Appendix A – Scope of Work (Web Development)

YUNGFENG IT CONSULTING'S SCOPE OF WORK

1. Implementation: YungFeng IT Consulting will design and implement the following services:
    a. Configure / Setup a Linux Based System to host the SQL Server
    b. Configure/ Setup MySQL database in the Firelight Server
    c. Graphical User Interface (see Appendix B for sample)
        i. Monitoring Dashboard
            1. Ability to see all projects in one page.
            2. Design and approval by Great Circle Solar
            3. Implementation of Performance Ratio (PR) Calculation. PR Calculations will be provided by Great Circle Solar.
        ii. Alarm Configuration
            1. Implementation of "Smart-Alarm"
            2. Email Alerts/Text Alerts
                a. Production Critical Alerts (Project or Inverters are offline).
                b. Underperformance Alerts
                c. Communication Alerts
                d. Email Alerts are configurable: setting of threshold
    d. Reporting (See Appendix C for sample)
            1. Automated email of Daily Total in .csv or pdf format of ALL projects and Individual Projects (format will be given by Great Circle Solar). See Report Template (Excel)
            2. Automated email of Monthly Total in .csv or pdf format ALL projects and Individual Projects (format will be given by Great Circle Solar). See Report Template (Excel)
            3. Export Tool
                a. Ability select multiple data points to export 1 minute, 15-minute (average), 1 Hour (average), daily (total), and monthly (total) data in .csv format.
                b. Ability to select data points and compare values across sites
        ii. Analytic Tools
            1. Scrollable Graph with time line to review underperformance (POA vs Energy (Kw) Analysis)
            2. Select Multiple sites on the screen to compare Weather Station, Inverter and Meter Readings.
        iii. Ability to assign projects to users

1. Users (i.e. Fund Managers or O&M Managers) can view specific projects under their fleet.

2. Database Details:
    a. Fund Details
    b. Equipment Type
    c. Project Details
    d. Projects IE Estimates
    e. 20 Year Project Budget Numbers
    f. Inverter, GEN meter, and Weather Station Data
        i. Inverter Data
            1. Power (kW)
            2. Inverter Status and Fault Codes
            3. VL AC
        ii. Weather Station
            1. Pyranometer: Irradiance / Insolation
            2. Ambient Temperature
            3. Back of Module Temperature
        iii. Gen meter
            1. Kw
            2. Kw DEL
            3. KW RECEIVED
            4. VLN
            5. VLA
            6. VLB
            7. VLC

Appendix B – GUI Interface

Front End (Dashboard)

Solar Asset Monitoring System

Site:	GC PR	Current Power	Irradiance (W/m^2)	Inverters Generating	Devices Communicating	Last Com (mins ago)
125 Bermondsey	99%	137.2	800	10/10	4/4	9
1935 Drew	94%	123.2	821	9/10	3/4	10
289 Coldwater Road	50%	220	666	1/1	4/4	14
1880 Eglinton	100%	394	539	1/1	4/4	11
4370 Walker	102%	363	666	1/1	4/4	5
7201 Tecumseh	98%	216	550	1/1	4/4	8
650 Dupont	96%	184	581	1/1	4/4	2
400 Manning	102%	288	734	10/10	4/4	13
5890 Malden	100%	358	640	1/1	4/4	3
289 Coldwater Road	104%	285	736	1/1	4/4	4
2210 Parkedale Ave W	104%	114	621	10/10	4/4	7
875 Highland	98%	473	749	1/1	4/4	6
3100 Swansea	100%	134	720	1/1	3/4	8
1067 Niagara Stone Rd	99%	374	706	1/1	4/4	6
3100 Swansea	76%	160	714	1/1	4/4	7
555 Davenport Road	97%	100	642	8/9	4/4	4
101 Second Line	100%	313	626	7/8	4/4	6
821 Niagara Street North	99%	452	610	1/1	4/4	2
180 Holiday Inn	102%	354	704	1/1	4/4	13
180 Holiday Inn	103%	437	710	1/1	4/4	2
3671 Dundas	103%	287	516	1/1	4/4	1
400 Glen Hill	98%	328	632	10/10	4/4	15
500 Bayly	100%	336	639	1/1	3/4	13
1361 Huntingwood Drive	101%	170	651	1/1	4/4	6
1 Presidents Choice Circle	98%	220	542	10/10	4/4	7
285 Geneva Street	102%	265	653	1/1	4/4	3
1375 Weber	104%	164	604	1/1	4/4	15
326 Humber College Blvd	97%	228	643	1/1	3/4	7
12035 Highway 17	6%	0	576	0/1	4/4	16
125 Queensway	100%	333	558	1/1	4/4	15
400 Conestoga Blvd	97%	231	527	1/1	0/4	341
Twin Oaks	103%	362	500	10/10	4/4	3
1244 HWY 21	99%	458	628	1/1	3/4	7
626 Victoria	101%	473	563	1/1	4/4	15
447 Dobbie Drive	102%	348	756	1/1	4/4	5
415 Dobbie Drive	97%	320	699	1/1	4/4	9
5200 Highway 69	103%	292	507	1/1	4/4	10
5554 Tomken Road	95%	301	580	1/1	4/4	8

Detailed (Site Information)

Project Name:	125 Bermondsey
Month-Year	Saturday, October 01, 2016
Time:	9:35am

Project Details			
	AC Size, kW	500	
	DC Size, kW	450	
	Address	Bermondsey Toronto	
	Inverter Type	AE Inverter	
	Number of Inverters	3	
	Inverter 1	AC Capacity, kW	100
	Inverter 2	AC Capacity, kW	200
	Inverter 3`	AC Capacity, kW	200
	Performance Ratio, %		

Production Detail	Historical Reading	
	Yesterday's Total Production, kWh	3000.0
	Yesterday's Total Insolation, kW/m2	48.9
	Month-to-date's Total Production, kWh	58900.0
	Month-to-date's Total Insolation, kW/m2	105.9
	Today's Production, kWh	150.0
	Today's Insolation, kWh	5.0

Inverter Data	Current Reading	
	Power, kW	450
	Status	On
	Fault Code	None
	VLA, Volts	
	VLB, Volts	
	VLC, Volts	
	VLN, Volts	

Weather Station	Current Reading	
	Insolation, kW/m2	898.0
	Ambient Temperature, C	20.0
	Back of Module Temperature, C	25.0

Meter Generation	Current Reading
	kW Delivered
	kW Received
	kVar
	VLA, Volts
	VLB, Volts
	VLC, Volts
	VLN, Volts

Appendix C – Sample Reporting

Daily Report

Project Monthly Report

Project: 1935 Bermondsey
COD:

Summary

			IE Reference			This Month's Production						
Project Name	Capacity kWDC	Capacity kWAC	Budget Production kWh	Budget Insolation kW/m2	Average Module Temp (Degrees C)	Total Production kWh	Total Insolation (kW/m2)	Average Module Temp (Degrees C)	Actual Budget	Actual Expected	Weather Performance %	GCS Performance Index %
1935 Drew												

Monthly Summary Report

Monthly Solar Energy Production Report

Date: Monday, October 31, 2016

Total Production Summary

			This Month's Production					Last Month's Production					
Total Number of Projects:	Capacity kWDC	Capacity kWAC	Total Production kWh	Total Insolation (kW/m2)	Actual Budget	Actual Expected	Weather Performance %	Total Production kWh	Total Insolation (kW/m2)	Actual Budget	Actual Expected	Weather Performance %	GCS Performance Index %
23													