

FLORIDA POWER & LIGHT (FPL) COMPANY

and

Energy Power & Sustainability (EPS) at FIU

Partnership

Proposed Project with Scope of Work

**Electric Power Reliability & Analytics Center
(EPRAC) for High Penetration Distributed
Renewable Resource Modern Grid System**

TABLE OF CONTENTS

Introduction3
 FPL - FIU Cooperation3
 Services Requested: Scope of Work4
 General Tasks4
 Expectations67
 Responsibility Matrix67
 Grant Distribution78

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Introduction

Florida Power & Light (FPL) is seeking a cooperation engagement with Florida International University's (FIU) Energy Power & Sustainability (EPS) laboratory in the department of Electrical & Computer Engineering (ECE). As part of this cooperation FIU's Electric Power Reliability & Analytics Center (EPRAC) in Miami, FL will conduct specific mutually agreed research in the field of solar PV as it relates to system reliability, grid integration, inverter performance and other related challenges associated with increased volumes of solar PV generation on the FPL grid.

The detailed scope of work is provided in the following sections. The tasks associated with this process are generalized in a manner to allow flexibility in the methodology used to accomplish these tasks provided requested deliverable objectives are met. The specific deliverables required are identified, as applicable in this document. Any deviation from this scope of work must be mutually agreed upon prior to its performance.

FPL - FIU Cooperation

In order to properly understand the testing and documentation requirements, a brief overview of the cooperation scope is necessary.

FPL is committing a grant of \$656,000 over 5 years, to be distributed as outlined in the section titled Grant Distribution to explore challenges identified in the Scope of Work of this document. FIU will in turn conduct research, analytics, and provide resources, in conjunction with FPL personnel, for reviewing and working to resolve various challenges in the field of solar PV implementation, integration and related issues. FPL and FIU may jointly look into other potential opportunities to develop new research programs in the following areas:

- a. Electric Power Reliability and Smart Grid
- b. Integration of Smart Grid Technologies
- c. Plug in Hybrid Electric Vehicles (PHEV)
- d. Storage
- e. Meters and Advanced Metering Infrastructure (AMI)

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3

- f. Radio Frequency Interference
- g. Home Area Network

Services Requested: Scope of Work

General Tasks

Florida Power & Light (FPL) is initiating a photovoltaic (PV) pilot program to install increased volumes of solar generation at the distribution feeder level. FPL wishes to study the impact the increased volume of PV solar generation has on the grid, and is soliciting FIU's experience with a study in the following areas:

1. Simulate the performance of selected feeders with increased volumes of PV solar (feeders to be provided by FPL)
2. Analyze current Distribution planning processes using Synergiee
 - a. Review FPL's current use to determine if corrections are needed
 - b. Recommend changes to deal with future increase PV penetration
 - c. Show effects of increased levels of PV penetration on feeders
3. Evaluate and recommend ideal site selection for
 - a. Photovoltaic installations
 - b. Metering
4. Review, trend, and analyze monthly FPL data, identify threshold issues impacting performance and identify tools, technology, controls, and/or protocol modifications to maintain or improve grid performance related to the following utility metrics:
 - a. System Average Interruption Duration Index (SAIDI)
 - b. System Average Interruption Frequency Index (SAIFI)
 - c. Momentary Average Interruption Frequency Index (MAIFI)
 - d. Customer Momentary Experience (CME)
 - e. Abnormal conditions
5. Review, trend, and analyze monthly FPL data, identify threshold issues impacting performance and identify tools, technology, controls, and/or proto-col modifications to maintain or improve grid performance related to power quality
 - a. Voltage Fluctuations
 - b. Harmonics

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4

- c. Frequency
6. Review, trend, and analyze monthly FPL data, identify threshold issues impacting performance and identify tools, technology, controls, and/or proto-col modifications to maintain or improve grid performance in the area of power reliability:
 - a. Capacitor Bank operations
 - b. Regulator operations
 - c. Distribution transformer operations
 - d. Make recommendations on removal/addition of volt/var control device
7. Provide recommendations for the specification of “smart” inverter technology
 - a. Manufacturer
 - b. Size
 - c. Location
 - d. Settings
 - e. Communications
 - f. Other associated equipment such as; combiner box, photovoltaic modules, transformer sizing
8. Provide recommendations on a general ratio of load to generation FPL should have with regards to distributed generation PV on a feeder. Currently in IEEE 1547.2-2008, Section 8.4.1.3.1 a 3 to 1 load to generation is recommended to give a margin against future customer’s minimum load
9. Conduct literature review for industry best practices for investigation and comparison of the existing low voltage ride-through (LVRT) improvement methods for PV systems and identify proper control systems to inject the reactive power during faults to improve LVRT curves. Perform additional investigation and comparison as needed.
10. Conduct literature review for industry best practices for identifying smart inverter functionalities that can benefit the overall distribution system by allowing the operation of PV systems in a coordinated manner with existing feeder components including capacitor banks, voltage regulators, and load tap changers. Identify additional functional benefits specific to FPL system
11. In order to enhance reliability of existing protection schemes and devices, define new control fault current levels for large PV solar

Meetings and Reports

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5

1. Teams will meet annually to establish research initiatives and develop project plan with milestones for the upcoming year
2. FIU will provide quarterly reports including:
 - a. A summary outline the status of ongoing activities, analysis, and research
 - b. Teams may meet monthly to review the project plan progress
3. At the end of each year, FIU will provide an annual research summary which will include the following:
 - a. Summarize activities and identify key findings
 - b. Proposed research initiatives and milestones for upcoming year

Expectations

All resources are expected to be proficient in the following areas:

- Reports on the tasks identified above
- Examine timeline and update tasks to meet new challenges
- Provide research support, back up, and materials as needed to to communicate the findings and results of the prescribed to FPL executive management,

Due to the nature of the contribution, resources and deliverables will vary from task to task and will be assigned dynamically to meet the established research initiatives.

Responsibility Matrix

It will be the responsibility of the service provider (FIU) to:

- Provide an appropriate and knowledgeable resource for all tasks
- Request clarification on any issues not fully understood
- Provide any requested deliverables in a timely manner for review and acceptance
- Clearly and concisely identify any issues which might result in either a delay or missed deliverable

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6

- Accept and comply with the non-disclosure agreement and any other documentation as defined in the contract

It will be the responsibility of FPL to:

- Provide access to data and information to achieve the task
- Provide initial information related to the task to be completed
- Provide physical access to the site(s) if required to complete the task
- Provide physical access to FPL facilities and test equipment
- Designate a point of contact to help resource with any questions they may have
- Provide an engineering lead to clearly and concisely identify tasks and deliverables for the resource

Grant Distribution

FPL is committing a total grant of \$656,000 (with a contingency of 10%, \$65,600) over 5 years, to be distributed as follows:

- Year 1 (July 2014 – June 2015) \$148,000
- Year 2 (July 2015 – June 2016) \$148,000
- Year 3 (July 2016 – June 2017) \$120,000
- Year 4 (July 2017 – June 2018) \$120,000
- Year 5 (July 2018 – June 2019) \$120,000

Monthly fixed invoicing, payments will be made net 48 days.

Sincerely,

Arif I Sarwat

Principle Investigator

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7