

Reference Number : \_\_\_\_\_

## FORM A - ESTIMATED EQUIPMENT DATA SOLAR POWER GENERATOR

### A. BASIC INFORMATION

GRID USER	
1. Power Plant Name	
2. Company Name	
3. Office Address	
4. Main Contact Person	
5. Position	
6. Contact Numbers	
7. Email Address	
8. Power Plant Location	
a. Street	
b. Sitio	
c. Barangay	
d. Province	
e. Location Map	<i>Please attach a geographic map showing the coordinates of the power plant site.</i>

### B. POWER REQUIREMENT

YEAR					
A. Load Forecast (MW) During Construction					
B. Load Forecast (MW) for Station Use					
C. Feedback Power Requirement (MW):					

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### C. GENERATOR / MACHINE DATA

STANDARD PLANNING DATA	VALUE
1. In-Service Date (Commissioning)	
2. Inverter Manufacturer & Model	
3. Solar Panel Technology	
4. Total Plant Capacity	
a. Total Installed Capacity, kW (Total rating of all installed solar panels)	
b. Number of units and unit size	
c. Inverter Power Rating, (kW)	
5. PVS Transformer data	
a. Transformer Voltage Ratio	
b. Percentage Impedance	
c. Winding Connection	
d. Tap Settings	
e. Normal station service consumption	
6. Number of Individual Generator Units (if composed of several machines)	
7. Rated Terminal Voltage (kV)	
8. Frequency Withstand Capability (Hz)	
9. Rated Speed (rpm)	

DETAILED PLANNING DATA			
Check below the corresponding machine model. If other models are to be used, please provide corresponding Machine Data.			
Generator	Electrical	Pitch Control	Aerodynamic
<input type="checkbox"/> PVGU1 <input type="checkbox"/> Other Model: _____ <p>(please specify)</p>	<input type="checkbox"/> PVEU1 <input type="checkbox"/> Other Model: _____ <p>(please specify)</p>	<input type="checkbox"/> IRRADU1 <input type="checkbox"/> Other Model: _____ <p>(please specify)</p>	<input type="checkbox"/> Other Model: _____ <p>(please specify)</p>
GENERATING UNIT PARAMETERS			VALUE

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<i>From the above-checked generator model, fill-out the corresponding solar generator data as applicable. Please provide per unit value. Put n.a. if not applicable.</i>	
1. Solar Panel Data	
▪ Solar Panel Manufacturer	
▪ Rated Power per Solar Panel (KW)	
▪ Solar Power Technology	
▪ Grid Inverter Data	
▪ Rated Apparent Power (KVA)	
▪ Frequency Tolerance Range	
▪ Width (mm)	
▪ Height (mm)	
▪ Area (M <sup>2</sup> )	
▪ Rated Voltage (Volt)	
▪ Rated Current (Ampere)	
▪ Watts per square meter	
▪ Efficiency, %	
2. Dynamic Model of the PVS	
3. Reactive Compensation	
4. PVS Configuration	
5. Converter time constant for $I_{Q_{cmd}}$ , (second)	
6. Converter time constant for $I_{P_{cmd}}$ , (second)	
7. Low voltage power logic (LVPL) voltage 1, VLPL1 (p.u.)	
8. LVPL voltage 2, VLPL2 (p.u.)	
9. GLVPL gain	
10.High voltage reactive current (HVRC) logic voltage, VHVRCL (p.u.)	
11.Maximum reactive current at VHVRCL, CURHVRCR (p.u.)	
12.Rate of LVACR active current change, Rip_LVPL	
13.Voltage sensor for LVACR time constants, T_LVPL	

SOLAR GENERATOR ELECTRICAL DATA PARAMETERS	VALUE
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<i>From the above-checked model, fill-out the corresponding solar electrical data as applicable. Please provide per unit value. Put n.a. if not applicable.</i>	
1. Filter time constant in voltage regulator, Tw (sec)	
2. Proportional gain in voltage regulator, Kpv (p.u.)	
3. Integrator gain in voltage regulator, Kiv (p.u.)	
4. Proportional gain in torque regulator, Kpp (p.u.)	
5. Rate feedback gain, Kf (p.u.)	
6. Rate feedback time constant, Tf (p.u.)	
7. Maximum limit in voltage regulator, Qmx (p.u.)	
8. Minimum limit in voltage regulator, Qmn (p.u.)	
9. Maximum active current limit, IPmax (p.u.)	
10. Voltage sensor time constant, Trv (sec)	
11. Maximum power order rate, dPMX (p.u.)	
12. Minimum power order rate, dPMN (p.u.)	
13. Power reference filter time constant, Tpower (sec)	
14. Volt/MVar gain, KQi	
15. Minimum voltage limit, Vmincl	
16. Maximum voltage limit, Vmaxcl	
17. Int. Volt/Term. Voltage gain KVi	
18. Lag in Windvar controller (sec), Tv	
19. Converter current limit, ImaxTD (p.u.)	
20. Hard active current limit, Iphl (p.u.)	
21. Hard reactive current limit, Iqhl (p.u.)	
22. Maximum power from PV plant, PMX (MW)	

<b>SOLAR GENERATOR PITCH CONTROL DATA PARAMETERS</b> <i>From the above-checked model, fill-out the corresponding pitch control data as applicable. Please provide per unit value. Put n.a. if not applicable.</i>	<b>VALUE</b>
1. Time of first data point, TIME1 (sec)	
2. Irradiance at first data point, IRRADIANCE1 (W/m <sup>2</sup> .)	
3. Time of second data point, TIME2 (sec)	
4. Irradiance at second data point, IRRADIANCE2 (W/m <sup>2</sup> .)	
5. Time of third data point, TIME3 (sec)	
6. Irradiance at third data point, IRRADIANCE3 (W/m <sup>2</sup> .)	
7. Time of fourth data point, TIME4 (sec)	

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8. Irradiance at fourth data point, IRRADIANCE4 (W/m <sup>2</sup> .)	
9. Time of fifth data point, TIME5(sec)	
10. Irradiance at fifth data point, IRRADIANCE5 (W/m <sup>2</sup> .)	
11. Time of sixth data point, TIME6 (sec)	
12. Irradiance at sixth data point, IRRADIANCE6 (W/m <sup>2</sup> .)	
13. Time of seventh data point, TIME7 (sec)	
14. Irradiance at seventh data point, IRRADIANCE7 (W/m <sup>2</sup> .)	
15. Time of eighth data point, TIME8 (sec)	
16. Irradiance at eighth data point, IRRADIANCE8 (W/m <sup>2</sup> .)	
17. Time of ninth data point, TIME9 (sec)	
18. Irradiance at ninth data point, IRRADIANCE9 (W/m <sup>2</sup> .)	
19. Time of tenth data point, TIME10 (sec)	
20. Irradiance at tenth data point, IRRADIANCE10 (W/m <sup>2</sup> .)	

Generator Model	<p><i>Insert equivalent standard model that represents the generator model</i></p> <p><input type="checkbox"/> User Written Model</p> <p><input type="checkbox"/> Other Standard Model</p> <p><i>Provide a block diagram suitable for stability studies or an IEEE standard model type with all in-service parameter values for the generator.</i></p>
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<b>HARMONICS AND WAVEFORM DISTORTION</b>					
<i>This table shall only be filled in for solar panels equipped with an electronic power inverter.</i>					
ORDER	OUTPUT POWER (kW)	Harmonic Current (% of I <sub>rated</sub> power)	ORDER	OUTPUT POWER (kW)	Harmonic Current (% of I <sub>rated</sub> power)
2			3		
4			5		
6			7		
8			9		
10			11		
12			13		
14			15		

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16			17		
18			19		
20			21		
22			23		
24			25		
26			27		
28			29		
30			31		
32			33		
34			35		
36			37		
38			39		
40			41		
42			43		
44			45		
46			47		
48			49		
50					

GENERATOR TRANSFORMER DATA			
1. Substation Name		10. Status	
2. Rated Capacity		11. Model type	
3. Transformation Voltage (kV)		12. Serial Number	
4. Vector Group		13. Rated Frequency	
5. No. of Taps		14. Power Factor	
6. % Adjust per Tap		15. Voltage Ratio	
7. % Impedance at Rated load & Voltage		16. Configuration (e.g. 3 Phase or Three Single Phase)	
8. Manufacturer		17. Temperature Rise (°C)	
9. Year of commissioning		18. Connection for each winding H,X,Y (e.g.	

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				Wye, Delta, Zigzag)				
19. Positive Sequence Impedance	(See IEEE C57.12.90 for measurement techniques)	Positive Sequence Impedance (%)				HX	HY	XY
		R						
		X						
		Base MVA						
20. Zero Sequence Impedance (Data is required for transformers with 1 or 2 external neutrals)	H winding energized all others open	Closed Tertiary	H			X	HX	XH
		R						
		X						
		Base MVA						
	H winding energized X winding shorted	Open Tertiary	H			X	HX	XH
		R						
		X						
		Base MVA						
	In-Service Off-Load Tap (kV)							
	Off –Load Taps (kV)							
	On-Load Taps (kV) (Max Tap, Min Tap, Number of Steps)							
	Core and Excitation Losses (kW, kVAr)							

CHARACTERISTIC DATA	
1. Open circuit saturation curve	Attach File
2. Short circuit curve	Attach File
3. V curves	Attach File
4. Reactive Power Capability curve	Attach File
5. Ramping Capability Curve	Attach File
6. Short Circuit and Open Circuit Characteristic Curve	Attach File

PLANT FLEXIBILITY PERFORMANCE DATA (FOR EACH GENERATING PLANTS)	
a. Rate of loading following weekend shutdown (Generating Unit and Generating Plant)	
b. Rate of loading following an overnight shutdown (Generating Unit and Generating Plant)	
c. Block Load following synchronization	
d. Rate of Load Reduction from normal rated MW	

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e. Regulating range	
f. Load rejection capability while still synchronized and able to supply Load.	

#### **AUXILIARY DEMAND DATA**

a. Rated Normal unit-supplied auxiliary Load for each Generating Unit at rated MW output	
b. Each Generating Plant Auxiliary Load other than (a) above and where the station auxiliary Load is supplied from the Grid.	
Please attach the following:	
a. Physical Layout	
b. Electrical Layout	
c. Specifications	
d. Protections	

#### **CONNECTION SCHEME**

*Provide a single line diagram of the connection scheme showing the details of the main connection facilities:*

- a. NGCP facility where connection of power plant will be made
- b. Length of the connection line including the type of conductor and structure used
- c. MVA Rating of the transformers
- d. MVAR Rating of Shunt Capacitors or Shunt Reactors, if any

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## D. SUBSTATION AND TRANSMISSION FACILITY

### Line Information

Line Name	Operating Voltage Level (kV)	Length (km)	Type of conductor		Actual Rating (MVA)	R	X	B	Year of Commissioning	Age (Year)	Connected Generator /Load
			No. of Bundles	Conductor size							

*Please add rows as necessary*

### Line Structure Information

Number	Type	Coordinates

*Please add rows as necessary*

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**Power Circuit Breaker**

Substation Name	System Voltage (kV)	Type (Live Tank or Dead Tank)	Continuous Rating (A)	Breaker Interrupting Capacity (kA)	Manufacturer	Year of Commissioning	Age (Year)

*Please add rows as necessary*

**Reactive Compensation Equipment**

Substation Name	Rated Voltage (kV)	Rated Capacity (MVar)	Manufacturer	Year of Commissioning	Age (year)	Status

*Please add rows as necessary*

**ACCOMPLISHED BY:**

**SIGNATURE:** \_\_\_\_\_

**NAME:** \_\_\_\_\_

**POSITION:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

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