ATTACHMENT 2D

PERFORMANCE STANDARDS AND LIQUIDATED DAMAGES

1. DEFINITIONS

"Day" unless specifically noted otherwise, means a calendar day of twenty-four (24) hours that begins at 12:00 A.M. and continues through 11:59 P.M. including Saturdays, Sundays, and holidays.

"Performance Guarantee" means Supplier's guarantee that the Facility will produce energy in an amount that is at least ninety-five percent (95%) of the Production Profile during each Calendar Month of the Performance Guarantee Period.

"Performance Guarantee Calculation" means the guaranteed efficiency of the Facility, using the measured POA and actual and estimated production of the Facility. The procedure associated with this calculation is set in the performance guarantee calculation attached herein.

"Performance Guarantee Period" means the period beginning on the first day of the Calendar Month following the date of Substantial Completion and continuing for sixty (60) Calendar Months thereafter. (Performance Guarantee Period is equal to final contract warranty period)

"Performance Ratio" or "PR" means the overall losses for the Facility before accounting for temperature and irradiance variations as used in PVSYST or SAM. The PR includes all the system losses from the DC array to the power output (in MW) to the grid at the point of interconnection including, but not limited to, the inverter efficiency, transformers, and wire losses.

"Performance Shortfall" expressed in MWh, means the failure of the Facility to achieve the Performance Guarantee during the Performance Guarantee Period, as described below, and shall equal the Performance Guarantee minus the actual production of the Facility at the Main Facility Meter measured at the end of each Calendar Month during the Performance Guarantee Period.

"Performance Testing" means the Capacity Test and the Reliability Test per the specification and contract.

"Performance Testing Period" means the period during which the Performance Testing is performed.

"POA" means plane of array irradiance.

"Production Profile" means the expected hourly production of the Facility as measured at the Main Facility Meter for the Performance Guarantee Period as of the Effective Date, the monthly summary of which is set forth in the contract (to be provided with bid). Such Production Profile shall be adjusted by Company to reflect the adjusted Capacity value in the event, and to the extent, that Supplier has paid capacity damages.

"Capacity" expressed in megawatts (MW), means the output the facility can supply to the Main Facility Meter on an instantaneous basis.

"Guaranteed Capacity" expressed in MW, means the output of the Facility is guaranteed to provide at Design Point Conditions, which shall be one megawatt (1 MW).

2. FACILITY PERFORMANCE DAMAGES

Upon Final Acceptance, Supplier shall guarantee that the Facility will produce energy in an amount that is at least ninety-five percent (95%) of the agreed upon Production Profile on a 12 month basis for a period no less than sixty months (60).

Performance shall be measured each calendar month during the Performance Guarantee Period in accordance with the Performance Guarantee Calculation below. Within thirty (30) Days of substantial completion and at the end of each twelve (12) month period during the Performance Guarantee Period, Company shall provide Notice to Supplier along with supporting documentation if the Facility has failed to satisfy the Performance Guarantee.

Company shall be entitled to one hundred fifty dollars ($150.00) per MWh multiplied by the annual performance shortfall. The annual shortfall will be calculated by adding the total monthly shortfall or over production for each twelve (12) month period of the performance guarantee period. The performance shortfall shall be expressed in Megawatt Hours (MWh) and shall equal the performance guarantee minus the actual production of the facility at the main facility meter for the measured time period.

See sample performance guarantee monthly calculation below.

3. CAPACITY DAMAGES

In order for Supplier to achieve Final Acceptance, Supplier shall conduct a Capacity Test of the Facility. If the Facility fails to achieve the Guaranteed Capacity, but achieves at least ninety five percent (95%) of the Guaranteed Capacity, then company shall be entitled to damages in the amount of five dollars ($5.00) per watt AC for all capacity below the Guaranteed Capacity.

See sample capacity test guideline and sample calculation below.

Performance Guarantee Calculation

"Actual Production" (in MWh's) means the total production measured, in MWh's, for each Calendar Month during the Performance Guarantee Period at the Main Facility Meter.

"Adjusted Performance Guarantee" means the difference between the Actual Production and the Calculated Expected Production.

"Baseline Expected Production" means the expected sum of the hourly production of the Facility as set forth in the Production Profile as supplied with bid and attached to the Contract for each Calendar Month during the Performance Guarantee Period.

"Baseline POA" means expected sum of the POA for any Calendar Month during the Performance Guarantee Period. For this Facility, the Baseline POA for each Calendar Month is as follows:

Monthly POA Summary	
Month	kWh/m²
Jan	96.5
Feb	107
Mar	150.4
Apr	164.8
May	187.7
Jun	190.9
Jul	196.7
Aug	177.1
Sep	156.9
Oct	138.3
Nov	94.5
Dec	81

"Calculated Expected Production" means the product of the Baseline Expected Production multiplied by the Weather Correction Factor.

"Quarterly POA" means the measured sum of the POA for each hour during any Calendar Month of the Performance Guarantee Period as measured by the average of two (2) or more suitable POA ground measurement devices installed at the Project Site providing valid hourly data (within 3% of other measurement devices).

"POA" means Plane of Array irradiance.

"TMY2 Year" means Typical Meteorological Year weather data set 2 from the National Renewable Energy Laboratory or agreed upon equivalent

"Weather Correction Factor" means the ratio of the monthly POA measured in a Calendar Month of the Performance Guarantee Period divided by the Baseline POA.

Background

The power production requirements for the Facility as bid and attached to the Contract, and are based on a TMY2 Year which represents a typical weather year. Baseline POA is generated using the TMY2 Year as an input, which is used to calculate the Baseline Expected Production of the Facility. The weather adjustment shall correct the Baseline Expected Production on a monthly basis from the Baseline POA to a value based on the monthly POA measured over each Calendar Month during the Performance Guarantee Period.

Procedure

Once the monthly POA dataset has been measured and established, the monthly POA shall be divided by the Baseline POA to develop the Weather Correction Factor for the Calendar Month. Next, the Weather Correction Factor shall be multiplied by the Baseline Expected Production for such Calendar Month to determine the Calculated Expected Production for the respective Calendar Month. Finally, the Actual Production shall be divided by the Calculated Expected Production to determine the Adjusted Performance Guarantee percentage.

Example 1: (Pass Performance Guarantee)

Measured POA in May: 210 kWh/m^2

Baseline POA in May: 187.7 kWh/m^2

Baseline Expected Production (MWh) in May: 832.7 MWh

Actual Production (MWh) measured in May: 900 MWh

Weather Adjusted Performance Guarantee calculation as follows:

Weather Correction Factor = (210) / (187.7) = 1.12

*Calculated Expected Production = 832.7 * 1.12 = 932 MWh*

Adjusted Performance Guarantee = 900 MWh / 932 MWh = 96.6%

In the foregoing example, the weather adjusted Performance Guarantee calculation is 96.6% of the Production Profile which satisfies the 95% Performance Guarantee requirement. No further action is required.

Example 2: (Fail Performance Guarantee)

Measured POA in May: 175 kWh/m^2

Baseline POA in May: 187.7 kWh/m^2

Expected Production (MWh) in May: 832.7 MWh

Actual Production (MWh) measured in May: 700 MWh

Weather adjusted Performance Guarantee calculation as follows:

Weather Correction Factor = (175) / (187.7) = 0.93

*Calculated Expected Production in May = 832.7 MWh * 0.93 = 776 MWh*

Adjusted Performance Guarantee = 700 MWh / 776 MWh = 90.2%

In the foregoing example, the weather Adjusted Performance Guarantee calculation is 90.25% of the Production Profile which fails to satisfy the 95% Performance Guarantee requirement. Therefore, the Supplier shall be responsible for Performance Shortfall Damages.

Example Calculation of Performance Shortfall Damages

Expected Production in May: 832.7 MWh

Calculated Expected Production in May = 776 MWh (as calculated above)

Minimum Performance Guarantee (95% of Expected Production) =

776 MWh x 0.95 = 737 MWh

Actual Production = 700 MWh

Production Shortfall = 737 MWh – 700 MWh = 37 MWh

Performance Shortfall Damages = $150.00/MWh x 37 MWh = $5,550

Capacity Test Guidelines

Objective:

The Capacity Test shall determine the Corrected Capacity at the Design Point Conditions established in the bid/contract in order for Supplier to achieve Final Acceptance. Since the Capacity Test will determine the Corrected Capacity for the Facility, as defined below, such test will be based on the relevant environmental conditions in the field at the time of such test, including field irradiance and temperature. The measured Capacity shall then be "corrected" to the Design Point Conditions as established in the contract and the resulting Corrected Capacity shall be compared to the Guaranteed Capacity as set forth herein.

Definitions:

The following definitions shall apply specifically to this capacity guideline.

"Corrected Capacity" means the most recent actual tested Capacity, in MW, corrected to DPC using the procedures specified in the Capacity Test Procedures as described herein.

"Design Point Conditions" or "DPC" means a set of ambient reference conditions, which include a solar irradiance of 1050 watts per meter squared, module cell temperature of forty-five degrees (45°) Celsius, atmospheric air mass of 1.5 or less and wind speed of one (1) meter per second.

"POA" means plane of array irradiance.

"PSP" means precision spectral pyranometer.

Capacity Test Procedure:

Supplier shall submit a Capacity Test Procedure to owner. The Capacity Test Procedure shall conform to the Capacity Test Guidelines contained herein and, at a minimum, include testing protocol, a listing of instrumentation, calibration procedures, test duration, type of data collected, collection frequency, Facility performance curves and test reporting. Such Capacity Test shall then be performed in accordance with the Capacity Test Procedure approved by Company in its reasonable discretion.

The data for the Capacity Test report shall include at least 50, 15 minute blocks of average POA solar irradiance data. The data shall be collected during a thirty (30) Day period for all intervals when the minimum POA conditions of 500 W/m^2 are met. If the Minimum Insolation Requirement is not achieved during the test period, the test period will be extended until the Minimum Insolation Requirement is obtained.

If there is sufficient data collected to satisfy the irradiance requirements, the Supplier may choose to end the test less than thirty (30) Days from test commencement. In the event the Minimum Irradiance Conditions have not been satisfied in aggregate at the end of the thirty (30)-Day period, the thirty (30)-Day dataset may be reviewed to see if the Minimum Irradiance Conditions can be pieced together with discontinuous Days. This discontinuous data set must be mutually agreed upon by the Parties.

The general guidelines for the Capacity Test Procedure include the following considerations:

1. Supplier shall supply all required labor to execute the Capacity Test and supply all test and calibration equipment, materials, tools and services necessary to perform all testing.

2. Supplier shall allow one (1) or more Company-designated engineers to witness all Capacity Test Procedures.

3. The Capacity Test Procedure shall detail test activities, such as:

    a. Specification "cut-sheets" and calibration certificates if requested for all primary measurement field devices.

    b. Location of the instruments for field measurements.

    c. Field testing procedures (i.e. test duration, frequency, actions in the event of a failed test, etc.).

    d. List of secondary measurement devices and locations.

    e. Output calculations, methodology, correction factors that serve as the basis for the Corrected Capacity calculation, equations and procedures.

    f. Sample test calculations.

4. The Capacity Test Procedure must provide sufficient detail to allow the Company to perform independent calculations of test results from the measured data.

5. All primary portable instruments shall be calibrated and certified by a non-affiliated third party at Supplier's expense in accordance with NIST standards or other Company-approved equivalent. Current calibration sheets and certificates shall be submitted for Company Review prior to commencement of the test.

Testing shall be performed between the hours of 9:00 a.m. to 4:00 p.m. when the POA is greater than 500 W/m^2 with minimal cloud cover. Fifteen (15) minute interval readings shall be taken for a minimum total of fifty (50) intervals, during which following data points shall be recorded:

1. POA (W/m^2) (with a minimum of two (2) locations in the array)

2. Total Facility output to the grid at the point of metering (at the high voltage side of the transformer) (MW)

3. Cell temperature at minimum of two (2) of the panels per every five (5) MWac within the array field distributed evenly as required to obtain a representative cell temperature for the Facility using calibrated thermocouples (T cell)

4. Ambient air temperature at one (1) location within the array field – C (T)

Once Supplier has recorded and logged data for all of the fifteen (15)-minute intervals, Supplier shall use such data to compare the Corrected Capacity of the Facility to the Guaranteed Capacity for each such interval. The following example illustrates the way in which Supplier shall compare the Corrected Capacity to the Guaranteed Capacity:

Definitions
a) W_{MEAS} = Measured AC Capacity of Field in MW (MW)
b) W_{COR} = Corrected AC output in MW (corrected to DPC)
c) W_{GUAR} = Guaranteed AC Capacity of Field in MW (4.5MW) (at DPC)
d) IRR = Measured Irradiance in W/m2 at the Solar Station
e) $IRR_{DPC} = IRR_{STC}$ = 1050 W/m^2 (Standard Test Conditions Irradiance)
f) T_{COEFF} = Power Temp Coefficient of Installed Module (-0.0044/°C)
g) T_{CELL} = Temp of Monitored Cell in °C (Tcell = T_{Module} +1.5)
h) T_{DPC} = 45°C (Design Point Conditions temperature)
i) Wnameplate = 4.5 MW AC

$W_{COR} = W_{MEAS} * (IRR_{DPC} / IRR) * (1 / (1+T_{COEFF} (T_{CELL} – T_{DPC})))$

Measurements in time interval 1 in the field (example):

Test Data

Plant Output = 4.0 MW

Cell Temperature= 50 °C

Irradiance= 800 W/m^2

WGuar AC= 4.5 MW

Tcoeff= - .0045%

Expected Wp

$W_{COR} = 4.0 * (1050/800) * (1/(1-0.0045*(50-45)))$

$= 4.0 * (1050/800) * (1/0.9775)$

$= 4.0 * 1.3125 * 1.023$

$= 5.37$ MW

$W_{COR} / W_{GUAR} = 5.37/ 4.5 = 1.193 = 119.3\%$ of Guaranteed Capacity

Note: Cell temperature is calculated based on the module temperature readings taken from a T-type thermocouple placed on the underside of the DUT. A correction factor of 1.5°C is assumed for backsheet to cell temperature as per the standard practice of glass and backsheet constructed c-Si modules.

Plant Capacity

In the foregoing example, the Corrected Capacity is shown to be 19 and 3 tenths percent (19.3%) greater than the Guaranteed Capacity.

Supplier shall repeat the foregoing analysis for a minimum of fifty (50) intervals and then compare the average Corrected Capacity to the Guaranteed Capacity. If the average Corrected Capacity meets or exceeds the Guaranteed Capacity, then the Facility shall have satisfied the Capacity Test. If the average Corrected Capacity is below the Guaranteed Capacity, however, the Company shall be entitled to damages.

Within seventy-two (72) hours or agreed upon period following its completion of the Capacity Test, Supplier shall submit to Company for Company Review a preliminary report providing all of the data collected as well as its calculations to determine the average Corrected Capacity relative to the Guaranteed Capacity as described above. Within five (5) Business Days following Company's approval of such preliminary report, Supplier shall provide to Company a detailed Capacity Test report which shall include:

1. A list of any mutually agreed upon deviations to the Capacity Test procedures.

2. Instrument calibration sheets and certificates.

3. Capacity Test data (manual and data acquisition).

4. Corrected test data.

5. Field notes.

6. Calculations.

7. Post-test uncertainty analysis.

8. Conclusions.