

Net +Plus Connection Code

**LANKA ELECTRICITY COMPANY
(PRIVATE) LIMITED**

1.0 BACKGROUND

The existing Net Metering Concept launched in the year 2010 noticed an exponential growth in the recent year and at present country has about 5500 such installations contributing 40MW of renewable energy to the national grid.

In view of enhancing the renewable energy portfolio in the electricity generation in Sri Lanka, the Government of Sri Lanka (GOSL) has launched “Soorya Bala Sangramaya” to promote roof top solar installations in the country. The objective of the above program is to reach an installed capacity of roof top solar to 200MW by 2020.

In order to support the GOSL’s renewable energy promotional drive, the Net Metering Concept was further enhanced by introducing following three schemes.

2.0 PURPOSE

Purpose of this document is to provide the Net +Plus prospective customer of the LECO requirement expects from the proposal he submits for approval together with his application.

3.0 SCHEME 01 - NET METERING

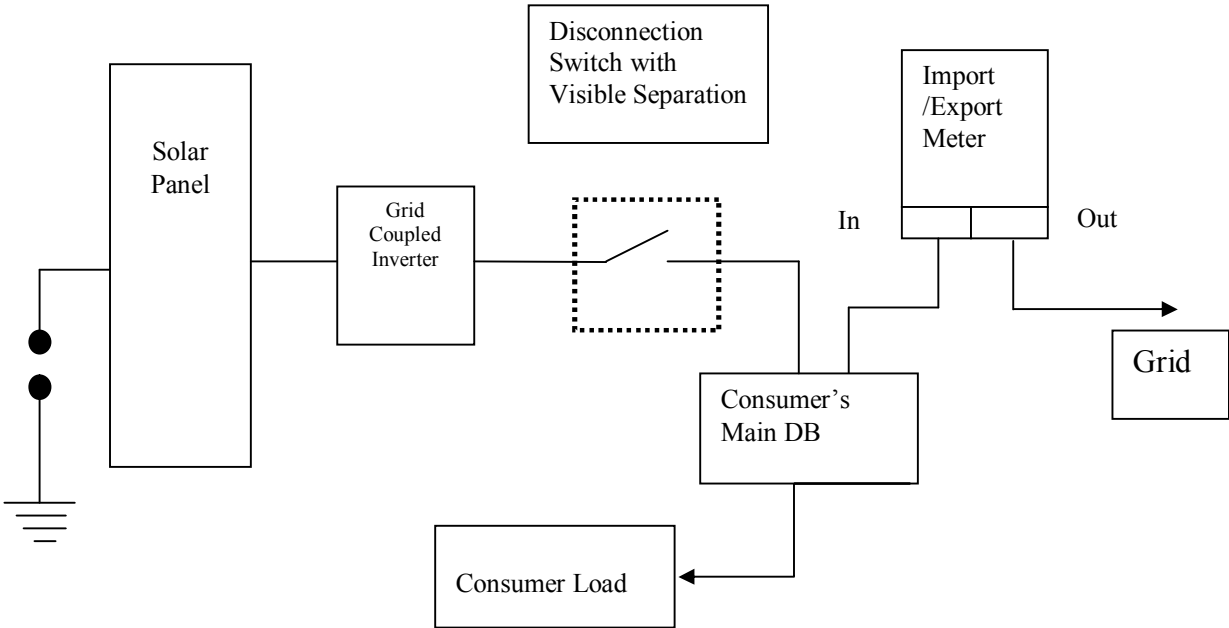
This scheme which is exists at present allows any electricity consumer to install a renewable energy based electricity generating facility and connect it to the LECO’s electricity network. The electricity network connection scheme shall be approved by LECO.

This connection will be metered by an export/import energy meter which registers the export and import of the customer separately.

At the end of each billing period, LECO will read the consumer’s export energy meter reading and the import meter reading. The electricity bill will be prepared for the difference between the import and the export registers. If the export is more than the import in any billing period, the Consumer will receive an export credit, and will be brought forward his next month’s consumption. Such credits may be carried-over to subsequent months, as long as there is no change in the legal consumer for the premises.

The key factor in this process is that there will be no financial compensation for the excess energy exported by the consumer. All exports will be set-off against the consumer’s own consumption, either in the current billing period or future billing periods.

The installed capacity of the Generating Facility shall not exceed the Contract Demand of the Customer. The contract period for the scheme is 20 years. Unlike other two schemes this scheme is open for all renewable energy forms including Solar. Other schemes are only limited for Roof Top Solar schemes.

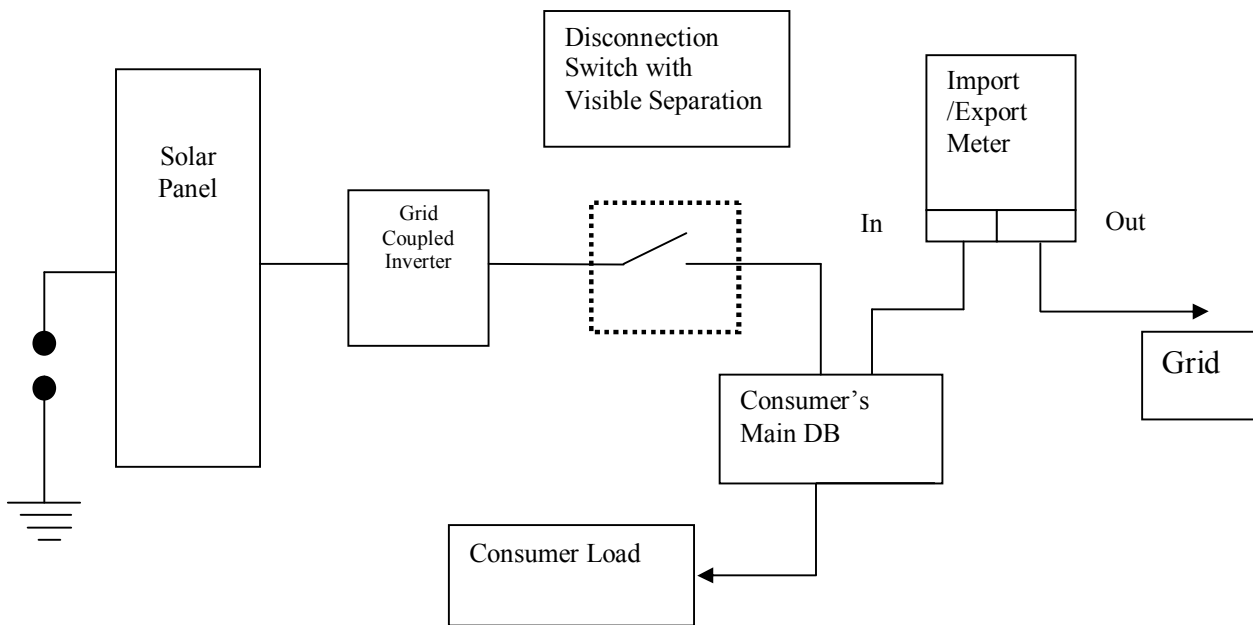


Typical connection arrangement for the Scheme 1

4.0 SCHEME 02 - NET ACCOUNTING

This Scheme has introduced an additional element to the Scheme 01 where export energy in any will be paid at an export tariff. As per the existing tariff, the customer will be paid Rs 22.00 per exported unit during the first 07 yrs and from the 08th year to 20th year he will be paid Rs 15.50 per export unit. If the consumption is greater than the energy generated from the solar panels, consumer will be issued a bill using the existing electricity tariff for the import. This Scheme is limited only for roof top solar power generation.

Scheme limited to the installed capacity of the customer. The contract period is 20 yrs.



Typical connection arrangement for the Scheme 2

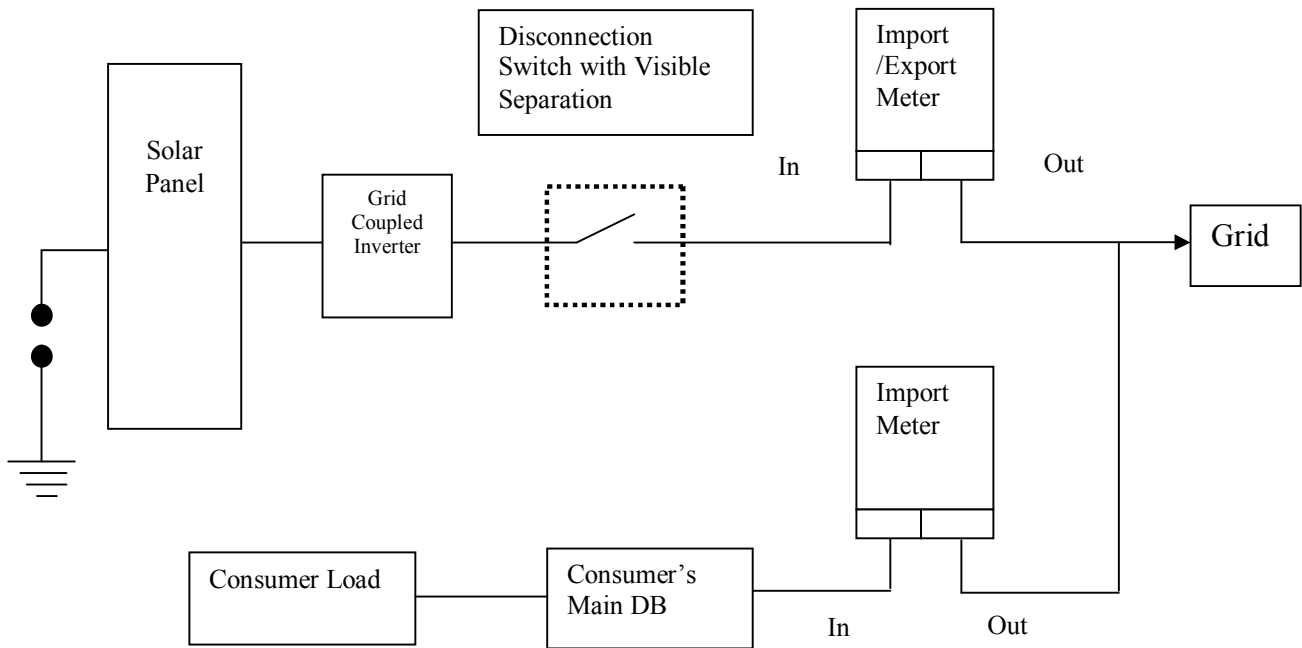
5.0 SCHEME 03 – NET PLUS

Total generation of electricity from the solar PV power plant will be metered through a dedicated export energy meter for which the customer will be paid. The energy import will be measured through a separate import energy meter.

The installed capacity of the Generating Facility shall not exceed the Contract Demand of the Customer. The contract period is 20 yrs.

The customer connection proposal shall clearly indicate his expected generation capacity and the expected maximum generation units per months. Any units generated more than such agreed quantity will not be paid until the customer makes a request for increased capacity.

The customer will be paid for his energy registered in the export meter at the export tariff and be charged for import using the normal customer tariff. The current export tariff is 22.00 Rs/kWh for the first 7 years and from the 8th year up to contract period of 20 years, Rs 15.50.



Typical connection arrangement for the Scheme 3

In Net +Plus Scheme, the solar PV electricity generation facility will be metered separately. The solar PV inverter output (generation facility output) should be brought to the metering point where both import and export energy meters are located in a separate meter cubical. The meter cubicle should be sealed properly to avoid tampering. If the space of the existing meter location is not sufficient to install another meter for energy export, the consumer should make necessary arrangements to shift the metering point to a suitable location. The cost associated for shifting the meter to a new location will be charged at the prevailing rate from the consumer in addition to his Net + plus connection charge.

6.0 PROCEDURE & APPLICATION PROCESS

- 6.1 The Applicant shall initiate contact with the respective LECO customer service centre to obtain the application form and the *Net +Plus* Code of Connection.
- 6.2 The Applicant shall complete the application including the connection proposal and submit the application to the Branch Engineer for Review. The installation certificates requested in the application need not to be submitted at this stage.

- 6.3 The Connection Proposal shall be in compliance to
- a. IEC 61727 (2004 -12), IEEE 1547 – 2003,
 - b. IEE 17th Edition Wiring Regulations or latest available equivalent Standards, the connection proposal and the
 - c. *Net +Plus* Code of Connection
- 6.4 The Branch Engineer will make the initial review and approve the design and the equipment. In addition the Branch Engineer will make an estimate for the Net +Plus connection.
- 6.5 The customer shall make the payment as per the estimate.
- 6.6 The Branch Engineer will issue a copy of the approved connection proposal for the Applicant to initiate installation.
- 6.7 The applicant can now purchase equipment as per the technical details given in this Connection Code and as per the initial approval.
- 6.8 Once the installation is complete the Applicant submit the installation certificate and make a request for the commissioning of the installation.
- 6.9 The installation certificate shall be a certificate issued by a Consulting Chartered Electrical Engineer confirming the compliance of the installation with
- a. IEC 61727 (2004 -12),
 - b. IEEE 1547 – 2003,
 - c. IEE 17th Edition Wiring Regulations or latest available equivalent Standards, the connection proposal and
 - d. The *Net +Plus* Code of Connection.
 - e. SLSI Stranded

- 6.10 The Branch Engineer upon inspection of the installation and being satisfied of the compliance of the installation with the proposal and the required standards will commission the installation.

7. GENERAL RULES, RIGHTS AND OBLIGATIONS

- 7.1. The Generating Facility shall use one or any combination of the approved types of renewable sources of energy to generate electricity at the Customer's premises in respect of Scheme 01.
- 7.2. Generating facility shall be solar for Schemes 02 and 03.
- 7.3. The Applicant is required to read and understand the conditions of the Agreement attached with the Code fully in detail.
- 7.4. The customer connection proposal shall clearly indicate his expected generation capacity and the expected maximum generation units per months. Any units generated more than such agreed quantity will not be paid until the customer makes a request for increased capacity.
- 7.5. If the customer intends to expand his generation capacity then he should make a fresh application in that regard.

8. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS

- 8.1. The protective function and requirements defined here are designed to protect LECO distribution system and not the Generating Facility. A Customer shall be solely responsible for providing adequate protection for its Generating Facility and interconnection facilities. The Customer's protective functions shall not impact the operation of other protective functions utilized on LECO's distribution system in a manner that would affect LECO capability of providing reliable service to its customers.
- 8.2. Generating facilities operating in parallel with LECO distribution system shall be equipped with the following protective functions to sense abnormal conditions on

LECO distribution system and cause generating facility to be automatically disconnected from LECO distribution system or to prevent the generating facility from being connected to LECO distribution system inappropriately.

8.2.1. The Customer should not change any of the settings stated above without the written permission from the LECO.

8.2.2. The protective function (Over current, Over And Under voltage , Anti Inland) comply with IEE 1547

8.2.3. LECO Distribution System Parameters are as follows;

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

8.3.Suitable equipment required.

Circuit breakers or other interrupting devices located at the point of common coupling must be certified by LECO as suitable for their intended operation. This includes being capable of interrupting the maximum available fault current expected at their location. Customer'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 LECO 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

8.4. Visible disconnect required

The customer shall furnish and install a ganged manually operated isolating switch near the point of common coupling (PCC) to isolate the generating facility from LECO 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 LECO 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 LECO prior to installation. If the device is not adjacent to the PCC, permanent signage must be installed at a LECO approved location providing a clear description of the location of the device

8.5. Drawings: Prior to parallel operation or momentary parallel operation of the generating facility LECO shall approve the Customers protective function and control diagrams. Generating facilities equipped with protective function and control scheme previously approved by LECO may satisfy this requirement by reference to previously approved drawings and diagrams certified by a Chartered Engineer.

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

8.7.The Total Harmonic Distortion (THD) for current and individual harmonic limit should be as follows.

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

Table 1: Current Harmonic Limits

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

8.9.The inverters used for interconnection shall be only those which have received the Type Approval by LECO. The technical specification and type test certificate of the inverter shall be submitted with the proposal for LECO approval.

8.10.The Customer should not change any of the settings stated in above without the written permission from the LECO.

8.11.The Power Quality at the Point of Common Coupling (PCC) shall be as f follows;

Power quality measurement shall be complied with 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.

8.12.Flicker

Standard applicable: As per IEC 61000-3-7

9. ENERGY METERING AND BILLING

9.1.SCHEME 01 (NET METERING)

- 9.1.1.The Customers' electricity service shall be metered with a two-way (import and export) energy meter, and the cost of installation of such meter or metering equipment for the first time, shall be borne by the Customer.
- 9.1.2.During any Billing Period, if the electrical energy supplied by LECO 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 Customer's applicable tariff. The fixed charge and/or the minimum charge applicable for the installation will also be applicable
- 9.1.3.During any Billing Period, if the electricity exported by the Customer plus any energy credits carried-over from the previous Billing Period exceeds the electrical energy supplied by LECO, the Customer 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.
- 9.1.4.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 LECO, and during the Term of this Agreement.
- 9.1.5.In the event the Customer's electricity supply account and/or the contract for the premises is terminated, any accumulated energy credits on the last day of such termination shall be granted to the LECO with no financial compensation to the Customer. Energy credits shall not be transferable to any other Customer 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.

9.2. SCHEME 2 (NET ACCOUNTING)

- 9.2.1.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 from the solar panels, consumer has to pay to the LECO at the existing electricity tariff for the excess energy consumed.

9.3.SCHEME 03 (NET PLUS)

9.3.1.LECO shall read the meter to read the solar power plant output and the other meter to read the import energy. Total generation of electricity from the solar PV power plant will be exported directly through a dedicated meter for which the customer will be paid Rs 22.0 per unit during the first 07 yrs and from the 08th year to 20th year the customer will be paid Rs 15.50 per unit. . The energy import will be measured through a separate import meter and will be billed as per the existing electricity tariff LECO.

10.0 DEFINITIONS

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

Import of Electrical Energy: Receipt of Electrical Energy by the Customer from the LECO system.

Export of Electrical Energy: Supply of Electrical Energy by the Customer to the LECO system.

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

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

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

Billing Period: The period for which the Customer's electricity meter is read by LECO 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 LECO distribution network during a specified Billing Period, which amount, measured in kilowatt hours, shall be credited to the Customer'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 LECO distribution network.