accompanying testimony are not yet final but rather reflect base-line designs. FPL will continue to evaluate optimization opportunities, with the final designs differing from that presented in this filing only if the changes are projected to result in greater customer benefits.

8. At each center, FPL will install highly efficient PV panels that convert sunlight to direct current ("DC") electricity. In total, about 1.1 million PV panels will be installed. The panels will be tied together electrically in groups and connected to an electronic device called a power conversion unit ("PCU"), which includes inverters that transform the DC electricity produced by the PV panels into alternating current ("AC") electricity. As described by FPL witness Brannen, the DC-to-AC ratio for the energy centers that comprise the 2020 Project will range from 1.45 to 1.50, depending on design considerations and site features. The high quality equipment and design selection result in high levels of output and reliability that will benefit customers.

9. Each center will have its own point of interconnection. At three of the centers - Hibiscus, Southfork and Echo River – FPL will construct new collection substations with power step-up transformers that will increase the AC voltage from 34.5 kV to the voltages at the transmission point of interconnect. These new collection substations will be connected to the

bulk transmission system at the corresponding point of interconnection by generation tie lines less than one tenth of mile in length.

10. The Okeechobee solar energy center will interconnect indirectly to FPL's transmission system through the Okeechobee Clean Energy Center ("OCEC"). A new step-down transformer will decrease the AC collection system voltage from 34.5 kV to 26 kV, which is the operating voltage of the low side of the step-up transformer for one of the OCEC combustion turbine generators. The step-down transformer connects to FPL's bulk transmission system.

11. No upgrades to the existing FPL bulk transmission system are required to accommodate the proposed solar generation at any of the solar energy centers.

Capital Costs

12. The projected overall cost for the 2020 Project is $410.7 million or $1,378/$kW_{AC}$. The cost for each center ranges from $1,339/$kW_{AC}$ to $1,407/$kW_{AC}$.

13. All of the costs for surveying, engineering, equipment, materials and construction services were established through competitive bidding processes specific to the 2020 Project. Specifically, FPL solicited proposals for the supply of the PV panels, PCUs and power step-up transformers, as well as the engineering, procurement and construction for the solar facilities, substations and interconnection facilities. FPL has secured the lowest-cost qualified bidders for each of these components.

The 2020 Project is Cost-Effective

14. The FPL Rate Settlement provides that SoBRA-eligible projects must be cost-effective, and it defines cost-effective as having a lower projected system cumulative present value revenue requirement ("CPVRR") with the project compared to the system CPVRR without

it. As explained more fully by FPL witness Enjamio, adding the 2020 Project's 298 MW_{AC} of solar generation to FPL's fleet is cost-effective.

15. To evaluate cost-effectiveness, FPL compared a resource plan that excludes the 2020 Project to a plan that includes it: the "No 2020 Project Plan" and the "2020 Project Plan," respectively. Both plans use the same major system assumptions, including the Company's load, fuel price and carbon dioxide ("CO_2") price forecasts, the same forecasts that will be used in FPL's 2019 Ten Year Site Plan. The "No 2020 Project Plan" includes only the solar generation already in service through February 2019, and the solar units that will comprise FPL's voluntary shared solar program.[1] The "No 2020 Project Plan" assumes that future resource needs are met by batteries, combustion turbines and combined cycle units. The "2020 Project Plan" adds the four solar energy centers that comprise the 2020 Project. Because the solar PV installations – existing and future – are assumed to provide firm capacity, adding the 2020 Project eliminates the need to add a 100 MW battery on FPL's system in 2020.

16. Based on the assumptions for each Plan, FPL determined the variable system costs, consisting primarily of fuel, variable operations & maintenance ("O&M") and emissions, using the hourly production costing model, UPLAN. The output of each UPLAN modeling run is imported into FPL's Fixed Cost Spreadsheet ("FCSS") Model, which adds fixed costs such as capital, capital replacements and fixed O&M. The FCSS model was used to calculate the CPVRR for each resource plan. To determine the cost impact of the proposed solar generation, FPL subtracted the CPVRR of the "No 2020 Project Plan" from the CPVRR of the "2020 Project Plan."

[1] FPL will separately file a petition detailing its proposed voluntary shared solar program, which will be known as SolarTogether - An FPL Shared Solar Program.

17. Based on the economic analysis, the 2020 Project is projected to be cost-effective. FPL customers are projected to save $26 million CPVRR.

Additional Benefits of the 2020 Project

18. The addition of the 2020 Project also provides non-economic advantages in the form of system, environmental and community benefits.

19. *System and environmental benefits*. The solar energy from the 2020 Project will displace fossil fuel generation at a level that is equivalent to removing approximately 54,000 cars from the road annually. More specifically, on an average annual basis, the Project is projected to reduce the use of natural gas by 4,734 million cubic feet and the use of coal by 459 tons. The reduced use of fossil fuel will, in turn, reduce CO_2 emissions by an average of 281,000 tons annually. Sulfur dioxide ("SO_2") and nitrogen oxide ("NO_x") emissions also are projected to decline by an annual average of 1 ton and 29 tons, respectively.

20. *Community benefits*. Construction of the 2020 Project will create about 800 jobs in total, providing an economic boost to local businesses. This construction in Florida will increase annual tax revenue for the counties where the sites are situated, thus contributing to the funding of public services that benefit those communities.

Conclusion

21. The 2020 Project satisfies the SoBRA cost requirements established in the FPL Rate Settlement and is projected to generate customer savings as well as system and environmental benefits. The estimated cost of the 2020 Project falls well below $1,750 per kW_{AC} and is reasonable, with FPL having solicited bids for the major equipment components, as well as the engineering and construction. Further, adding the 2020 Project to FPL's system is estimated to save customers approximately $26 million CPVRR and will improve FPL's fuel

diversity. Finally, it will also reduce CO_2, SO_2 and NO_x emissions, providing cleaner air for all Florida residents to enjoy for years to come.

22. Accordingly, the Commission should enter a final order determining that FPL's 2020 Project satisfies the requirements for SoBRA approval set forth in the FPL Rate Settlement and authorizing FPL to recover the annualized revenue requirements for the 2020 Project when it enters commercial operation. The amount of revenue requirements and the appropriate percentage increase in base rates needed to collect the estimated revenue requirements will be presented in FPL's subsequent projection filing in this docket.

WHEREFORE, for the foregoing reasons and as more fully set forth in the supporting testimony and exhibits filed with and incorporated in this Petition, Florida Power & Light Company requests that the Commission authorize FPL to implement a solar base rate adjustment when the 2020 Project enters commercial service.

Respectfully submitted,

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By: *s/ Maria Jose Moncada*
Maria Jose Moncada
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CERTIFICATE OF SERVICE
Docket No. 20190001-EI

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished by electronic service on this 1st day of March 2019 to the following:

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By: *s/ Maria Jose Moncada*
Maria Jose Moncada

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

TESTIMONY OF JUAN E. ENJAMIO

DOCKET NO. 20190001-EI

MARCH 1, 2019

Q. Please state your name and business address.

A. My name is Juan E. Enjamio. My business address is Florida Power & Light Company, 700 Universe Boulevard, Juno Beach, Florida 33408.

Q. By whom are you employed and what is your position?

A. I am employed by Florida Power & Light Company ("FPL" or the "Company") as Manager of Analytics in the Finance Department.

Q. Please describe your educational background and professional experience.

A. I graduated from the University of Florida in 1979 with a Bachelor of Science degree in Electrical Engineering. I joined FPL in 1980 as a Distribution Engineer. Since my initial assignment at FPL, I have held positions as a Transmission System Planner, Power System Control Center Engineer, Bulk Power Markets Engineer, Supervisor of Transmission Planning, Supervisor of Supply and Demand Analysis, and Supervisor of Integrated Analysis – Resource Planning. In 2014, I became Manager of Analytics – Finance Department.

Q. Please describe your duties and responsibilities in your current position.

A. In my current position as Manager of Analytics, I am responsible for the management and coordination of economic analyses of alternatives to meet FPL's resource needs and maintain system reliability.

Q. Are you sponsoring an exhibit in this case?

A. Yes. I am sponsoring the following exhibits which are attached to my direct testimony:

- JE-1 Load Forecast
- JE-2 FPL Fuel Price Forecast
- JE-3 FPL Resource Plans
- JE-4 CPVRR – Costs and (Benefits)

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to present FPL's economic analysis which shows that 298 megawatts alternating current ("MW_{AC}") of universal solar photovoltaic ("PV") generation, scheduled to be placed in service in early 2020 (the "2020 Project"), is cost-effective. My testimony covers several areas. First, I briefly describe the 2020 Project. FPL's witness Brannen provides a more detailed description in his testimony. Second, I discuss the major assumptions and the methodology used to perform the economic analysis. Third, I present the results of the economic analysis demonstrating that the addition of 298 MW_{AC} of solar PV generation is projected to be cost-effective. Lastly, I discuss non-economic benefits derived from the construction and operation of these facilities.

Q. Please summarize your testimony.

A. FPL is proposing the construction and operation of 298 MW_{AC} of solar PV generation, consisting of one construction project made up of four universal solar energy centers, which are expected to be in-service by May 1, 2020. FPL performed an economic analysis and determined that the 2020 Project is projected to result in a reduction in the cumulative present value of revenue requirements ("CPVRR") to FPL customers, for a total savings of approximately $26 million. In addition, these centers are also projected to result in a significant reduction in air emissions, primarily carbon dioxide ("CO_2") resulting from a reduction in the projected use of fossil fuels, which will in turn lower FPL's system reliance on generation fueled by natural gas. The 2020 Project is projected to be cost-effective, as required to qualify for a Solar Base Rate Adjustment ("SoBRA") under FPL's 2016 Rate Case Settlement approved by the Commission in Order No. PSC-16-0560-AS-EI.

Q. Please describe the 2020 Project.

A. The 2020 Project comprises four centers with a total nameplate capacity of 298 MW_{AC}, which will be constructed and is expected to be placed in service by May 1, 2020. On average, these centers will have a capacity factor of 28.7% and generate 190,000 MWh in a year. This is enough energy to serve the annual energy needs of about 14,500 homes. FPL witness Brannen describes each center in greater detail and demonstrates that the cost for the proposed solar generation is reasonable, and falls well below the $1,750 per kilowatt alternating current threshold established in the 2016 Rate Case Settlement.

Q. What are the major system assumptions used in this study?

A. The major assumptions used in this study are the following:

- **Load Forecast –** The analysis use**s** FPL's most recent long-term load forecast, approved as FPL's official load forecast in December 2018. This load forecast, including system peaks and net energy for load, will be used in FPL's 2019 Ten Year Site Plan ("TYSP") and is shown in Exhibit JE-1;
- **Fuel Price Forecast –** The analysis uses FPL's most recent long-term fuel forecast, based on FPL's standard long-term fuel forecasting methodology, approved as FPL's official fuel price forecast in December 2018. This fuel price forecast will be used in FPL's 2019 TYSP and is shown in Exhibit JE-2;
- **CO_2 Emission Price Forecast -** The CO_2 cost projections used in this filing are based on ICF's proprietary CO_2 compliance costs forecast dated November 2018. ICF is a consulting firm with extensive experience in forecasting the cost of complying with the regulation of air emissions and is recognized as one of the industry leaders in this field. This forecast, which assumes that CO_2 compliance costs will start in the year 2026, will be used in preparing FPL's 2019 TYSP. FPL has utilized ICF's CO_2 emission price forecast in preparing its resource plans since 2007, including the economic analyses presented in the need determination dockets for the Okeechobee Clean Energy Center (Docket No. 150196-EI) and Dania Beach Clean Energy Center

(Docket No. 20170225-EI), previous SoBRA filings (Docket Nos. 20170001-EI and 20180001-EI), and the Nuclear Cost Recovery proceedings (e.g., Docket Nos. 20150009-EI and 20160009-EI).

Q. Please describe the resource plans that formed the basis for FPL's cost-effectiveness analysis.

A. For purposes of this filing, FPL developed two resource plans. In the first resource plan, called the "No 2020 Project Plan," no new solar facilities are assumed beyond the 2019 SoBRA Project except the solar facilities that will comprise FPL's voluntary shared solar program.[1] In this resource plan, future resource needs are met by batteries, combustion turbines, and combined cycle units.

The second resource plan, called the "2020 Project Plan," adds the 2020 Project. As a result of adding the 2020 Project, a 100 MW battery in 2020 is no longer needed.

These two resource plans are shown in Exhibit JE-3.

Q. How did FPL determine the firm capacity that solar facilities will provide?

[1] FPL will separately file a petition detailing its proposed voluntary shared solar program, which will be known as *SolarTogether - An FPL Shared Solar Program* ("FPL SolarTogether"). This program will consist of 1,490 MW of solar generation. The first FPL SolarTogether project is expected to be placed in service in the first quarter of 2020, and the remaining FPL SolarTogether projects are expected to be placed in service in the fourth quarter of 2020 and the first quarter of 2021.

A. Firm capacity value is based on the expected output of a solar facility at the time of summer peak load, which typically occurs in August from 4 p.m. to 5 p.m., and winter peak load, which typically occurs in January from 7 a.m. to 8 a.m. FPL applies this same methodology to all of its solar PV facilities, existing or new.

The 2020 centers are projected to have an average summer firm capacity value of 61% of their nameplate rating. Therefore, the four centers, with a total nameplate capacity of 298 $MW_{AC,}$ are assumed to have a total firm capacity of 182 MW_{AC} at the time of summer peak. These solar installations are assumed to have zero firm capacity value at the time of winter peak due to FPL's winter peak occurring in the early morning, when there is little or no solar generation output.

Q. Please provide an overview of the analytical process that FPL used to determine the cost-effectiveness of the 2020 Project.

A. FPL used the hourly production costing model UPLAN to forecast the system economics and compare resource plans that include or exclude the 2020 Project. This model has been used by FPL in prior proceedings at the Commission including each of its previous petitions for SoBRA approval. Each UPLAN modeling run is used to determine generation system costs, consisting primarily of fuel costs, variable O&M costs, and emissions costs for a given resource plan. The output of each of the UPLAN model runs is then imported into FPL's Fixed Cost Spreadsheet ("FCSS") Model, which

adds fixed costs such as capital costs, capital replacements costs, and fixed O&M costs. The FCSS Model is used to determine the CPVRR for each resource plan.

Q. Please provide the result of the economic analysis.

A. To determine the CPVRR impact of the proposed solar generation, FPL subtracted the CPVRR of the "No 2020 Project Plan" from the CPVRR of the "2020 Project Plan". As shown in Exhibit JE-4, the CPVRR benefit to FPL customers from the 2020 Project is projected to be approximately $26 million.

Q. Will the 2020 Project reduce FPL's use of fossil fuel?

A. Yes. The 2020 Project is expected to reduce the annual average use of natural gas by 4,734 million cubic feet, and the use of coal by 459 tons. By adding the 2020 Project to its generation fleet, FPL reduces its reliance on these fossil fuels.

Q. What effect will these solar energy centers have with respect to greenhouse gases and other air emissions?

A. Reducing the use of fossil fuel is projected to result in an average annual reduction of 281,000 tons of global warming gases, specifically CO_2. This reduction in CO_2 is equivalent to removing approximately 54,000 cars from the road. Sulfur dioxide and nitrogen oxide emissions are projected to be reduced by an annual average of 1 ton and 29 tons, respectively.

Q. What is your conclusion regarding the 2020 Project?

A. As demonstrated by the economic analysis described in my testimony, the addition of the 2020 Project is projected to result in CPVRR savings of

approximately $26 million. Therefore, the 2020 Project meets the SoBRA cost-effectiveness requirement established in the 2016 FPL Rate Case Settlement. Additionally, the 2020 Project is projected to reduce the use of fossil fuel, reduce air emissions, and reduce FPL's reliance on natural gas.

Q. Does this conclude your testimony?

A. Yes.

Load Forecast
December 2018

Year	Summer Peak MW	Winter Peak MW	Net Energy for Load MWh
2020	24,507	19,904	122,284,248
2021	24,668	20,264	122,369,658
2022	24,837	20,255	122,330,746
2023	25,173	20,528	122,680,361
2024	25,583	20,775	123,864,043
2025	25,939	20,932	124,440,227
2026	26,380	21,150	125,429,987
2027	26,867	21,374	126,520,149
2028	27,363	21,623	127,940,788
2029	28,008	21,889	128,967,611
2030	28,691	22,153	130,367,909
2031	29,254	22,404	131,675,941
2032	29,833	22,653	133,326,250
2033	30,407	22,900	134,288,370
2034	30,974	23,145	135,498,214
2035	31,542	23,388	136,706,457
2036	32,109	23,630	138,063,532
2037	32,657	23,871	138,932,635
2038	33,228	24,110	140,133,040
2039	33,804	24,349	141,312,242
2040	34,382	24,586	142,843,906
2041	34,771	24,825	144,980,773
2042	35,161	25,063	146,449,887
2043	35,554	25,301	147,916,439
2044	35,948	25,540	149,764,613
2045	36,344	25,779	150,844,643
2046	36,741	26,018	152,304,156
2047	37,139	26,258	153,765,649
2048	37,540	26,498	155,583,773
2049	37,943	26,738	156,652,695
2050	38,347	26,978	158,122,734

FPL Fuel Price Forecast
December 2018

Year	FGT Firm Gas ($/MMBTU)	Gulfstream Firm Gas ($/MMBTU)	Sabal Trail Firm Gas ($/MMBTU)	Residual Oil ($/MMBTU)	Distillate Oil ($/MMBTU)	Scherer 4 Coal Price ($/MMBTU)
2020	2.74	2.67	2.74	10.92	14.10	2.59
2021	2.71	2.64	2.72	12.27	15.61	2.65
2022	2.80	2.73	2.80	11.31	14.65	2.72
2023	3.02	2.95	3.01	10.83	14.62	2.80
2024	3.37	3.29	3.35	11.01	15.02	2.86
2025	3.68	3.60	3.65	11.64	15.54	2.93
2026	3.98	3.91	3.95	11.93	15.84	3.00
2027	4.19	4.11	4.15	12.17	16.12	3.06
2028	4.37	4.29	4.33	12.40	16.39	3.13
2029	4.54	4.46	4.49	12.65	16.71	3.19
2030	4.68	4.60	4.63	12.93	17.02	3.25
2031	4.80	4.72	4.75	13.18	17.33	3.31
2032	4.92	4.83	4.86	13.40	17.65	3.38
2033	5.02	4.94	4.97	13.64	17.98	3.45
2034	5.13	5.05	5.07	13.87	18.31	3.52
2035	5.23	5.15	5.17	14.11	18.67	3.60
2036	5.34	5.25	5.27	14.36	19.01	3.67
2037	5.44	5.35	5.37	14.62	19.35	3.75
2038	5.54	5.45	5.47	14.88	19.70	3.83
2039	5.65	5.56	5.58	15.14	20.06	3.91
2040	5.76	5.67	5.68	15.42	20.42	3.99
2041	5.82	5.73	5.75	15.49	20.45	4.08
2042	5.88	5.79	5.81	15.56	20.48	4.18
2043	5.95	5.86	5.87	15.63	20.51	4.27
2044	6.01	5.92	5.93	15.70	20.54	4.36
2045	6.08	5.99	6.00	15.78	20.57	4.46
2046	6.14	6.05	6.06	15.85	20.60	4.55
2047	6.21	6.12	6.13	15.92	20.64	4.65
2048	6.28	6.19	6.19	16.00	20.67	4.75
2049	6.35	6.26	6.26	16.07	20.70	4.85
2050	6.42	6.32	6.33	16.14	20.73	4.95

Resource Plans - Units Added

Year	No 2020 Project Plan	2020 Project Plan
2020	447 MW Solar Together; 100 MW Battery	2020 Project (298 MW); 447 MW FPL SolarTogether
2021	1,043 MW FPL SolarTogether	1,043 MW FPL SolarTogether
2022	Dania Beach Energy Center, 469 MW Manatee battery, Manatee 1-2 retire,	Dania Beach Energy Center, 469 MW Manatee battery, Manatee 1-2 retire,
2023	Greenfield 469 MW CT Unit	Greenfield 469 MW CT Unit
2024	Greenfield 1,886 MW CC Unit	Greenfield 1,886 MW CC Unit
2025		
2026		
2027		
2028	Greenfield 1,886 MW CC Unit	Greenfield 1,886 MW CC Unit
2029		
2030	Greenfield 704 MW CT Unit	Greenfield 704 MW CT Unit
2031	Equalizing 266 MW CC Unit	Equalizing 180 MW CC Unit

CPVRR - Costs and (Benefits)

Solar Revenue Requirements		**Non-Solar (Avoided) Generation Costs**				**Avoided System Costs**			
Generation Capital (Millions)	Fixed O&M (Millions)	Generation Capital (Millions)	Fixed O&M (Millions)	Transmission Interconnection (Millions)	Capital Replacement (Millions)	System Net Fuel (Millions)	Startup + VOM (Millions)	Emission (Millions)	Total CPVRR (Millions)
$402	$20	($79)	($15)	($2)	($4)	($323)	($6)	($20)	**($26)**

* Negative ( ) indicates savings to FPL customers

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

TESTIMONY OF WILLIAM F. BRANNEN

DOCKET NO. 20190001-EI

MARCH 1, 2019

Q. Please state your name and business address.

A. My name is William F. Brannen. My business address is NextEra Energy Resources, LLC ("NEER"), 700 Universe Boulevard, Juno Beach, Florida, 33408.

Q. By whom are you employed and what is your position?

A. I am employed by NEER as a Senior Director for Project Engineering and Due Diligence.

Q. Please describe your duties and responsibilities in that position.

A. I manage the development and implementation of engineering, technology selection, and execution strategies for universal solar and distributed generation projects for NextEra Energy, Inc., the parent of Florida Power & Light Company ("FPL") and NEER. I am responsible for coordinating the activities of project team members to optimize the value of projects by leveraging technology advances, market dynamics, and supplier relationships during the early stage due diligence, permitting, engineering, and execution phases of these projects. My goal is to ensure that development projects meet or exceed reliability and performance requirements while maintaining reasonable costs.

Q. Please describe your education and professional experience.

A. I earned both a Bachelor and Master of Science in Civil Engineering from the University of New Hampshire. Additionally, I hold a Master of Business Administration from Nova Southeastern University. I have been a licensed professional engineer in the State of Florida since 1981. I have worked for FPL and NEER since 1979. During that time, I have held a variety of technical, operational, commercial, and management positions in areas related to power generation, engineering, and construction. I have experience in a wide range of power generation technologies including nuclear, combined cycle, wind and approximately 3,376 MW of photovoltaic ("PV") and concentrated solar thermal facilities. Since 2009, I have been responsible for key aspects of the design and construction of all eighteen of FPL's universal solar energy centers. The total capacity of these centers is approximately 1,228 MW, which is made up of one 75 MW solar thermal facility and approximately 1,153 MW of PV generation at seventeen solar energy centers. In addition to these FPL facilities, I have served the same function for 350 MW of solar thermal generation in California and Spain, as well as approximately 2,200 MW of universal solar PV generation throughout North America outside of Florida.

Q. What is the purpose of your testimony?

A. The purpose of my direct testimony is three-fold. First, I discuss FPL's experience designing, building, and operating universal solar. Second, I describe the four universal solar energy centers, which are currently under construction and expected to begin commercial operation by April 30, 2020

("2020 Project"). I provide a description of the centers, the technology, engineering design parameters, construction, operating characteristics, and overall costs and schedules. Third, I demonstrate that the cost of the components, engineering, and construction estimated for the 2020 Project is reasonable and falls well below $1,750 per kilowatt alternating current ("kW_{AC}"), the cost cap approved by the Commission as part of FPL's 2016 rate case settlement.

Q. Please summarize your testimony.

A. My testimony demonstrates that the estimated cost to build the 2020 Project -- $1,378/$kW_{AC}$ – is reasonable and falls well below the $1,750 per kW_{AC} cost cap. Additionally, I testify that the universal solar energy centers will deliver high levels of efficiency and reliability to serve FPL customers.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring Exhibits WFB-1 through WFB-6. The title to each exhibit is shown below, and they are all attached to my direct testimony.

Exhibit WFB-1	List of FPL Universal PV Solar Energy Centers in Service
Exhibit WFB-2	Typical Solar Energy Center Block Diagram
Exhibit WFB-3	Renderings of 2020 Solar Energy Centers
Exhibit WFB-4	Specifications for 2020 Solar Energy Centers
Exhibit WFB-5	Property Delineations, Features and Land Use of 2020 Solar Energy Centers
Exhibit WFB-6	Construction Schedule for 2020 Solar Energy Centers

Q. Does FPL have experience in designing and building universal PV solar facilities?

A. Yes. FPL's extensive experience designing and building universal solar generation facilities places it among the leaders in the U.S. Since 2009, FPL has completed seventeen universal solar centers totaling approximately 1,153 MW_{AC}. The existing FPL universal solar energy centers range in size from 10 MW_{AC} to 74.5 MW_{AC}. Exhibit WFB-1 provides a list of the FPL universal solar energy centers in service.

Q. Please describe FPL's track record building universal solar PV.

A. The seventeen PV universal solar energy centers constructed and placed into operation by FPL were completed an average of 29 days early, at a total cost of $1.85 billion, about 4.6% or nearly $90 million below the cumulative budget. In addition, each center was completed at or below budget.

Q. Please describe FPL's history of operating universal solar generation.

A. FPL has been operating universal solar generation since 2009. Over that time, FPL developed and continues to improve advanced monitoring technology and performance analysis tools. These tools optimize plant operations, drive process efficiencies, and facilitate the deployment of technical skills as demand for services grows. For example, the Company's Fleet Performance and Diagnostics Center ("FPDC") in Juno Beach, Florida, provides FPL with the capability to monitor every plant in its system. The FPDC uses advanced technology to identify potential problems earlier than traditional detection methods, which allows the operating teams the opportunity to prevent or

mitigate the effects of failures. FPL compares the performance of like components on similar generating units and determines how to make improvements, which often prevents problems before they would otherwise occur resulting in improved service reliability for FPL customers. Live video links can be established between the FPDC and plant control centers to immediately discuss challenges that may arise, thus enabling FPL to prevent, mitigate, or solve problems.

Additionally, in 2017 FPL established a Renewable Operations Control Center ("ROCC") to serve as the centralized remote operations center for all FPL PV solar and energy storage facilities. The ROCC provides a mechanism to efficiently manage daily work activities and ensure effective deployment of best operating practices at all of FPL's renewable energy centers.

The FPL team has leveraged these capabilities along with its broad range of experience to develop robust and industry-leading operating plans that deliver high levels of reliability and availability at low cost. Each of the solar energy centers that FPL has placed in operation since 2009 is meeting or exceeding performance expectations.

Q. Please identify the centers that comprise the 2020 Project.

A. FPL will place four solar energy centers in service by May 1, 2020. These are the Hibiscus Solar Energy Center in Palm Beach County, the Okeechobee Solar Energy Center in Okeechobee County, the Southfork Solar Energy Center in

Manatee County, and the Echo River Solar Energy Center in Suwannee County. Each center will have a nameplate capacity of 74.5 MW_{AC}. Exhibits WFB-2, WFB-3, WFB-4 and WFB-5 more fully describe and depict the centers.

Q. Has FPL finalized the site layouts and designs for the solar centers?

A. Not at this time. FPL used base-line designs to establish the cost and performance projections for the centers. However, FPL is continuing to evaluate potential optimization opportunities. Both my testimony and the analysis presented in witness Enjamio's testimony are predicated on the base-line designs. Details of the final designs for the solar centers would differ from the base-line only if such changes result in a greater benefit to FPL's customers.

Q. Please describe the solar PV generation technology that FPL plans to use.

A. The 2020 Project will utilize a combination of approximately 550,000 silicon crystal and 566,000 thin-film solar PV panels that convert sunlight to direct current ("DC") electricity. These panels will have an average conversion efficiency of approximately 18.6%. This simply means that 18.6% of the solar energy reaching the surface of the panels is converted into DC electrical energy. The average efficiency of the panels that will be used on the 2020 Project is among the highest for universal solar applications in the U.S. market and is even higher than the efficiency for the panels used in FPL's 2017, 2018, and 2019 solar projects.

The panels will be mounted on fixed-tilt support structures at the Okeechobee and Hibiscus centers and on tracking support structures at the Echo River and

Southfork centers. The panels will be linked together in groups, with each group connected to an inverter, which transforms the DC electricity produced by the PV panels into alternating current ("AC") electricity. The voltage of AC electricity coming out of each inverter is increased by a series of transformers to match the transmission interconnection voltage for each solar center. The inverters are paired with a single medium voltage transformer on a common equipment skid to form a power conversion unit ("PCU"). Twenty-four PCUs are required to produce a capacity of 74.5 MW_{AC} at the Okeechobee center, with twenty-three PCUs at the Hibiscus center, and twenty-two for the remaining two centers. These configurations will produce the same output at all centers. Exhibit WFB-2 provides a typical block diagram depicting the basic layout of major equipment components.

Q. Describe the DC/AC ratio for the 2020 Project.

A. The DC/AC ratio is the ratio of the total installed DC capacity of PV modules to the AC capacity of each energy center. The DC/AC ratios for the energy centers that comprise the 2020 Project will range from 1.45 to 1.50 depending on design considerations and site features unique to each of the centers.

Q. Why are the DC/AC ratios not the same for all the centers?

A. Design optimization activities and the careful selection of major components determines a DC/AC ratio for each center that yields high levels of output, availability, reliability, and the highest overall benefit to customers. Site and equipment characteristics unique to each of the centers drives variability in the DC/AC ratios. Ongoing design optimization efforts may yield DC/AC ratios

different from those mentioned earlier, but only to the extent such changes result in a greater overall benefit to FPL's customers.

Q. How will the solar energy centers be interconnected to FPL's transmission network?

A. As noted earlier, each of the four centers has an individual point of interconnection to the FPL transmission system. The overall transmission interconnection schemes to be implemented at three of the four centers – Hibiscus, Southfork and Echo River – are similar, although the specific details vary from center to center based on which scheme will provide the lowest cost option for each site. New collection substations with step-up power transformers will be constructed for each of these three centers. The step-up power transformers increase the AC voltage from 34.5 kV to the voltages at the transmission point of interconnect. The interconnection voltages for these centers range from 115 kV to 230 kV. The new collection substations for these three centers will be connected to the bulk transmission system by looping the existing transmission line into a new transmission switchyard that shares a common site with the collection substation. The looped transmission lines are all less than one tenth of a mile.

The fourth center, Okeechobee, will connect indirectly to the FPL transmission system through the Okeechobee Clean Energy Center ("OCEC"). A new step-down transformer will decrease the AC collection system voltage from 34.5 kV to 26 kV, which is the operating voltage of the low side of the step-up

transformer for one of the Okeechobee combustion turbine generators, which subsequently connects to the FPL 500 kV transmission system.

Q. Does FPL's cost estimate include the costs associated with transmission interconnection?

A. Yes. The estimated capital construction cost for each of the centers includes the projected cost for its unique interconnection configuration.

Q. Are upgrades to the existing FPL bulk transmission system required to accommodate the proposed solar energy centers?

A. No. As a result, there are no costs associated with upgrading FPL's transmission system.

Q. Did FPL have to acquire property for the energy centers?

A. Yes, FPL acquired property for three of the four energy centers. FPL was able to use land at the OCEC site for the Okeechobee Solar Energy Center.

Q. Can you explain how FPL acquired and optimized the property for the centers?

A. Yes. FPL identified candidate parcels available for purchase for the three centers through a review of real estate listings and public land records. FPL screened the list of candidate parcels by using criteria including each property's proximity to a transmission system interconnection point and whether the property provides sufficient acreage to accommodate the expected permitting requirements and the construction of the solar centers. Because the landowners sell the parcels as a whole, FPL evaluated the features of each property – such as the presence of wetlands and flood plains, environmental constraints and

cultural restrictions – and developed designs that optimize the land use for each parcel. Exhibit WFB-5 depicts the features and land use associated with each parcel.

Q. What is the proposed construction schedule for the 2020 Project?

A. As I noted earlier, it is expected that the Project will be placed into service by May 1, 2020. The period necessary to complete engineering, permitting, equipment procurement, contractor selection, construction, and commissioning will exceed twenty-two months. This construction period includes the time necessary to prepare each of the sites, construct roads and drainage systems, install the solar generating equipment, erect fencing, and build the interconnection facilities. The construction schedules support the proposed commercial in-service dates. Exhibit WFB-6 provides more details regarding the construction schedules.

Q. As of March 1, 2019, what is the status of the certifications and permits required to begin construction for the centers?

A. The Florida Department of Environmental Protection ("FDEP") has issued the required permits for all four of the centers. Two of the four sites also required approval from the U.S. Army Corps of Engineers. All such permits have been issued. Finally, applications for the required county zoning, special exceptions, and site plan approvals have been submitted and all four sites have received all county level approvals.

Q. What is FPL's estimated cost for the 2020 Project?

A. FPL estimates the cost of the 2020 Project will be $410.7 million or $1,378/kW$_{AC}$. The cost of each center ranges from $1,339/kW$_{AC}$ to $1,407/kW$_{AC}$. FPL is in the final stages of securing fixed pricing for the supply of all the required equipment and materials, as well as for engineering and construction of the solar centers interconnection facilities.

Q. Are the cost estimates for equipment, engineering, and construction for the proposed solar generation reasonable and prudent?

A. Yes.

Q. What is the basis for your conclusion?

A. The costs for 99.5% of all the surveying, engineering, equipment, materials and construction services necessary to complete the centers were established through competitive bidding processes specific to the 2020 Project. The balance of the costs was the result of leveraging existing agreements for engineering services, which themselves were the result of a separate competitive bidding process. Therefore, 100% of the Project's costs were subject to competitive solicitations.

Q. Please describe the competitive solicitations associated with the 2020 Project.

A. Throughout 2018, FPL solicited proposals for the supply of the PV panels, PCUs, and step-up power transformers as well as the engineering, procurement and construction services required to complete the proposed solar energy centers. The scope of services for the engineering, procurement and

construction solicitations included the supply of the balance of equipment and materials.

FPL requested proposals for PV panels from nineteen large, industry-leading suppliers. All nineteen suppliers submitted proposals that satisfied the requirements of the request for proposals and all were evaluated. Due to the volume of panels required for the 2020 Project and availability of supply in the market, FPL contracted with more than one supplier. FPL was able to secure panels from the lowest cost bidders. In addition to offering the lowest cost and highest efficiency, these suppliers demonstrated that they have among the highest product quality programs in the industry and were able to provide strong financial performance security.

FPL solicited proposals from nine PCU suppliers. Two of the suppliers elected not to submit proposals. The proposals submitted by the seven remaining suppliers met the requirements of the request for proposals and were evaluated. FPL selected the lowest cost bidder to supply the PCUs.

FPL solicited proposals for step-up power transformers from seven industry-leading manufacturers, one of which declined to submit a proposal. FPL evaluated the six qualifying proposals and selected the lowest cost bidder to supply the transformers.

Engineering, procurement, and construction ("EPC") proposals for the Project's solar fields were solicited from seven industry-recognized contractors. Four of the contractors elected not to submit proposals. The bids submitted by the three remaining contractors met the requirements of the request for proposals. Accordingly, these submitted proposals were evaluated. In mid-December 2018, FPL executed a contract with the EPC contractor that submitted the lowest and most competitive proposal for the construction of the 2020 Project.

Proposals for the construction of the substation and interconnection facilities were solicited from sixteen industry-recognized contractors. Ten contractors did not submit bids. The remaining six bids satisfied the requirements of the request for proposal and were evaluated. The two lowest cost bidders have been selected to construct the substation and interconnection facilities. Each will be constructing facilities at two sites.

The bids from the PV panel, PCU, and step-up power transformer suppliers, as well as those received from the EPC and substation contractors, were high quality and extremely competitive.

Q. Are there other benefits associated with the 2020 Project?

A. Yes, there are a number of other benefits associated with the Project. For example, approximately 200 individuals will be employed at each of the centers at the height of construction, creating about 800 jobs. The contractors building the solar energy centers are required to exercise reasonable efforts to use local

labor and resources. The jobs associated with the construction of the centers will therefore provide a secondary benefit by boosting the economy of local businesses. Additionally, the local communities will benefit from increased property tax revenues following the completion of the solar centers.

Q. How does the cost of the 2020 Project compare to the cost of FPL's 2017, 2018 and 2019 Projects?

A. The estimated cost for FPL's 2017, 2018, and 2019 Projects were $1,405/kW$_{AC}$, $1,485/kW$_{AC,}$ and $1,386/kW$_{AC}$ respectively. At $1,378/kWac the estimated cost of the 2020 Project is lower than the estimated costs for the 2017, 2018, and 2019 Projects.

Q. Are FPL's projected costs and construction schedules reasonable and below the cost cap of $1,750/kW$_{AC}$?

A. Yes. The estimated cost for the 2020 Project is well below the prescribed cost cap, and the competitive bidding process provides assurance that costs for equipment, engineering, and construction for the 2020 Project are reasonable as previously discussed. The construction schedule for the Project also is reasonable.

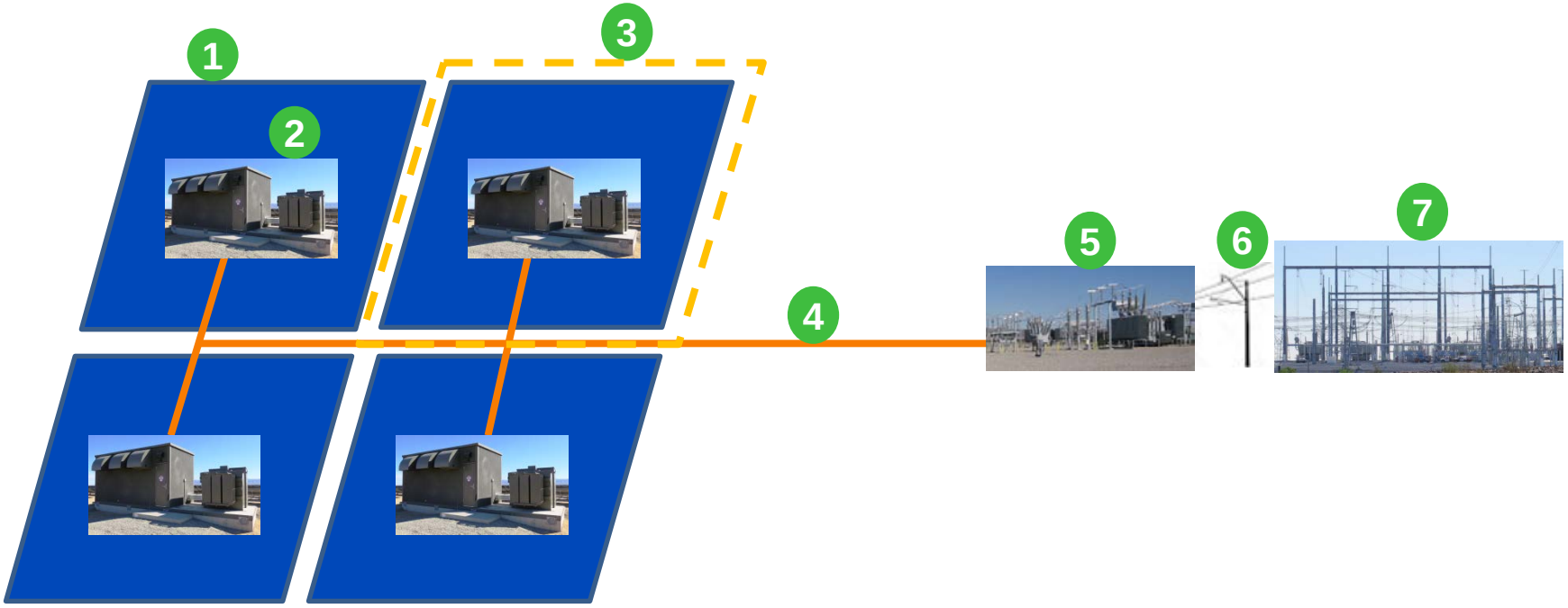
Q. Does this conclude your testimony?

A. Yes.

List of FPL Universal PV Solar Centers in Service

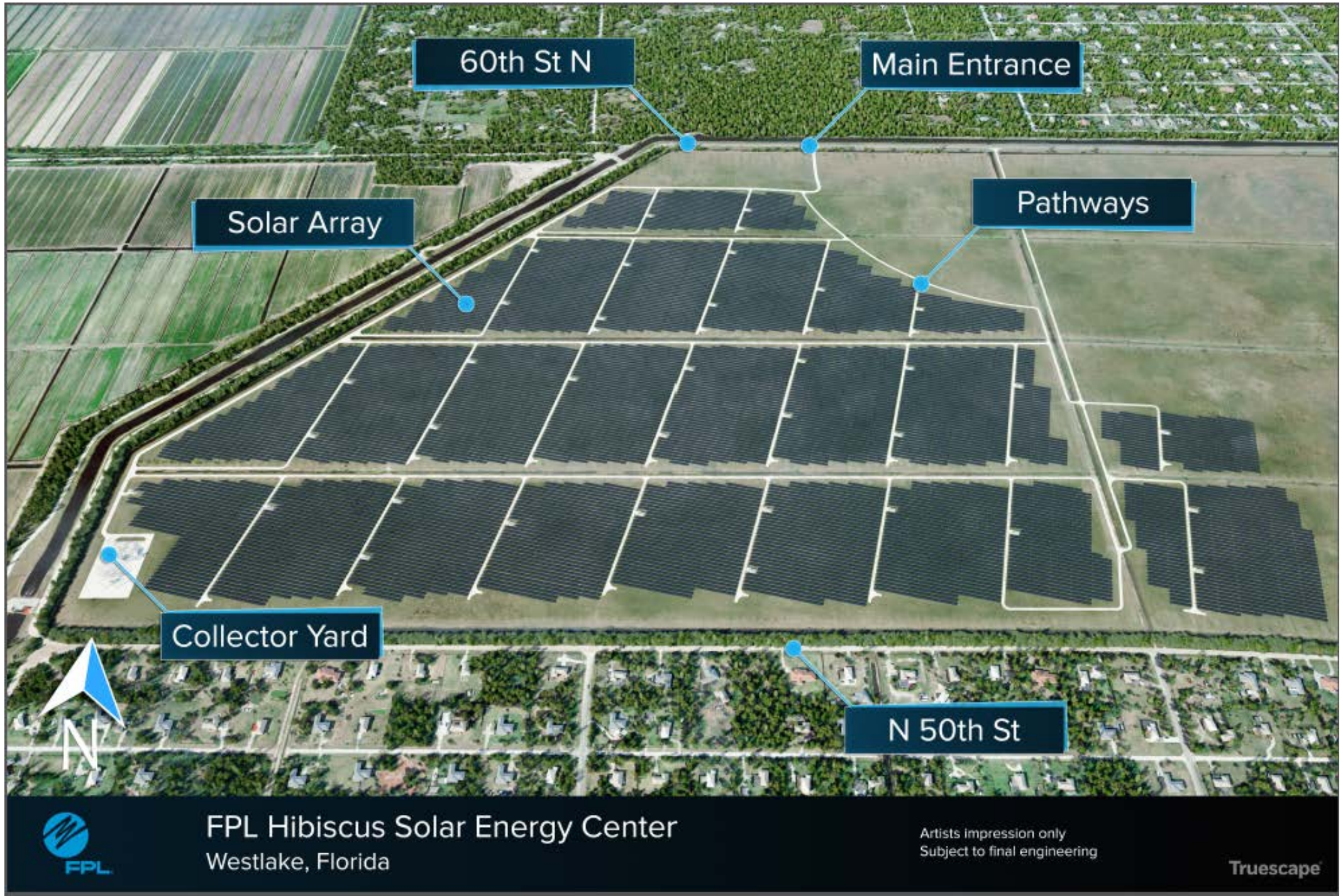
Solar Energy Center	Capacity (MW_{AC})	In-Service Date
DeSoto	25.0	October 27, 2009
Space Coast	10.0	April 16, 2010
Babcock Ranch	74.5	December 31, 2016
Citrus	74.5	December 31, 2016
Manatee	74.5	December 31, 2016
Coral Farms	74.5	January 1, 2018
Horizon	74.5	January 1, 2018
Wildflower	74.5	January 1, 2018
Indian River	74.5	January 1, 2018
Loggerhead	74.5	March 1, 2018
Barefoot Bay	74.5	March 1, 2018
Hammock	74.5	March 1, 2018
Blue Cypress	74.5	March 1, 2018
Interstate	74.5	January 31, 2019
Miami-Dade	74.5	January 31, 2019
Pioneer Trail	74.5	January 31, 2019
Sunshine Gateway	74.5	January 31, 2019
FPL Total	**1,152.5**	

Typical Solar Energy Center Block Diagram

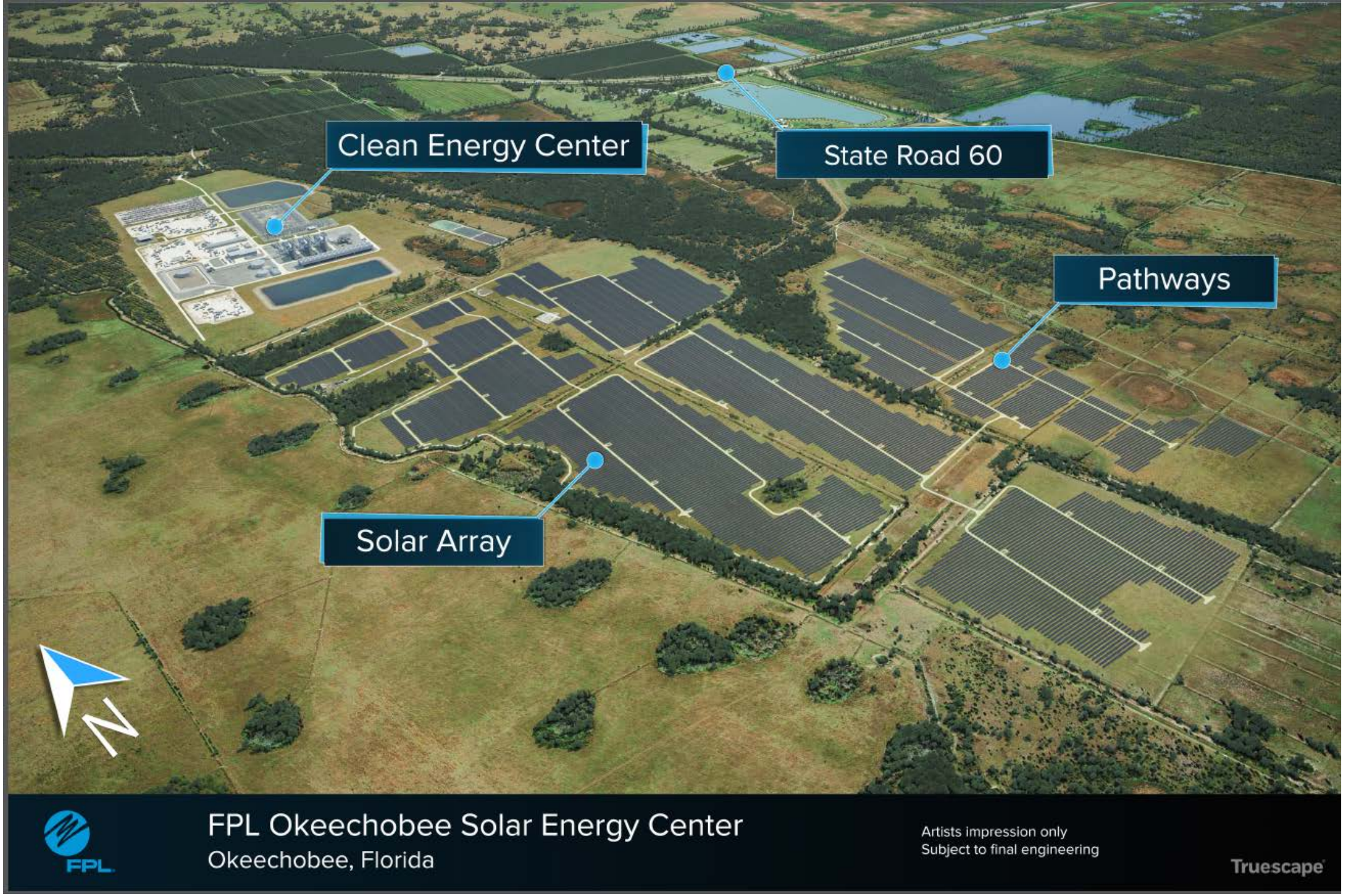


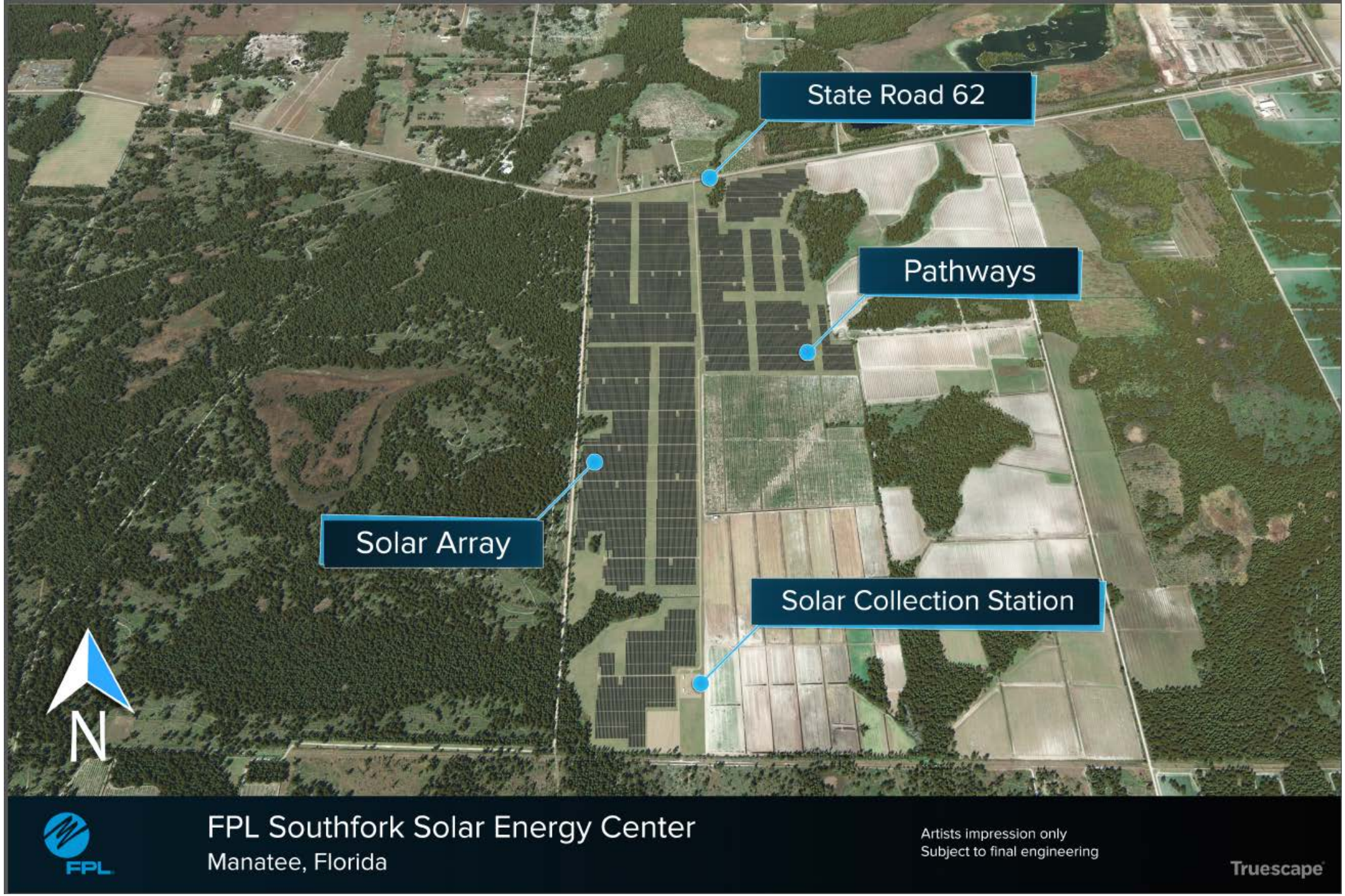
1. Array of PV Panels
2. Inverter/Medium Voltage Transformer
3. Inverter Block
4. AC Collection System
5. Switchyard and Power Step-up Transformer
6. Generation Tie Line
7. Interconnection Substation

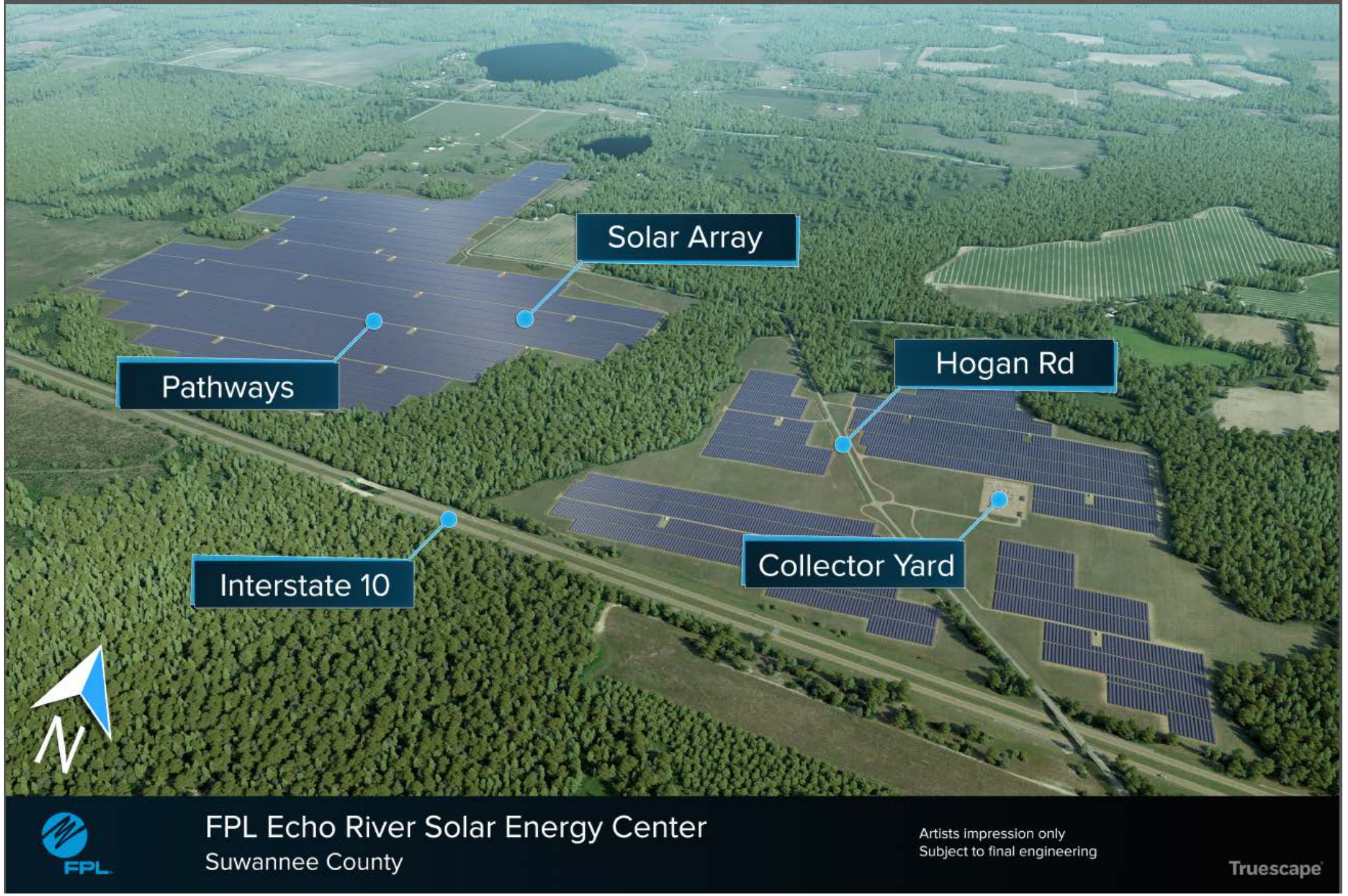
Docket No. 20190001-EI
Typical Solar Energy Center Block Diagram
Exhibit WFB-2, Page 1 of 1



Docket No. 20190001-EI
Renderings of 2020 Solar Energy Centers
Exhibit WFB-3, Page 1 of 4


Clean Energy Center
State Road 60
Pathways
Solar Array
N
FPL
FPL Okeechobee Solar Energy Center
Okeechobee, Florida
Artists impression only
Subject to final engineering
Truescape


State Road 62
Pathways
Solar Array
Solar Collection Station
N
FPL Southfork Solar Energy Center
Manatee, Florida
Artists impression only
Subject to final engineering
FPL
Truescape


Solar Array
Pathways
Hogan Rd
Interstate 10
Collector Yard
N
FPL
FPL Echo River Solar Energy Center
Suwannee County
Artists impression only
Subject to final engineering
Truescape

Specifications for 2020 Solar Energy Centers
Hibiscus

The following table sets forth the base-line specifications used to develop the estimated installed cost for the Hibiscus Energy Center.

Specifications for FPL 74.5 MW_{AC} Hibiscus Solar Energy Center	
Peak Alternating Current Output	74.5 MW_{AC}
Total Installed Direct Current Capacity	108.03 MW_{DC}
PV Panel Suppliers	First Solar
PV Panel Technologies	Thin film CdTE semiconductor
PV Panel Voltage (V)	1,500
Average PV Panel Power Ratings (W_{DC})	420
Number of Panels (Approximate)	257,200
PV Panel Support System	Fixed-tilt
PV Panel Support System Material	Structural Steel Shapes
Inverter DC Input (MW_{DC})	4.70
DC/AC Ratio	1.45
Number of Power Conversion Units (PCU)	23
PCU Supplier	SMA
Inverter Type	MVPS-4000-S2
Inverter Rating (MVA/V)	4.0/600
Medium Voltage Transformers Per PCU	1
Medium Voltage Transformer Supplier	TBD
Medium Voltage Transformer Type	3-Phase, 60 Hz, 3-Windings
Medium Voltage Transformer Rating (MVA)	4.0
Number of Inverters	23
Inverter Capacity Installed (MVA)	86.5 @ 35º C
Number of Medium Voltage Transformers	23
Medium Voltage Transformer Capacity Installed (MVA)	92
Number of Panels Per PCU Block (Approximate)	11,180
DC Input Per PCU Block (MW_{DC})	4.70
Step-up Power Transformer Supplier	SMIT
Step-up Power Transformer Type	3-Phase, 60 Hz
Step-up Power Transformer Ratings	241.5 kV, 85 MVA

Specifications for 2020 Solar Energy Centers
Okeechobee

The following table sets forth the base-line specifications used to develop the estimated installed cost for the Okeechobee Energy Center.

Specifications for FPL 74.5 MW_{AC} Okeechobee Solar Energy Center	
Peak Alternating Current Output	74.5 MW_{AC}
Total Installed Direct Current Capacity	111.75 MW_{DC}
PV Panel Suppliers	First Solar
PV Panel Technologies	Thin film CdTE semiconductor
PV Panel Voltage (V)	1,500
Average PV Panel Power Ratings (W_{DC})	430
Number of Panels (Approximate)	259,900
PV Panel Support System	Fixed-tilt
PV Panel Support System Material	Structural Steel Shapes
Inverter DC Input (MW_{DC})	4.66
DC/AC Ratio	1.50
Number of Power Conversion Units (PCU)	24
PCU Supplier	SMA
Inverter Type	MVPS-4000-S2
Inverter Rating (MVA/V)	4.0/600
Medium Voltage Transformers Per PCU	1
Medium Voltage Transformer Supplier	TBD
Medium Voltage Transformer Type	3-Phase, 60 Hz, 3-Windings
Medium Voltage Transformer Rating (MVA)	4.0
Number of Inverters	24
Inverter Capacity Installed (MVA)	90.2 @ 35° C
Number of Medium Voltage Transformers	24
Medium Voltage Transformer Capacity Installed (MVA)	96
Number of Panels Per PCU Block (Approximate)	10,830
DC Input Per PUC Block (MW_{DC})	4.66
Step-up Power Transformer Supplier	HICO America, Inc.
Step-up Power Transformer Type	3-Phase, 60 Hz
Step-up Power Transformer Ratings	26 kV, 85 MVA

Specifications for 2020 Solar Energy Centers
Southfork

The following table sets forth the base-line specifications used to develop the estimated installed cost for the Southfork Energy Center.

Specifications for FPL 74.5 MW_{AC} Southfork Solar Energy Center	
Peak Alternating Current Output	74.5 MW_{AC}
Total Installed Direct Current Capacity	108.03 MW_{DC}
PV Panel Suppliers	Jinko
PV Panel Technologies	72 cell, mono-crystalline
PV Panel Voltage (V)	1,500
Average PV Panel Power Ratings (W_{DC})	395
Number of Panels (Approximate)	273,500
PV Panel Support System	Single-axis tracker
PV Panel Support System Material	Structural Steel Shapes
Inverter DC Input (MW_{DC})	4.91
DC/AC Ratio	1.45
Number of Power Conversion Units (PCU)	22
PCU Supplier	SMA
Inverter Type	SMA MVPS-4200-S2
Inverter Rating (MVA/V)	4.2/630
Medium Voltage Transformers Per PCU	1
Medium Voltage Transformer Supplier	TBD
Medium Voltage Transformer Type	3-Phase, 60 Hz, 2-Windings
Medium Voltage Transformer Rating (MVA)	4.2
Number of Inverters	22
Inverter Capacity Installed (MVA)	86.9 @ 35^{o} C
Number of Medium Voltage Transformers	22
Medium Voltage Transformer Capacity Installed (MVA)	92.4
Number of Panels Per PCU Block (Approximate)	12,430
DC Input Per PUC Block (MW_{DC})	4.91
Step-up Power Transformer Supplier	SMIT
Step-up Power Transformer Type	3-Phase, 60 Hz
Step-up Power Transformer Ratings	241.5 kV, 85 MVA

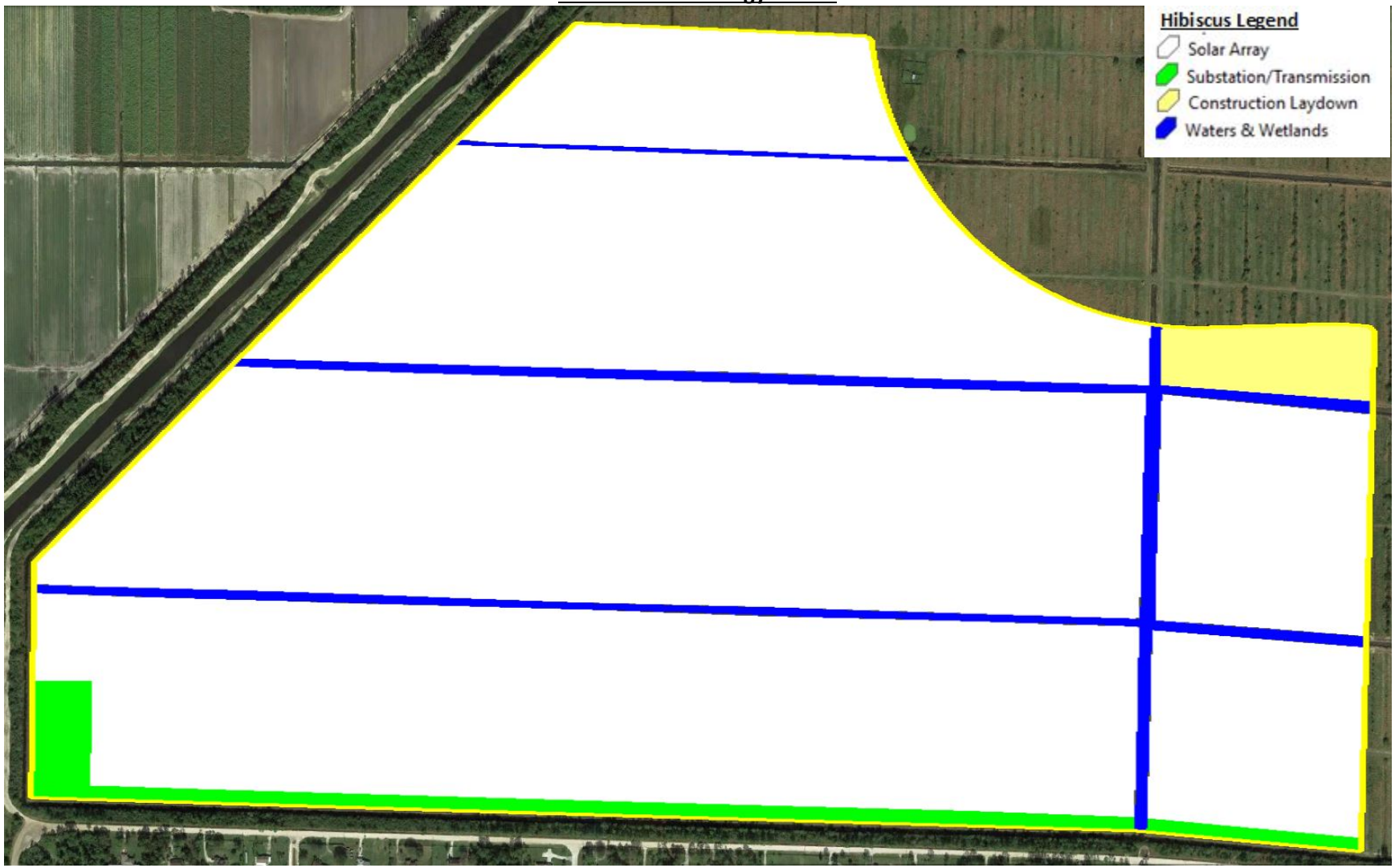
Specifications for 2020 Solar Energy Centers
Echo River

The following table sets forth the base-line specifications used to develop the estimated installed cost for the Echo River Energy Center.

Specifications for FPL 74.5 MW_{AC} Echo River Solar Energy Center	
Peak Alternating Current Output	74.5 MW_{AC}
Total Installed Direct Current Capacity	108.03 MW_{DC}
PV Panel Suppliers	Jinko
PV Panel Technologies	72-cell, mono-crystalline
PV Panel Voltage (V)	1,500
Average PV Panel Power Ratings (W_{DC})	395
Number of Panels (Approximate)	273,500
PV Panel Support Structure	Single-axis tracker
PV Panel Support System Material	Structural Steel Shapes
Inverter DC Input (MW_{DC})	4.91
DC/AC Ratio	1.45
Number of Power Conversion Units (PCU)	22
PCU Supplier	SMA
Inverter Type	MVPS-4200-S2
Inverter Rating (MVA/V)	4.2/630
Medium Voltage Transformers Per PCU	1
Medium Voltage Transformer Supplier	TBD
Medium Voltage Transformer Type	3-Phase, 60 Hz, 2-Windings
Medium Voltage Transformer Rating (MVA)	4.2
Number of Inverters	22
Inverter Capacity Installed (MVA)	86.9 @ 35^{o} C
Number of Medium Voltage Transformers	22
Medium Voltage Transformer Capacity Installed (MVA)	92.4
Number of Panels Per PCU Block (Approximate)	12,430
DC Input Per PUC Block (MW_{DC})	4.91
Step-up Power Transformer Supplier	SMIT
Step-up Power Transformer Type	3-Phase, 60 Hz
Step-up Power Transformer Ratings	117.5 kV, 85 MVA

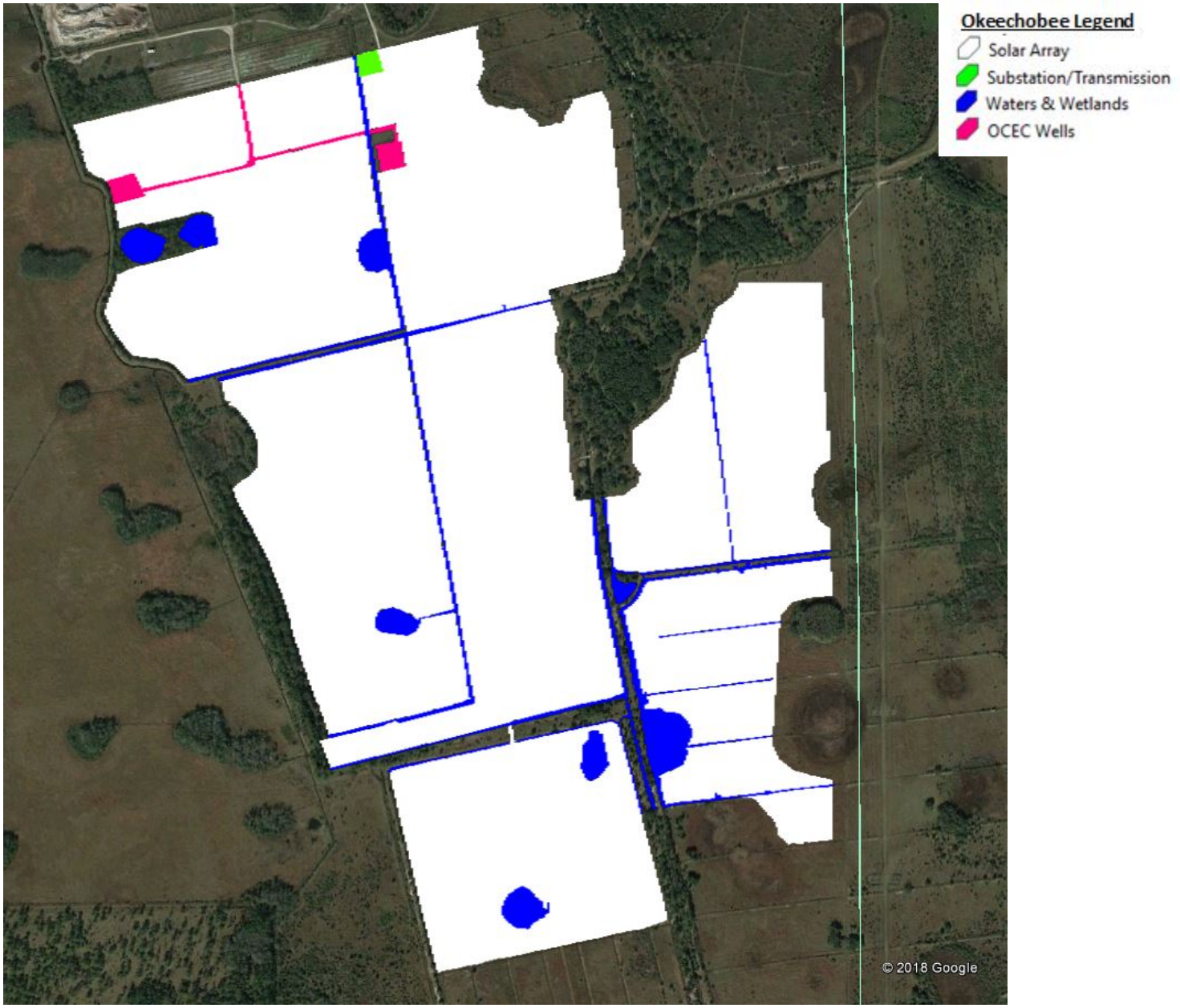
Property Delineations, Features and Land Use of 2020 Solar Energy Centers

Hibiscus Solar Energy Center



Property Delineations, Features and Land Use of 2020 Solar Energy Centers

Okeechobee Solar Energy Center

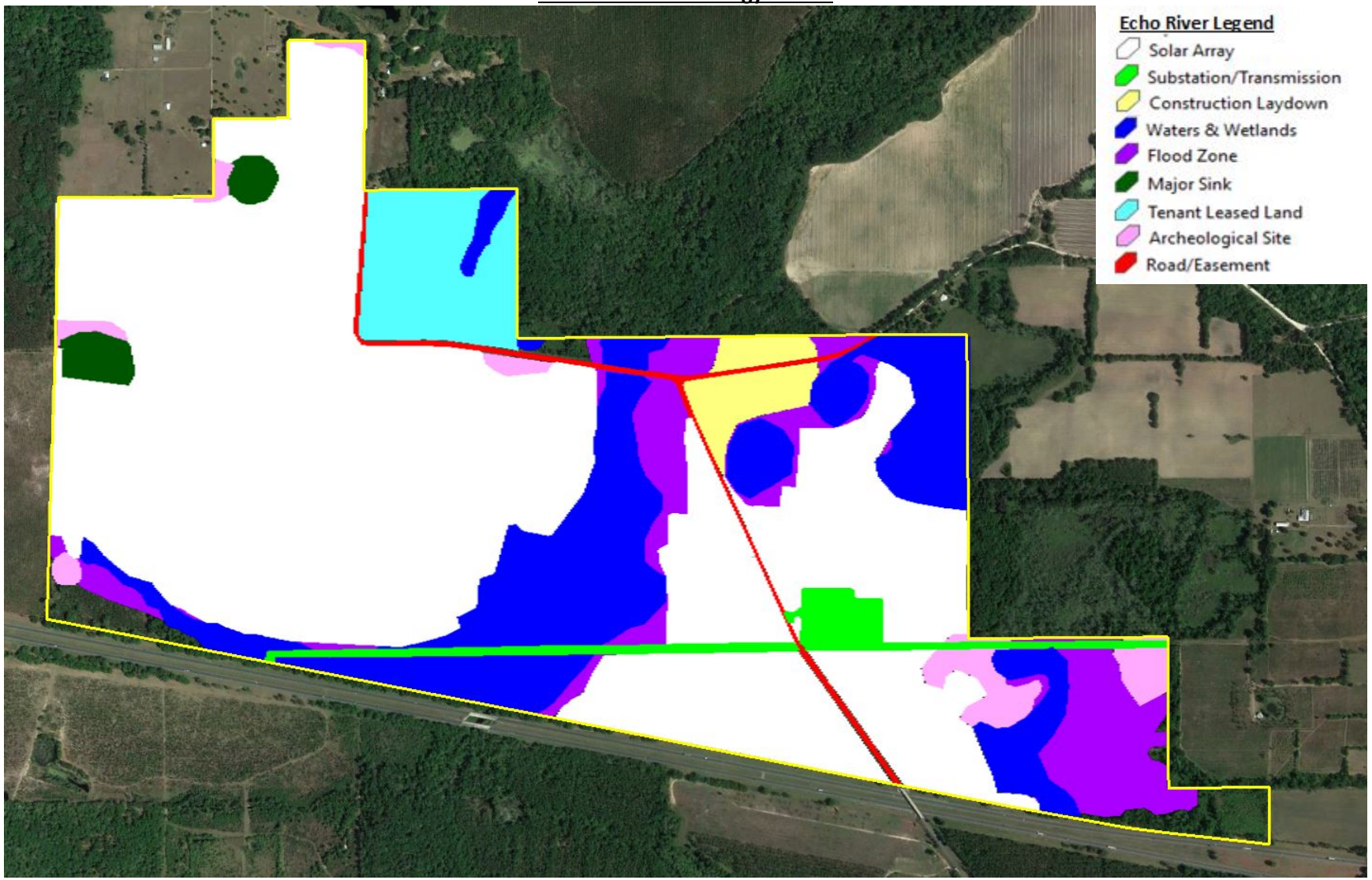


Property Delineations, Features and Land Use of 2020 Solar Energy Centers

Southfork Solar Energy Center

Property Delineations, Features and Land Use of 2020 Solar Energy Centers

Echo River Solar Energy Center



Construction Schedule for 2020 Solar Energy Centers

		Echo River		Southfork		Okeechobee		Hibiscus	
Item	**Major Activities**	**Start**	**Finish**	**Start**	**Finish**	**Start**	**Finish**	**Start**	**Finish**
1	PV panel contract		12/31/2018		12/31/2018		7/30/2018		7/30/2018
2	Power Conversion Unit contract		3/31/2019		3/31/2019		3/31/2019		3/31/2019
4	EPC contract		12/19/2018		12/19/2018		12/19/2018		12/19/2018
3	LNTP for EPC contracts		3/1/2019		3/1/2019		3/1/2019		3/1/2019
4	Contractor mobilization	5/1/2019	5/15/2019	5/1/2019	5/15/2019	5/1/2019	5/15/2019	4/1/2019	4/15/2019
5	Panel deliveries	8/23/2019	12/27/2019	8/16/2019	12/27/2019	9/13/2019	11/29/2019	8/23/2019	11/8/2019
6	Power Conversion Unit deliveries	11/1/2019	11/15/2019	11/1/2019	11/15/2019	10/1/2019	10/15/2019	11/1/2019	11/15/2019
7	Energization, Testing & Startup	4/9/2020	4/23/2020	4/9/2020	4/23/2020	4/9/2020	4/23/2020	4/9/2020	4/23/2020
8	Commence Commercial Operations	5/1/2020							

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Construction Schedule for 2020 Solar Energy Centers
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