

Appendix C – Attachment C

This Appendix C – Attachment C includes a portion of the questions from the Appendices found in Appendix D (Scope Book) of the RFP. The appendices included in this Attachment C include questions from Appendix 1, Appendix 2, Appendix 3, Appendix 4, and Appendix 7.

Appendix 1: Performance Guarantees

The Bidder shall complete all information in the tables below.

PERFORMANCE GUARANTEES				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	MINIMUM CRITERIA			
1.1	Guaranteed Plant Capacity (@ POI)	MWac		
1.2	Guaranteed Availability (Required / As Bid)	%	98% /	
1.3	Project Total Energy Yield in Year 1 (Net)	MWh		Based on TMY. Actual site measured weather data to be used during testing.
1.4	Minimum Acceptance Criteria for Performance Testing (Required / As Bid)	%	95% /	

Appendix 2: Performance Model

The following table details in the inputs to and results from the Performance Model (PVsyst). The Bidder shall complete all missing information in the tables below. Where Bidder data differs from that provided in the tables below, the Bidder shall update the information providing justification for the change.

PERFORMANCE MODEL				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	REFERENCE SITE CONDITIONS	-		
1.1	Global Horizontal Irradiation (GHI) @ ground level	kWh/m²		
1.2	Diffuse Horizontal Irradiation (DHI) @ ground level	kWh/m²		
1.3	Ambient temperature	°F		
1.4	Altitude (above sea level)	ft		
2	WEATHER DATA	-		
2.1	Data source	-		
2.2	Period of data collection	years		
2.3	Distance from site or spatial resolution	km		
2.4	Uncertainty	%		
3	MODEL PARAMETERS	-		
3.1	Installed Capacity (DC)	kWp		Total peak DC power
3.2	Nominal Power (AC)	kW		Total nominal inverter output
3.3	Nominal Power at POI (AC)	kW		
3.4	DC/AC ratio	-		
3.5	PV modules	-		
3.5.1	PV module manufacturer and model	-		
3.5.2	PV module power at STC	Wp		
3.5.3	Technology	-		
3.5.4	Power	%/K		
3.5.5	Voltage	%/K		
3.5.6	Current	%/K		
3.5.7	NOCT	°F		
3.5.8	Annual degradation factor	%	0.6 /	
3.5.9	Number of PV modules per string	-		
3.5.10	Total number of PV modules installed	-		
3.5.11	Total number of strings	-		
3.5.12	Product warranty period (Required / As Bid)	years	10 /	
3.5.13	Power warranty (Required / As Bid)	years	25 /	
3.5.14	Certifications	-		
3.6	Inverters	-		
3.6.1	Inverter manufacturer and model	-		

PERFORMANCE MODEL

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
3.6.2	Input voltage rating	VDC		
3.6.3	Number of strings per inverter	-		
3.6.4	Number of inverters	-		
3.6.5	Maximum efficiency	%		
3.6.6	European weighted efficiency	%		
3.6.7	CEC weighted efficiency	%		
3.6.8	Max. standby consumption	W		
3.6.9	Max. self-consumption (operation)	W		
3.6.10	Cooling method	-		
3.6.11	Heating system	-		
3.6.12	Product warranty period (Required / As Bid)	years	5 /	
3.6.13	Certifications	-		
3.7	Mounting System	-		
3.7.1	Tilt angle of fixed tilt system or rotation limits of tracking system	°		
3.7.2	Backtracking	Yes / No		
3.7.3	Orientation of PV modules (azimuth)	°		
3.7.4	Installation type (portrait / landscape)	-		
3.7.5	Rows and columns per mounting structure	- x -		
3.7.6	Ground Coverage Ratio	%		
3.8	Array losses	-		
3.8.1	Module quality loss	%		
3.8.2	Module mismatch losses	%		
3.8.3	String mismatch losses	%		
3.8.4	Light induced degradation losses	%		
3.8.5	IAM losses defined by manufacturer	Yes / No		
3.8.6	Constant thermal loss factor	W/m ² /k		
3.8.7	Wind loss factor	W/m ² /k/m/s		
3.8.8	Soiling losses	%		
3.8.9	Spectral correction applied	Yes / No		
3.9	Cabling	-		
3.9.1	DC ohmic losses @STC (Max/Calculated)	%		
3.9.2	AC ohmic losses @STC (Max/Calculated)	%		
3.10	Transformers	-		
3.10.1	Transformer type	-		
3.10.2	Number of transformers	-		
3.10.3	Iron losses	%		
3.10.4	Resistive losses @ STC	%		
3.11	System losses	-		
3.11.1	First year degradation	%		
3.11.2	Annual degradation	%		

PERFORMANCE MODEL					
Nº	CHARACTERISTICS	UNITS	DATA		NOTES
3.11.3	Light soaking effect	%			
3.11.4	Inverter losses	%			
3.11.5	Auxiliary losses	%			
3.11.6	Unavailability	%			
3.12	Combined Uncertainty	%			
4	ANNUAL PERFORMANCE RESULTS	-	PVsyst Results	Final Results	Final Results include all post-processing
4.1	Net electricity production	-			
4.1.1	Year 1, P50	MWh/yr			
4.1.2	Year 1, P90	MWh/yr			
4.1.3	25-year average, P50	MWh/yr			
4.2	Specific Yield (first year, P50)	kWh/kWp/yr			
4.3	Performance Ratio (first year, P50)	%			
4.4	Document number of the attached calculation/report	-			

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Appendix 3: Design and Operation Data

The following table details the design requirements for the overall Project. The Bidder shall complete all missing information in the tables below. Where Bidder data differs from that provided in the tables below, the Bidder shall update the information providing justification for the change.

DESIGN AND OPERATIONAL DATA				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	DESIGN CONDITIONS	-		
1.1	Design lifetime of the plant (Required / As Bid)	years	25 /	
1.2	Average elevation	ft a.s.l		
1.3	Ambient Temperature Recorded (Minimum/Average/Maximum)	°F		
1.4	Design Temperature for Operation (Minimum/Maximum)	°F		
1.5	Design Relative Humidity	%		
1.6	Design wind speed (per ASCE 7, Risk Category III)	mph		If equipment selection is to be based on 10-minute mean wind velocity at 10 m above ground level, a correlation factor of 0.67 with 3 second gust may be used. Category C surface roughness as per ASCE shall be considered.
1.7	Rainfall (Annual Avg/Annual Max/1-day Max)	in		
1.8	Typical meteorological year (GHI)	W/m ²		
1.9	Seismic Zone	-		Zone and ground acceleration values shall be confirmed by the geotechnical study.
1.10	Available Area required (approx.)	acres		
2	GENERAL PLANT DATA	-		
2.1	PV technology type	-		
2.2	Installed Capacity (total DC peak power)	MWp		
2.3	Nominal Power (AC) (total nominal inverter output)	MW		
2.4	Nominal Power at POI (AC)	MW		
2.5	DC/AC ratio	-		
2.6	Auxiliary Power (Average/Peak)	MW		
2.7	Annual Auxiliary Power	MWh		Year 1 based on TMY
2.8	Total area covered by PV arrays	acres		
2.9	Total area of Project	acres		
2.10	Row to row spacing	ft		
2.11	Ground Coverage Ratio	%		
2.12	Shading losses due to internal row spacing	%		
2.13	Total number of PV panels	Qty		

DESIGN AND OPERATIONAL DATA

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
2.14	Total number of strings	Qty		
2.15	Total number of racking system tables	Qty		
2.16	Total number of combiner boxes	Qty		
2.17	Total number of inverters	Qty		
2.18	Total number of batteries/enclosures	Qty		
2.19	Total number of LV/MV transformers	Qty		
2.20	Total number of MV/HV transformers	Qty		
3	MONTHLY PERFORMANCE RATIOS	-		
3.1	January	%		
3.2	February	%		
3.3	March	%		
3.4	April	%		
3.5	May	%		
3.6	June	%		
3.7	July	%		
3.8	August	%		
3.9	September	%		
3.10	October	%		
3.11	November	%		
3.12	December	%		
3.13	PR Base	%		
4	YEARLY PERFORMANCE RATIOS	-		
4.1	Year 1	%		
4.2	Year 2	%		
4.3	Year 3	%		
4.4	Year 4	%		
4.5	Year 5	%		
4.6	Year 6	%		
4.7	Year 7	%		
4.8	Year 8	%		
4.9	Year 9	%		
4.10	Year 10	%		
4.11	Year 11	%		
4.12	Year 12	%		
4.13	Year 13	%		
4.14	Year 14	%		
4.15	Year 15	%		
4.16	Year 16	%		
4.17	Year 17	%		
4.18	Year 18	%		
4.19	Year 19	%		
4.20	Year 20	%		
4.21	Year 21	%		

DESIGN AND OPERATIONAL DATA

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
4.22	Year 22	%		
4.23	Year 23	%		
4.24	Year 24	%		
4.25	Year 25	%		
5	ANNUAL DEGRADATION FACTOR	-		
5.1	Year 1	%		
5.2	Year 2	%		
5.3	Year 3	%		
5.4	Year 4	%		
5.5	Year 5	%		
5.6	Year 6	%		
5.7	Year 7	%		
5.8	Year 8	%		
5.9	Year 9	%		
5.10	Year 10	%		
5.11	Year 11	%		
5.12	Year 12	%		
5.13	Year 13	%		
5.14	Year 14	%		
5.15	Year 15	%		
5.16	Year 16	%		
5.17	Year 17	%		
5.18	Year 18	%		
5.19	Year 19	%		
5.20	Year 20	%		
5.21	Year 21	%		
5.22	Year 22	%		
5.23	Year 23	%		
5.24	Year 24	%		
5.25	Year 25	%		
6	YEARLY PRODUCTION	-		
6.1	Year 1	MWh/yr		
6.2	Year 2	MWh/yr		
6.3	Year 3	MWh/yr		
6.4	Year 4	MWh/yr		
6.5	Year 5	MWh/yr		
6.6	Year 6	MWh/yr		
6.7	Year 7	MWh/yr		
6.8	Year 8	MWh/yr		
6.9	Year 9	MWh/yr		
6.10	Year 10	MWh/yr		
6.11	Year 11	MWh/yr		
6.12	Year 12	MWh/yr		

DESIGN AND OPERATIONAL DATA

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
6.13	Year 13	MWh/yr		
6.14	Year 14	MWh/yr		
6.15	Year 15	MWh/yr		
6.16	Year 16	MWh/yr		
6.17	Year 17	MWh/yr		
6.18	Year 18	MWh/yr		
6.19	Year 19	MWh/yr		
6.20	Year 20	MWh/yr		
6.21	Year 21	MWh/yr		
6.22	Year 22	MWh/yr		
6.23	Year 23	MWh/yr		
6.24	Year 24	MWh/yr		
6.25	Year 25	MWh/yr		

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Appendix 4: Key Equipment Datasheets

The following tables detail the design requirements for the designated equipment. The Bidder shall complete all missing information in the tables below. Where Bidder data differs from that provided in the tables below, the Bidder shall update the information providing justification for the change.

RACKING/TRACKER SYSTEM				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	GENERAL	-		
1.1	Manufacturer	-		
1.2	Type	Fixed / Tracking		
2	BASIC DATA	-		
2.1	Type of foundations	-		
2.2	Type of supporting profiles	-		
2.3	Corrosion protection	Yes / No		
2.4	Type of corrosion protection	-		
2.5	Design wind speed (per ASCE 7, Risk Category III)	mph		See Design and Operational Data Sheet No. 1.6
2.6	kWp per table	kWp		
2.7	Number of tables	-		
3	TRACKER SYSTEM	-		
3.1	Type of tracking system	-		
3.2	Tracking range	°		
3.3	Backtracking	Yes / No		
3.4	Rows per tracker actuator	-		
3.5	Strings per row	-		
3.6	Power per tracker	kWp		
3.7	Drive type	-		
3.8	Power consumption	kWh/MWp/yr		
3.9	Stow Wind Speed	mph		
3.10	Motors per MWp	-		
4	WARRANTIES	-		
4.1	Product warranty period (Required / As Bid)	years	5&20 /	5 years for moving parts and 20 years for structural parts
4.2	Certifications	-		
1 - Bidder is allowed to add/include any information considered as important.				
LV/MV TRANSFORMER				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	GENERAL	-		
1.1	Manufacturer	-		
1.2	Type/Model	-		
1.3	Nº of units	-		
2	TRANSFORMER CHARACTERISTICS	-		
2.1	Type of Transformer	-		
2.2	3 x single phase or three-phase	-		

LV/MV TRANSFORMER						
Nº	CHARACTERISTICS	UNITS	DATA			NOTES
2.3	Core or shell	-				
2.4	Type of tank	-				
2.5	Type of cooling	-				
2.6	Vector group	-				
2.7	Rated frequency	hz				
2.8	Transformer life value at IEC conditions	-				
2.9	Rated power based @ 20°C	kW				
2.10	Higher grid voltage	kV				
2.11	Primary rated current	A				
2.12	Tappings	-				See Section Error! Reference source not found. of MFS
3	OTHERS	-				
3.1	Temperature rising windings	°F				
3.2	LV	-				
3.3	MV	-				
4	WARRANTIES	-				
4.1	Product warranty period (Required / As Bid)	months	18 or 36 /			18 months from energization or 36 months from delivery
4.2	Certifications	-				
1 - Bidder is allowed to add/include any information considered as important.						
2 – Bidder to complete for each type of LV/MV transformer used on the Project including inverter station transformers and BESS transformers.						
GENERATOR STEP-UP (GSU) TRANSFORMER						
Nº	CHARACTERISTICS	UNITS	DATA			NOTES
1	GENERAL	-				
1.1	Manufacturer	-				
1.2	Type/Model	-				
1.3	Nº of units	-				
2	TRANSFORMER CHARACTERISTICS	-				
2.1	Type of transformer	-				
2.2	Installation	-				
2.3	Rated frequency	-				
2.4	Number of phases	-				
2.5	Number of windings	-				
2.6	Winding material	-				Must be Copper
2.7	Cooling class	-				
3	CAPACITY	-				
3.1	Base rating	MVA				
3.2	1st stage fans	MVA				
3.3	2nd stage fans	MVA				
4	WINDING DATA	-	Primary (H)	Secondary (X)	Tertiary (Y)	
4.1	Voltage rating	kV				
4.2	Transformer internal ANSI BIL	kV				
4.3	Transformer bushing ANSI BIL	kV				
4.4	Neutral BIL	kV				
4.5	Winding connection	-				
5	SYSTEM DATA	-				
5.1	Utility tie	MVA				
5.2	Utility tie	V				

GENERATOR STEP-UP (GSU) TRANSFORMER

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
5.3	MVA/HP	MVA		
5.4	MVA/HP	HP		

1 - Bidder is allowed to add/include any information considered as important.

MEDIUM VOLTAGE SWITCHGEAR

Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	GENERAL	-		
1.1	Manufacturer	-		
1.2	Type/Model	-		
1.3	Nº machines	-		
2	RATINGS	-		
2.1	Rated voltage	kV		
2.2	Insulated rated voltage	kV		
2.3	Rated frequency	hz		
2.4	Rated short-duration power-frequency withstand voltage	kV		
2.5	Rated lightning impulse withstand voltage	kV		
2.6	Rated short-circuit breaking current, max.	kA		
2.7	Rated short-time withstand current, 3s, max.	kA		
2.8	Rated short-circuit making current, max.	kA		
2.9	Rated peak withstand current, max.	kA		
2.10	Rated main busbar current	A		
2.11	Rated normal current of feeder, circuit-breaker, max.	A		
2.12	Rated normal current of feeder, switch-disconnector	A		
2.13	Rated normal current of feeder, switch-disconnector with fuses	A		
2.14	Degree of protection standard	-		

1 - Bidder is allowed to add/include any information considered as important.

BALANCE OF PLANT				
Nº	CHARACTERISTICS	UNITS	DATA	NOTES
1	COMBINER BOXES	-		
1.1	Number of strings	-		
1.2	Permissible DC voltage	Vdc		
1.3	String voltage, temperature and surge protection monitoring	Yes / No		
1.4	String current monitoring	Yes / No		
1.5	Output DC switch	Yes / No		
1.6	Surge protection on DC side	-		
1.7	Design Ambient Temperature (min/max)	°F		
1.8	Enclosure Rating	-		
1.9	Warranties (As Required / As Bid)	years	5 /	
1.10	Certifications	-		
2	INSTRUMENTATION AND CONTROL	-		
2.1	Number of operator stations	Qty		
2.2	Meteorological Stations	Qty		Minimum 2
2.2.1	GHI Pyranometer	Qty		per met station
2.2.2	POA Pyranometer	Qty		per met station
2.2.3	Ambient temperature	Qty		per met station
2.2.4	Module temperature	Qty		per met station
2.2.5	Wind speed (anemometer)	Qty		per met station
2.2.6	Relative Humidity Sensor	Qty		per met station
2.2.7	Soiling Monitoring System/Sensor	Qty		per met station
2.2.8	Data Logger	Qty		per met station
2.2.9	Battery Backup (required/as bid)	hr	12 /	per met station
2.2.10	Cloud sensor	Qty		per met station

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Appendix 7: Approved Manufacturers List

Approved Manufacturers List					
Major Equipment					
PV Modules	Jinko	Trina	LG	Hanwha Q CELLS	Canadian Solar
	FirstSolar	Astronergy	Talesun	LONGi	Phono Solar (SUMEC)
	Yingli	JA Solar	Suntech	SunPower	REC Solar
Inverters	GE	TMEIC	Schneider	Power Electronics	SMA
	Schneider	Sungrow	Chint	Ingeteam	ABB
Racking System	Array Technologies Inc.	NexTracker	GameChange	SunLink	Shoals
	RBI	Schletter	TerraSmart	Ideematec	Unirac
	SunPower	Soltec	Nclave		
Transformer	ABB	Waukesha	Siemens	Alstom	Hyundai
	Virginia Transformer	Pennsylvania Transformer	Cooper	PACS	
Switchgear	ABB	Cutler-Hammer	GE	Powell	
Balance of Plant					
Combiner / Recombiner Boxes	SolarBOS	Shoals	Bentek		
Disconnects	Square D	Siemens	Eaton	ABB	SMA
Data Logger	Campbell Scientific	Kipp and Zonen			
Pyranometer	Kipp and Zonen	Eppley Laboratory	EKO		

Temperature Sensor (cell)	Aros Solar Technology				
Anemometer	Gill Instruments				
Power Distribution Center	Powell	Zachry	PACS	Alstom	
HV Circuit Breakers	ABB	GE-Hitachi	Mitsubishi	Siemens	
HV Disconnect Switch	Pascor	Southern-States			