AGREEEMENT AND GRID INTERCONNECTION STANDARDS FOR NET METERING / NET ACCOUNTING OF A HYBRID ROOFTOP SOLAR POWER ELECTRICAL INSTALLATION

(SCHEME 01-NET METERING)

CEYLON ELECTRICITY BOARD
AND

THIS AGREEMENT is entered into at …… on this ……. day of …… Two Thousand and …… between Ceylon Electricity Board, a body corporate duly constituted by Act No. 17 of 1969 and having its head office at 50, Sir Chittampalam A. Gardiner Mawatha, Colombo in the Democratic Socialist Republic of Sri Lanka (hereafter referred to as "CEB"), and
……located at ……..(complete address of the premises, the same address as in the electricity account and Account Number) hereinafter referred to as "Producer", and collectively, Parties.

WHEREAS

a) The Producer has entered into an Agreement with the CEB for supply of electricity on net metering under Account No ……for the supply of electricity to ……which is still in force.

b) The parties agree that they are bound by the conditions of supply contained in the Agreement for supply of electricity dated …….. for the purposes of the Agreement.

c) CEB is desirous of providing Net Energy Metering facilities to allow its electricity consumers to install a hybrid rooftop solar power system to the existing electricity supply network.

d) The parties are desirous of entering into this Agreement for the purpose given in Clause – c above.

Now it is hereby agreed as follows.

1. DEFINITIONS

Producer: A person or a company who owns a generating facility to produce and deliver electrical energy to the distribution network of CEB and presently owns a valid account receiving electricity from CEB distribution network.

Import of Electrical Energy: Receipt of Electrical Energy by the Producer from the CEB system.

Export of Electrical Energy: Supply of Electrical Energy by the Producer to the CEB system.

Net Metering: Net Metering means the measurement of the difference between electrical energy supplied through the electricity distribution network of CEB to the Producer and the amount of electrical energy generated by the Producer's Generating Facility delivered to the electricity distribution network of CEB.

Generating Facility: Generating Facility means all of the Producer's equipment and land at a single site or parcel of land utilised to produce and deliver electrical energy, including but not limited to, Producer's generating, metering and protection equipment.

Contract Demand: The allocated capacity, as depicted in the electricity agreement, to the Consumer by the CEB expressed in terms of kilovolt ampere.

Billing Period: The period for which the Producer's electricity meter is read by CEB and the Consumer is issued with an electricity bill, usually a period of one month (30 days).

Energy Credit: This shall be the amount of net electrical energy exported to the CEB distribution network during a specified Billing Period, which amount, measured in kilowatt hours, shall be credited to the Producer's electricity account in the subsequent Billing Period.

Parallel Operation: The operation of the Generating Facility and producing electrical energy at the Consumer's premises, while connected to the CEB distribution network.

2. TERM

2.1. This Agreement shall come into effect from the date of execution and continues to be in force until the expiry of twenty years. No extensions shall be allowed, and any new Agreement shall be based on the policies prevailing at that time.

2.2. If for any reason, the Producer's electricity supply is partially or fully disconnected by CEB for whatever reason, with or without a request from the Producer, or owing to natural causes, and when there is reasonable hope that the supply will be restored within a reasonable time, this Agreement automatically stands suspended for the period of such disconnection.

3. GENERAL RULES, RIGHTS AND OBLIGATIONS

3.1. This scheme is applied only for domestic consumers, who are in TOU tariff.

3.2. The Generating Facility shall use one or any combination of the approved types of renewable sources of energy to generate electricity at the Producer's premises.

3.3. The entire Generating Facility and equipment such as solar panels, turbines and associated accessories such as hybrid inverters, battery storage, and protective circuits shall be located within the Producer's premises and shall be owned by the Producer.

3.4. A Producer must comply with the conditions imposed by CEB and should execute the interconnection Agreement with CEB and receive CEB written permission before parallel operation of its Generating Facility with the CEB distribution system

3.5. The Generating Facility shall be intended to meet all or a part of the Producer's electricity demand and electrical energy requirements. It shall be the responsibility of the Producer to decide on the capacity of Generating Facility with due consideration to the amount of renewable energy available, investment and operating costs of equipment, the Producer's Contract Demand with CEB and the average electrical energy requirements of the Producer. However, the clearance certification for the capacity of the hybrid rooftop solar power system shall be obtained from CEB before commencing installation.

3.6. Interconnection with CEB/ LECO distribution system under this agreement does not provide the Producer any rights to utilize CEB distribution system for the transmission, distribution or wheeling of electric power to a third party.

3.7. A Producer shall ascertain and comply with applicable rules, regulations imposed by the Ministry of Power / CEB / Public Utilities Commission of Sri Lanka (PUCSL)/ Sri Lanka Sustainable Energy Authority (SEA) and any law or standard that applies to the design, construction, installation, operation or any other aspect of the Producers Generating Facility and interconnection facilities.

3.8. CEB shall have the right to review the design of Producer's generating and interconnection facilities and to inspect such faculties prior to the commencement of Parallel Operation with CEB distribution system. CEB may require a Producer to make modification as necessary to comply with the requirements. CEB review and authorization for parallel operation shall not be construed as conforming or endorsing the Producers design or as warranting the Generating and or interconnection facility's safety, durability or reliability. CEB shall not, by reason of such review or lack of review, be responsible for the strength, adequacy or capability of such equipment.

3.9. The installed capacity of the Generating Facility which is [.....] kVA AC shall not exceed the Contract Demand of the Producer, which is [.....] kVA. If the Producer so wishes to increase or decrease his Contract Demand and/or capacity of the Generating Facility, he shall first apply for the appropriate change, and after fulfilling the requirements specified by CEB, request an amendment to this Agreement. If the producer wishes to change the ownership of the facility, and after fulfilling the requirements specified by CEB, the new producer shall request relevant amendments to this Agreement. In any event, the Term of this Agreement, and the commencement of the agreement shall remain unchanged as twenty (20) years, and as the date, on which the agreement commenced first, respectively.

3.10. The Generating Facility shall be built and operated according to the relevant standards and other guidelines stipulated in this Agreement.

3.11. The Produce shall install all the necessary protective equipment required to ensure safe and reliable operation of the Generating Facility and the Producer shall meet all the expenses of installing such equipment and other associated accessories.

3.12. The Producer shall maintain all the equipment downstream of the metering equipment in good operating condition.

3.13. The Producer shall allow CEB to enter his premises for the inspection of the metering equipment and the Generating Facility, and would promptly attend to and implement any written recommendations or instructions with regard to the Generating Facility.

3.14. Any information pertaining to Generating and/or interconnection facilities provided to CEB by a Producer shall be treated by CEB in a confidential manner.

3.15. A Producer shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with Prudent Electrical Practices

3.16. CEB may limit the operation or disconnect or require the disconnection of a Producer's Generating Facility from CEB's distribution system at any time with or without notice, in the event of an emergency or to correct unsafe operating conditions. CEB may also limit the operation or disconnect or require the disconnection of a Producers Generating facility from CEB distribution system upon the provision of reasonable notice.

3.16.1. to allow for routine maintenance, repairs or modifications to CEB distribution system.

3.16.2. Upon CEB determination that a Producer's Generating Facility is not in compliance with the conditions stipulated in this Agreement

3.16.3. Upon termination of Interconnection Agreement.

3.17. CEB shall promptly install the meters and metering equipment to implement Net Metering, the initial cost of which shall be paid by the Producer.

3.18. CEB shall maintain the distribution network and the metering equipment to supply and meter the electricity requirements of the Producer, and to accept the electricity generated by the Producer, up to the capacity stated in the supply agreement and this Agreement, respectively.

3.19. CEB shall promptly attend to Producer's requests for testing the meters or metering equipment for their accuracy, the fees for which shall be payable by the Producer.

3.20. Prior to signing the agreement, the Producer shall provide technical literature including Type Test certificates of the protective equipment for Net Metering to the CEB and shall obtain the concurrences of the CEB to procure the same.

3.21. CEB shall promptly read the Producer's meter at the end of each Billing Period and bill the Consumer for his net consumption in the Billing Period after giving due consideration to the credits from the previous Billing Period, and credit the energy exported to the Consumer's account to be carried over to the next Billing Period. CEB's monthly invoice shall show the export credit carried over from the previous Billing Period, consumption and export in the present Billing Period, and the credit carried over to the subsequent Billing Period (all figures in kilowatt hours).

4. APPLICATION PROCESS

4.1. Potential Applicant initiates contact with CEB. Upon request CEB will provide information and documents such as sample agreements, application including, technical information, listing of certified equipment, initial review information, metering requirement etc. to a potential Producer.

4.2. Applicant shall request an interconnection clearance by submitting technical information such as datasheets, installation layout and diagrams.

4.3. Applicant completes an application as per the condition stipulated in clearance certificates and files application and supply any relevant additional information requested by CEB. Initial review fee as applicable shall be included with the application.

4.4. CEB performs an Initial Review and develops preliminary cost estimates and interconnection requirements.

4.5. The applicant should purchase equipment as per the technical details given in this Net Energy Metering Agreement and IEC 61727 (2004-12), IEEE 1547 – 2003 or latest equivalent Standards.

4.6. Applicant and CEB enter into an interconnection Agreement.

4.6.1. When an application is processed, if a Generating Facility or part of a Generating Facility is identified as any of Generating Facility already contracted with CEB on any of schemes, the date of commencement of the agreement shall be the date, which the agreement already commenced first.

4.7. Where applicable, CEB or Producer installs required interconnection facilities or modified CEB distribution system.

4.8. Producer arranges for and completes commissioning testing of generating facility and Producers interconnection facilities by a Consulting Chartered Electrical Engineer as per IEC 61727 (2004-12), IEE 1547 – 2003, IEE 17th Edition Wiring Regulations or latest available equivalent Standards at producers cost and the same is witnessed by the Area Engineer of the CEB. Before commissioning testing, Producers shall develop a written testing plan to be submitted to CEB for its review and acceptance. Where applicable the test plan shall include the installation test procedures published by the manufacturer of the generation or interconnection equipment. Facility testing shall be conducted at a mutually agreeable time.

4.9. CEB authorize parallel operation, after successful commissioning testing by the Area Engineer and execution Agreement.

5. METERING AND BILLING

5.1. The Producers' electricity service shall be metered with a two-way meter, and the cost of installation of such meter or metering equipment for the first time, shall be borne by the Producer.

5.2. During any Billing Period, if the electrical energy supplied by CEB exceeds the electricity exported by the Consumer plus any energy credits carried-over from the previous Billing Period, the charges

for the net energy (kWh) consumed will be calculated using the Producer's applicable tariff. The fixed charge and/or the minimum charge applicable for the installation will also be applicable

5.3. During any Billing Period, if the electricity exported by the Producer plus any energy credits carried-over from the previous Billing Period exceeds the electrical energy supplied by CEB, the Producer shall be billed only for the applicable fixed charge and/or the minimum charge, and the balance of the electricity generated shall be carried over to the next Billing Period and appear as an energy credit, stated in kilowatt hours.

5.4. Energy credits may be carried over from one Billing Period to another, for so long as the Consumer has a legal contract for the supply of electricity by CEB, and during the Term of this Agreement.

5.5. In the event the Producer's electricity supply account and/or the contract for the premises is terminated for whatever reason, any accumulated energy credits on the last day of such termination shall be granted to the CEB with no financial compensation to the Producer. Energy credits shall not be transferable to any other Producer who applies for a new contract for the supply of electricity to the same premises. Energy credits shall not be transferable to the same consumer applying for a contract to another premise.

5.6. If the tariff applicable to the consumer / customer is multi-tier tariff, the energy credit is given only in the tier where credit is generated. This credit is carried forward to next billing period in the same tier. When the consumer's tariff is converted to a multi-tier tariff, this multi-tier credit forwarding is applicable even if the consumer / customer was in single tier tariff at the signing of this contract. In such a case, appropriate tier for the carried forward credit is determined by the energy credit of the consumer in 01st billing period (with not less than 21 days) after converting in to multi-tier. The previous accumulated total credit will be assigned to the tier having highest credit in this 01st billing period. In case of no credit in this period, highest export tier is considered.

6.0 GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS FOR THE SYSTEM OF HYBRID INVERTERS, SOLAR PV ROOFTOP AND BATTERY WITH LOW VOLTAGE FEEDERS

6.1 The protective function and requirements defined here are designed to protect CEB distribution system and not the system of hybrid inverters, solar PV rooftop and battery with low voltage feeders (Hereafter, it is named as the Generating Facility). A Producer shall be solely responsible for providing adequate protection for its Generating Facility and interconnection facilities. The Producer's protective functions shall not impact the operation of other protective functions utilized on CEB's distribution system in a manner that would affect CEB capability of providing reliable service to its customers.

6.2 Generating facilities operating in parallel with CEB distribution system shall be equipped with the following protective functions to sense abnormal conditions on CEB distribution system and cause generating facility to be automatically disconnected from CEB distribution system or to prevent the generating facility from being connected to CEB distribution system inappropriately.

6.2.1 CEB Distribution System Parameters are as follows;

a	Nominal Voltage	33 kV	11k	4
b	System Highest	36 kV	12	4
c	Rated fault current	25 kA	20	2
d	No. of Phases	3	3	
e	System Frequency	50Hz	50	5
f	Method of Earthing	Non-Earthed	Sol Ear	S Ea

6.2.2 Over and Under Voltage trip functions and over and under frequency trip functions.

6.2.3 A voltage and frequency sensing and time delay function to prevent the generating facility from energizing a de-energized distribution system circuit and to prevent the generating facility from reconnecting with CEB distribution system unless CEB distribution system service voltage is within

06% of the nominal supply voltage and frequency is within 47 Hz to 52 Hz and are stable for at least 3 minutes.

6.2.4 A function to prevent the generating facility from contributing to the formation of an Unintended Island and cease to energize the CEB system within half a second (0.5 second) of the formation of an unintended island.

6.2.5 The generating facility shall cease to energize CEB distribution system for faults on CEB distribution system circuit to which it is connected. (IEEE1547 – 4.2.1). The generating facility shall cease to energize CEB distribution circuit prior to reclosure by CEB distribution system equipment. (IEEE 1547-4.2.2)7.2.6 The generating facility shall be automatically disconnected from the CEB distribution network within half a second (0.5 second) when the CEB supply is intentionally or automatically switched off.

6.2.6 The generating facility should have an external back feed protection scheme to prevent any hazardous voltage or current back feed to CEB system during a power interruption by the hybrid solar PV installer. The external back feed protection scheme (Back up to the primary protection) shall be placed in between CEB meter and point of common coupling (PCC), closer to CEB meter through a separate isolation device for Type I & Type II as shown in the drawings attached with this document. An automatic phase failure relay shall be installed at external back feed protection scheme and the relay tripping signal shall be wired to the isolation device. Isolation device shall be a two-pole device for single phase connections and a four-pole device for three phase connections. Isolation device ‘Close’ and ‘Open’ status shall be clearly indicated via indication lamps. Further, grid power availability also shall be indicated via another

indication lamp. During grid failure, operation of the isolation device (Open operation) shall be taken place within 0.5 seconds and once the grid status reinstate, close operation shall be taken place after 1 second relay detects grid availability. The producer shall be responsible for the proper function of the external back feed protection scheme. This protection scheme shall be operated and maintained by The Producer at its own cost and expenses.

6.2.7 The Producer should not change any of the settings stated above without the written permission from the CEB.

6.3 Suitable equipment required

The electrical installation of PV power supply system including AC modules shall comply with the latest edition of BS 7671 (IEE wiring regulations) & SLS 1680. Circuit breakers or other interrupting devices located at the point of common coupling, if needed, must be certified by CEB as suitable for their intended operation. This includes being capable of interrupting the maximum available fault current expected at their location.

Producer's generating facility and interconnection facilities shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of CEB distribution system.

The generating facility paralleling device shall be capable of withstanding 220% of the interconnection facility rated voltage (IEEE 1547 – 4.1.8.3). The interconnection facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE 1547 – 4.1.8.2.

6.4 Visible disconnect required

The producer shall furnish and install a ganged manually operated isolating switch near the point of common coupling (PCC) to isolate the generating facility from CEB distribution system. The device does not have to be rated for load break nor provide over current protection.

The device must:

a. Allow visible verification that separation has been accomplished. (This requirement may be met by opening the enclosure to observe contact separation)

b. Include marking or signage that clearly open and closed positions.

c. Be capable of being reached quickly and conveniently 24 hours a day by CEB personnel for construction, maintenance, inspection, testing or reading, without obstacles or without requiring those seeking access to obtain keys, special permission, or security clearance even when the isolating equipment is consumer's property.

d. Be secured in a weather-proof enclosure and capable of being locked in the open position prevent unauthorized or accidental closing.

e. Be clearly marked on the submitted single line diagram and its type and location approved by CEB prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a CEB approved location providing a clear description of the location of the device.

6.5 Drawings: Prior to parallel operation or momentary parallel operation of the generating facility, CEB shall approve the Producer's protective function and control diagrams. Generating facilities equipped with protective function and control scheme previously, approved by CEB, may satisfy this requirement by reference to previously approved drawings and diagrams certified by a Designer / Contractor and a Chartered Electrical Engineer (Inspection & Testing) following the formats given in Annex 3 and Annex 4.

6.6 The output voltage wave form of the Generating Facility shall be of 50 Hz, with a sinusoidal wave form.

6.7 The Total Demand Distortion (TDD) and individual harmonic current distortion limits as a percentage of the minimum of rated current of the inverter and current of 85% of PV panel capacity at PCC should be as follows.

Individual harmonic	h<1	11<	17	23<	35	T
Allowable Limit	4	2	1.	0.6	0.	5

Even harmonics are limited to 25% of the odd harmonic limits above.

Table 1: Current Harmonic Limits

6.8 If the Generating Facility uses a direct current (dc) generator, it should use an inverter to convert the dc to ac, complying with the TDD for current and individual harmonic limits as in table 1.

6.9 Total Demand Distortion shall be measured as follows,

a. Disconnect the customer house and EPS/UPS load.
b. Open disconnection switch inside the meter enclosure.
c. Connect current probes and voltage probes of the power quality analyser to AC Isolator of the inverter.
d. Open AC isolator of the inverter
e. Close the disconnection switch, referred in b. above
f. Log 10 minute-average of Voltage THD% for 30 minutes.

Note: measured Voltage THD% during first 30 minutes must be below 2.5%. If this utility side Voltage THD% is more than 2.5%, utility must take action to reduce it to a value below 2.5%.

g. After 30 minutes, Close the AC isolator of the inverter referred in d. above in order to connect the inverter to Utility supply.
h. Check the inverter, which must be turned on.
i. After the inverter is turned on, log 10 minute-average of Voltage THD%, current THD%, current TDD%, harmonic current distortions (2^{nd} – 50^{th} order) and Output Power for 4 hours, preferably (10:00 hrs -14:00 hrs).
j. During the testing period in i. above, after 3 hours, disconnect solar PV DC isolator and continue the test for remaining period at least for an hour. The TDD should be calculated during last segment of the test (without PV panels), taking the minimum of rated current of the inverter and rated current of the battery into consideration.

6.10 95^{th} percentile short time (10 min) harmonic currents should be less than the values given in Table 1.

6.11 Testing procedure for the external back feed protection scheme.

An external back feed protection isolation device is provided externally as a backup protection to the inbuilt back feed protection. The operation of the device shall be done automatically. Compliance shall be determined by relevant circuit diagram inspection and carrying out following tests/inspection based on IEC 62040-1 Clause 5.1.4 and Annex 1.

a. Phase Failure Relay manufacturing standard conformity IEC standard or equivalent acceptable standard.
b. Automatic reset capability of Phase Failure Relay.
c. Functionality test during disconnection of CEB supply (from the breaker/fuse cutouts at the meter). Isolation device shall operate (Close to Open) within 0.5 seconds after the disconnection.
d. Functionality test during reconnection of CEB supply (from the breaker/fuse cutouts at the meter). Isolation device shall operate (Open to Close) 1 second after the reconnection.
e. Functionality test of Indication lamps of the Isolation device status and CEB supply status.

6.12 The inverters used for interconnection shall be only those which complied with SLS 1680:2020

6.13 The Producer should not change any of the settings stated in section 7.0 without the written permission from the CEB.

6.14 The Power Quality measurement at the Point of Common Coupling (PCC) shall be as follows;

Power quality measurement shall be complied with (IEEE 519 – 2014) IEC 61400-21. Emission of inter- harmonic currents from the power electronic converter up to 2 kHz and of current distortions above 2 kHz up to 9 kHz during operations shall be stated. The individual inter-

harmonic currents below 2 kHz and the current distortions in the range 2 kHz up to 9 kHz shall be given as ten-minute average data for each frequency at the output power giving the maximum individual inter-harmonic current or current distortion.

7.15 Flicker Standard applicable: As per IEC 61000-3-7.

7.16 A compliance Inspection, including the harmonics measurements at the commissioning shall be performed by CEB as in Annex 5 & test results shall be documented in Annex 6.

7. EVENTS OF DEFAULT AND TERMINATION

7.1. Events of Default by the Producer shall be on each or any of the following events.

7.1.1. If the Producer violates any of the conditions stipulated in Sections 3 and 6.

7.1.2. If the permit issued to the Producer subject to the provisions of Sri Lanka Sustainable Energy Authority Act, No. 35 of 2007 is cancelled for contravening and/or failing to conform to any of the terms and conditions stipulated therein.

7.1.3. If the Producer is in breach or is unable to perform any of his obligations under any approval, license granted or which may be granted to the Consumer for the purpose of the Facility and has not remedied such default within the cure periods provided in such approval, permit or license;

7.1.4. The disconnection of the electricity account due to non-payment of electricity bills or any other reason.

7.1.5. The change of Producer or change of location of the Generating Facility.

7.2. Events of Default by CEB shall be on each or any of the following events.

7.2.1. Failure to meet the obligations in Section 3 of this Agreement.

7.2.2. Failure to read the meter and issue invoices to the Consumer.

7.2.3. Failure to maintain the supply equipment, meters and metering equipment.

7.3. Upon the occurrence of an Event of Default, the aggrieved Party may terminate this Agreement after giving due notice of not less than thirty (30) days to the defaulting Party.

7.4. Notwithstanding the foregoing, this Agreement shall remain in effect after the termination hereof to the extent necessary to provide for final billings, billing adjustments and charges which have accrued up to the time of termination of the Agreement.

8. LIABILITIES & INDEMNIFICATION

8.1. The Producer agrees to hold harmless CEB for any damages to equipment as a result of any failure or malfunction thereof. CEB shall not be liable, indirectly or directly for permitting or continuing to allow the interconnection of the facility or for the acts or misuse or omissions of the Consumer or the failure or malfunction of any Consumer-owned equipment that causes loss or injury, including death, to any party. Whenever any liabilities are incurred by either or both the parties for damages caused by injuries to either party (or their employees or agents) or the property of either party then the liabilities for such damages between the parities will be as follows;

8.1.1. Each party will be liable for all damages because of injuries to persons or property caused solely by its negligence or solely by its failure to comply with this agreement.

8.1.2. Each party will be liable for all damages to its own property that are caused by the concurrent negligence of both parties, or that are due to causes that cannot be traced to the sole negligence of the other party, to the extent of its negligence therefore.

8.1.3. Each party will be liable for all damages due to injuries to itself or its own employees or agents that are caused by the concurrent negligence of both parties, or that are due to causes that cannot be traced to the sole negligence of either party provided that in no event will a party be liable for damages because of injuries to itself or its own employees and agents in any amount in excess of applicable workmen's compensation insurance and provided further that this agreement will in no way impair the right of the injured party or its employee or agent to that extent that a third party negligence proximately caused injuries or damages to party or its employee or agent.

8.1.4. In the event of claims brought to recover damages because of injuries to persons not employees of either party and because of injuries to property not belonging to either party that are alleged to be caused by the concurrent negligence or both parties or are alleged to be due to causes that cannot be traced to the sole negligence of either party, the parties agree no right of indemnification will exist, so that in all such claims, the issues of liabilities will be determined as a matter of contribution and not as a matter of indemnity.

8.1.5. Neither party will have any liability whatsoever for any special, indirect, consequential or punitive damages.

CEYLON ELECTRICITY BOARD				PRODUCER		
	By				By	
	Name				Name	
	Title				Title	
	Date				Date	

AGREEEMENT AND GRID INTERCONNECTION STANDARDS FOR NET METERING / NET ACCOUNTING OF A HYBRID ROOFTOP SOLAR POWER ELECTRICAL INSTALLATION

(SCHEME 02-NET ACCOUNTING)

CEYLON ELECTRICITY BOARD
AND

THIS AGREEMENT is entered into at…….. on this …… day of…… Two Thousand and…… between Ceylon Electricity Board, a body corporate duly constituted by Act No. 17 of 1969 and having its head office at 50, Sir Chittampalam A. Gardiner Mawatha, Colombo in the Democratic Socialist Republic of Sri Lanka (hereafter referred to as "CEB"), and ……located at ……..(complete address of the premises, the same address as in the electricity account and Account Number) hereinafter referred to as "Producer", and collectively, Parties.

WHEREAS

a) The Producer has entered into an Agreement with the CEB for supply of electricity on net accounting under Account No ……for the supply of electricity to …….which is still in force.

b) The parties agree that they are bound by the conditions of supply contained in the Agreement for supply of electricity dated …….. for the purposes of the Agreement.

c) CEB is desirous of providing facilities to allow its electricity consumers to install a hybrid rooftop solar power system to the existing electricity supply network.

d) The parties are desirous of entering into this Agreement for the purpose given in Clause – c above.

Now it is hereby agreed as follows.

1. DEFINITIONS

Producer: A person or a company who owns a solar power generating facility installed in a roof to produce and deliver electrical energy to the distribution network of CEB and presently owns a valid account receiving electricity from CEB distribution network.

Import of Electrical Energy: Receipt of Electrical Energy by the Producer from the CEB system.

Export of Electrical Energy: Supply of Electrical Energy by the Producer to the CEB system.

Net Accounting: Net Accounting means the payment for the difference between electrical energy supplied through the electricity distribution network of CEB to the Producer and the amount of electrical energy generated by the Producer's Generating Facility through Solar PV delivered to the electricity distribution network of CEB.

Generating Facility: Generating Facility means all of the Producer's equipment and roof space at a single site utilised to produce and deliver electrical energy, including but not limited to, Producer's generating, metering and protection equipment.

Contract Demand: The allocated capacity, as depicted in the electricity agreement, to the Consumer by the CEB expressed in terms of kilovolt ampere.

Billing Period: The period for which the Producer's electricity meter is read by CEB and the Consumer is issued with an electricity bill, usually a period of one month (30 days).

Energy Credit: This shall be the amount of net electrical energy exported to the CEB distribution network during a specified Billing Period, which amount, measured in kilowatt hours, shall be credited to the Producer's electricity account in the subsequent Billing Period.

Parallel Operation: The operation of the Generating Facility and producing electrical energy at the Consumer's premises, while connected to the CEB distribution network.

2. TERM

2.1. This Agreement shall come into effect from the date of execution and continues to be in force until the expiry of twenty years. No extensions shall be allowed, and any new Agreement shall be based on the policies prevailing at that time.

2.2. If for any reason, the Producer's electricity supply is partially or fully disconnected by CEB for whatever reason, with or without a request from the Producer, or owing to natural causes, and when there is reasonable hope that the supply will be restored within a reasonable time, this Agreement automatically stands suspended for the period of such disconnection.

3. GENERAL RULES, RIGHTS AND OBLIGATIONS

3.1. This scheme is applied only for domestic consumers, who are in TOU tariff.

3.2. The Generating Facility shall use solar as renewable source of energy to generate electricity at the Producer's premises.

3.3. The entire Generating Facility and equipment including solar panel and other associated accessories such as hybrid inverters, battery storage and protective circuits shall be located within the Producer's premises and shall be owned by the Producer. Generating facility should be installed only on actual functional roofs, not on ground or structures erected for the purpose of adding more capacity.

3.4. A Producer must comply with the conditions imposed by CEB and should execute the interconnection Agreement with CEB and receive CEB written permission before parallel operation of its Generating Facility with the CEB distribution system

3.5. The Generating Facility shall be intended to meet all or a part of the Producer's electricity demand and electrical energy requirements. It shall be the responsibility of the Producer to decide on the capacity of Generating Facility with due consideration to the amount of renewable energy available, investment and operating costs of equipment, the Producer's Contract Demand with CEB and the average electrical energy requirements of the Producer. However, the clearance certification for the capacity of the Hybrid solar PV system shall be obtained from CEB before commencing installation.

3.6. Interconnection with CEB distribution system under this agreement does not provide the Producer any rights to utilize CEB distribution system for the transmission, distribution or wheeling of electric power to a third party.

3.7. A Producer shall ascertain and comply with applicable rules, regulations imposed by the Ministry of Power / CEB / Public Utilities Commission of Sri Lanka (PUCSL)/ Sri Lanka Sustainable Energy Authority (SEA) and any law or standard that applies to the design, construction, installation, operation or any other aspect of the Producers Generating Facility and interconnection facilities.

3.8. CEB shall have the right to review the design of Producer's generating and interconnection facilities and to inspect such facilities prior to the commencement of Parallel Operation with CEB distribution system. CEB may require a Producer to make modification as necessary to comply with the requirements. CEB review and authorization for parallel operation shall not be construed as conforming or endorsing the Producers design or as warranting the Generating and or interconnection facility's safety, durability or reliability. CEB shall not, by reason of such review or lack of review, be responsible for the strength, adequacy or capability of such equipment.

3.9. The installed capacity of the Generating Facility which is [.....] kVA AC shall not exceed the Contract Demand of the Producer, which is [.....] kVA. If the Producer so wishes to increase or decrease his Contract Demand and/or capacity of the Generating Facility, he shall first apply for the appropriate change, and after fulfilling the requirements specified by CEB, request an amendment to this Agreement. If the producer wishes to change the ownership of the facility, and after fulfilling the requirements specified by CEB, the new producer shall request relevant amendments to this Agreement. In any event, the Term of this Agreement, and the commencement of the agreement shall remain unchanged as twenty (20) years, and as the date, on which the

agreement commenced first, respectively.

3.10. The Generating Facility shall be built and operated according to the relevant standards and other guidelines stipulated in this Agreement.

3.11. The Producer shall install all the necessary protective equipment required to ensure safe and reliable operation of the Generating Facility and the Producer shall meet all the expenses of installing such equipment and other associated accessories.

3.12. The Producer shall maintain all the equipment downstream of the metering equipment in good operating condition.

3.13. The Producer shall allow CEB to enter his premises for the inspection of the metering equipment and the Generating Facility, and would promptly attend to and implement any written recommendations or instructions with regard to the Generating Facility.

3.14. Any information pertaining to Generating and/or interconnection facilities provided to CEB by a Producer shall be treated by CEB in a confidential manner.

3.15. A Producer shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with Prudent Electrical Practices

3.16. CEB may limit the operation or disconnect or require the disconnection of a Producer's Generating Facility from CEB's distribution system at any time with or without notice, in the event of an emergency or to correct unsafe operating conditions. CEB may also limit the operation or disconnect or require the disconnection of a Producers Generating facility from CEB distribution system upon the provision of reasonable notice

3.16.1. to allow for routine maintenance, repairs or modifications to CEB distribution system.

3.16.2. Upon CEB determination that a Producer's Generating Facility is not in compliance with the conditions stipulated in this Agreement

3.16.3. Upon termination of Interconnection Agreement.

3.17. CEB shall promptly install the meters and metering equipment to implement Net Accounting, the initial cost of which shall be paid by the Producer.

3.18. CEB shall maintain the distribution network and the metering equipment to supply and meter the electricity requirements of the Producer, and to accept the electricity generated by the Producer, up to the capacity stated in the supply agreement and this Agreement, respectively.

3.19. CEB shall promptly attend to Producer's requests for testing the meters or metering equipment for their accuracy, the fees for which shall be payable by the Producer.

3.20. Prior to signing the agreement, the Producer shall provide technical literature including Type Test certificates of the protective equipment for Net Accounting to the CEB and shall obtain the concurrences of the CEB to procure the same.

3.21. CEB shall promptly read the Producer's meter at the end of each Billing Period and bill the Consumer for his net consumption in the Billing Period. If the generated units of electricity using the solar panels fixed in the roof are greater than the units consumed, the customer will be paid Rs 22.0 per unit during the first 07 yrs and from the 08th year to 20th year he will be paid Rs 15.50 per unit. If the consumption is greater than the energy generated form the solar panels, consumer has to pay to the CEB at the existing electricity tariff for the excess energy consumed.

4. APPLICATION PROCESS

4.1. Potential Applicant initiates contact with CEB. Upon request CEB will provide information and documents such as sample agreements, application including, technical information, listing of certified equipment, initial review information, metering requirement etc to a potential Producer.

4.2. Applicant shall request an interconnection clearance by submitting technical information such as datasheets, installation layout and diagrams.

4.3. Applicant completes an application as per the condition stipulated in clearance certificates and files application and supply any relevant additional information requested by CEB. Initial review fee as applicable shall be included with the application.

4.4. CEB performs an Initial Review and develops preliminary cost estimates and interconnection requirements.

4.5. The applicant should purchase equipment as per the technical details given in the Net Accounting Agreement and IEC 61727 (2004-12), IEEE 1547 – 2018 or latest equivalent Standards.

4.6. Applicant and CEB enter into an interconnection Agreement.

4.6.1. When an application is processed, if a Generating Facility or part of a Generating Facility is identified as any of Generating Facility already contracted with CEB on any of schemes, the date of commencement of the agreement shall be the date, which the agreement already commenced first.

4.7. Where applicable, CEB or Producer installs required interconnection facilities or modified CEB distribution system.

4.8. Producer arranges for and completes commissioning testing of generating facility and Producers interconnection facilities by a Consulting Chartered Electrical Engineer as per IEC 61727 (2004-12), IEE 1547 – 2018, IEE 18th Edition Wiring Regulations or latest available equivalent Standards at producers cost and the same is witnessed by the Area Engineer of the CEB. Before commissioning testing, Producers shall develop a written testing plan to be submitted to CEB for its review and acceptance. Where applicable the test plan shall include the installation test procedures published by the manufacturer of the generation or interconnection equipment. Facility testing shall be conducted at a mutually agreeable time.

4.9. CEB authorize parallel operation, after successful commissioning testing by the Area Engineer and execution Agreement.

5. METERING AND BILLING

5.1. The Producers' electricity service shall be metered with a two-way meter, and the cost of installation of such meter or metering equipment for the first time, shall be borne by the Producer.

5.2. During any Billing Period, if the electrical energy supplied by CEB exceeds the electricity exported by the Consumer, the charges for the net energy (kWh) consumed will be calculated using the CEB's applicable tariff. The fixed charge and/or the minimum charge applicable for the installation will also be applicable.

5.3. During any Billing Period, if the electricity exported by the Producer exceeds the electrical energy supplied by CEB, the customer will be paid Rs 22.0 per unit during the first 07 yrs and from the 08th year to 20th year he will be paid Rs 15.50 per unit. The fixed charge and/or the minimum charge applicable for the installation will also be applicable. The kVA demand charge will be applicable even in the case of prolonged absence of grid electricity imports by an institutional customer.

5.4. If the tariff applicable to the consumer / customer is multi-tier tariff, the energy credit is given in each tier separately.

6.0 GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS FOR THE SYSTEM OF HYBRID INVERTERS, SOLAR PV ROOFTOP AND BATTERY WITH LOW VOLTAGE FEEDERS

6.1 The protective function and requirements defined here are designed to protect CEB distribution system and not the system of hybrid inverters, solar PV rooftop and battery with low voltage feeders (Hereafter, it is named as the Generating Facility). A Producer shall be solely responsible for providing adequate protection for its Generating Facility and interconnection facilities. The Producer's protective functions shall not impact the operation of other protective functions utilized on CEB's distribution system in a manner that would affect CEB capability of providing reliable service to its customers.

6.2 Generating facilities operating in parallel with CEB distribution system shall be equipped with the following protective functions to sense abnormal conditions on CEB distribution system and cause generating facility to be automatically disconnected from CEB distribution system or to prevent the generating facility from being connected to CEB distribution system inappropriately.

6.2.1 CEB Distribution System Parameters are as follows;

a.	Nominal Voltage	33 kV	11kV	400 V
b.	System Highest Voltage	36 kV	12 kV	440 V
c.	Rated fault current	25 kA	20 kA	20 kA
d.	No. of Phases	3	3	3ph&Neutral
e.	System Frequency	50Hz	50Hz	50Hz
f.	Method of Earthing	Non-Effectively Earthed	Solidly Earthed	Solidly Earthed

6.2.2 Over and Under Voltage trip functions and over and under frequency trip functions.

6.2.3 A voltage and frequency sensing and time delay function to prevent the generating facility from energizing a de-energized distribution system circuit and to prevent the generating facility from reconnecting with CEB distribution system unless CEB distribution system service voltage is within

06% of the nominal supply voltage and frequency is within 47 Hz to 52 Hz and are stable for at least 3 minutes.

6.2.4 A function to prevent the generating facility from contributing to the formation of an Unintended Island and cease to energize the CEB system within half a second (0.5 second) of the formation of an unintended island.

6.2.5 The generating facility shall cease to energize CEB distribution system for faults on CEB distribution system circuit to which it is connected. (IEEE1547 – 4.2.1). The generating facility shall cease to energize CEB distribution circuit prior to reclosure by CEB distribution system equipment. (IEEE 1547-4.2.2)7.2.6 The generating facility shall be automatically disconnected from the CEB distribution network within half a second (0.5 second) when the CEB supply is intentionally or automatically switched off.

6.2.6 The generating facility should have an external back feed protection scheme to prevent any hazardous voltage or current back feed to CEB system during a power interruption by the hybrid solar PV installer. The external back feed protection scheme (Back up to the primary protection) shall be placed in between CEB meter and point of common coupling (PCC), closer to CEB meter through a separate isolation device for Type I & Type II as shown in the drawings attached with this document. An automatic phase failure relay shall be installed at external back feed protection scheme and the relay tripping signal shall be wired to the isolation device. Isolation device shall be a two-pole device for single phase connections and a four-pole device for three phase connections. Isolation device ‘Close’ and ‘Open’ status shall be clearly indicated via indication lamps. Further, grid power availability also shall be indicated via another indication lamp. During grid failure, operation of the isolation device (Open operation) shall be taken place within 0.5 seconds and once the grid status reinstate, close operation shall be taken place after 1 second relay detects grid availability. The producer shall be responsible for the proper function of the external back feed protection scheme. This protection scheme shall be operated and maintained by The Producer at its own cost and expenses.

6.2.7 The Producer should not change any of the settings stated above without the written permission from the CEB.

6.3 Suitable equipment required

The electrical installation of PV power supply system including AC modules shall comply with the latest edition of BS 7671 (IEE wiring regulations) & SLS 1680. Circuit breakers or other interrupting devices located at the point of common coupling, if needed, must be certified by

CEB as suitable for their intended operation. This includes being capable of interrupting the maximum available fault current expected at their location.

Producer's generating facility and interconnection facilities shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of CEB distribution system.

The generating facility paralleling device shall be capable of withstanding 220% of the interconnection facility rated voltage (IEEE 1547 – 4.1.8.3). The interconnection facility shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE 1547 – 4.1.8.2.

6.4 Visible disconnect required

The producer shall furnish and install a ganged manually operated isolating switch near the point of common coupling (PCC) to isolate the generating facility from CEB distribution system. The device does not have to be rated for load break nor provide over current protection.

The device must:

a. Allow visible verification that separation has been accomplished. (This requirement may be met by opening the enclosure to observe contact separation)

b. Include marking or signage that clearly open and closed positions.

c. Be capable of being reached quickly and conveniently 24 hours a day by CEB personnel for construction, maintenance, inspection, testing or reading, without obstacles or without requiring those seeking access to obtain keys, special permission, or security clearance even when the isolating equipment is consumer's property.

d. Be secured in a weather-proof enclosure and capable of being locked in the open position prevent unauthorized or accidental closing.

e. Be clearly marked on the submitted single line diagram and its type and location approved by CEB prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a CEB approved location providing a clear description of the location of the device.

6.5 Drawings: Prior to parallel operation or momentary parallel operation of the generating facility, CEB shall approve the Producer's protective function and control diagrams. Generating facilities equipped with protective function and control scheme previously, approved by CEB, may satisfy this requirement by reference to previously approved drawings and diagrams certified by a Designer / Contractor and a Chartered Electrical Engineer (Inspection & Testing) following the formats given in Annex 3 and Annex 4.

6.6 The output voltage wave form of the Generating Facility shall be of 50 Hz, with a

sinusoidal wave form.

6.7 The Total Demand Distortion (TDD) and individual harmonic current distortion limits as a percentage of the minimum of rated current of the inverter and current of 85% of PV panel capacity at PCC should be as follows.

Individual harmonic order h	h<11	11<h<17	17<h<23	23<h<35	35<h	TDD
Allowable Limit (%)	4	2	1.5	0.6	0.3	5

Even harmonics are limited to 25% of the odd harmonic limits above.

Table 1: Current Harmonic Limits

6.8 If the Generating Facility uses a direct current (dc) generator, it should use an inverter to convert the dc to ac, complying with the TDD for current and individual harmonic limits as in table 1.

6.9 Total Demand Distortion shall be measured as follows,

k. Disconnect the customer house and EPS/UPS load.
l. Open disconnection switch inside the meter enclosure.
m. Connect current probes and voltage probes of the power quality analyser to AC Isolator of the inverter.
n. Open AC isolator of the inverter
o. Close the disconnection switch, referred in b. above
p. Log 10 minute-average of Voltage THD% for 30 minutes.

Note: measured Voltage THD% during first 30 minutes must be below 2.5%. If this utility side Voltage THD% is more than 2.5%, utility must take action to reduce it to a value below 2.5%.

q. After 30 minutes, Close the AC isolator of the inverter referred in d. above in order to connect the inverter to Utility supply.
r. Check the inverter, which must be turned on.
s. After the inverter is turned on, log 10 minute-average of Voltage THD%, current THD%, current TDD%, harmonic current distortions (2^{nd} – 50^{th} order) and Output Power for 4 hours, preferably (10:00 hrs -14:00 hrs).
t. During the testing period in i. above, after 3 hours, disconnect solar PV DC isolator and continue the test for remaining period at least for an hour. The TDD should be calculated during last segment of the test (without PV panels), taking the minimum of rated current of the inverter and rated current of the battery into consideration.

6.10 95^{th} percentile short time (10 min) harmonic currents should be less than the values given in Table 1.

6.11 Testing procedure for the external back feed protection scheme.

An external back feed protection isolation device is provided externally as a backup protection to the inbuilt back feed protection. The operation of the device shall be done automatically. Compliance shall

be determined by relevant circuit diagram inspection and carrying out following tests/inspection based on IEC 62040-1 Clause 5.1.4 and Annex 1.

f. Phase Failure Relay manufacturing standard conformity IEC standard or equivalent acceptable standard.
g. Automatic reset capability of Phase Failure Relay.
h. Functionality test during disconnection of CEB supply (from the breaker/fuse cutouts at the meter). Isolation device shall operate (Close to Open) within 0.5 seconds after the disconnection.
i. Functionality test during reconnection of CEB supply (from the breaker/fuse cutouts at the meter). Isolation device shall operate (Open to Close) 1 second after the reconnection.
j. Functionality test of Indication lamps of the Isolation device status and CEB supply status.

6.12 The inverters used for interconnection shall be only those which complied with SLS 1680:2020

6.13 The Producer should not change any of the settings stated in section 7.0 without the written permission from the CEB.

6.14 The Power Quality measurement at the Point of Common Coupling (PCC) shall be as follows;

Power quality measurement shall be complied with (IEEE 519 – 2014) IEC 61400-21. Emission of inter- harmonic currents from the power electronic converter up to 2 kHz and of current distortions above 2 kHz up to 9 kHz during operations shall be stated. The individual inter-harmonic currents below 2 kHz and the current distortions in the range 2 kHz up to 9 kHz shall be given as ten-minute average data for each frequency at the output power giving the maximum individual inter-harmonic current or current distortion.

7.15 Flicker Standard applicable: As per IEC 61000-3-7.

7.16 A compliance Inspection, including the harmonics measurements at the commissioning shall be performed by CEB as in Annex 5 & test results shall be documented in Annex 6.

7. EVENTS OF DEFAULT AND TERMINATION

7.1. Events of Default by the Producer shall be on each or any of the following events.

7.1.1. If the Producer violates any of the conditions stipulated in Sections 3 and 6.

7.1.2. If the permit issued to the Producer subject to the provisions of Sri Lanka Sustainable Energy Authority Act, No. 35 of 2007 is cancelled for contravening and/or failing to conform to any of the terms and conditions stipulated therein.

7.1.3. If the Producer is in breach or is unable to perform any of his obligations under any approval, license granted or which may be granted to the Consumer for the purpose of the Facility and has not remedied such default within the cure periods provided in such approval, permit or license;

7.1.4. The disconnection of the electricity account due to non-payment of electricity bills or any other reason.

7.1.5. The change of Producer or change of location of the Generating Facility.

7.2. Events of Default by CEB shall be on each or any of the following events.

7.2.1. Failure to meet the obligations in Section 3 of this Agreement.

7.2.2. Failure to read the meter and issue invoices to the Consumer.

7.2.3. Failure to maintain the supply equipment, meters and metering equipment.

7.3. Upon the occurrence of an Event of Default, the aggrieved Party may terminate this Agreement after giving due notice of not less than thirty (30) days to the defaulting Party.

7.4. Notwithstanding the foregoing, this Agreement shall remain in effect after the termination hereof to the extent necessary to provide for final billings, billing adjustments and charges which have accrued up to the time of termination of the Agreement.

8. LIABILITIES & INDEMNIFICATION

8.1. The Producer agrees to hold harmless CEB for any damages to equipment as a result of any failure or malfunction thereof. CEB shall not be liable, indirectly or directly for permitting or continuing to allow the interconnection of the facility or for the acts or misuse or omissions of the Consumer or the failure or malfunction of any Consumer-owned equipment that causes loss or injury, including death, to any party. Whenever any liabilities are incurred by either or both the parties for damages caused by injuries to either party (or their employees or agents) or the property of either party then the liabilities for such damages between the parities will be as follows;

8.1.1. Each party will be liable for all damages because of injuries to persons or property caused solely by its negligence or solely by its failure to comply with this agreement.

8.1.2. Each party will be liable for all damages to its own property that are caused by the concurrent negligence of both parties, or that are due to causes that cannot be traced to the sole negligence of the other party, to the extent of its negligence therefore.

8.1.3. Each party will be liable for all damages due to injuries to itself or its own employees or agents that are caused by the concurrent negligence of both parties, or that are due to causes that cannot be traced to the sole negligence of either party provided that in no event will a party be liable for damages because of injuries to itself or its own employees and agents in any amount in excess of applicable workmen's compensation insurance and provided further that this agreement will in no way impair the right of the injured party or its employee or agent to that extent that a third party negligence proximately caused injuries or damages to party or its employee or agent.

8.1.4. In the event of claims brought to recover damages because of injuries to persons not employees of either party and because of injuries to property not belonging to either party that are alleged to be caused by the concurrent negligence or both parties or are alleged to be due to causes that cannot be traced to the sole negligence of either party, the parties agree no right of indemnification will exist, so that in all such claims, the issues of liabilities will be determined as a matter of contribution and not as a matter of indemnity.

8.1.5. Neither party will have any liability whatsoever for any special, indirect, consequential or punitive damages.

CEYLON ELECTRICITY BOARD			PRODUCER		
	By			By	
	Name			Name	
	Title			Title	
	Date			Date	