ST GEORGES CAY POWER COMPANY (SGCPC)

CUSTOMER GRID INTERCONNECTION REQUIREMENTS (GIR) FOR RENEWABLE ENERGY GENERATION

PV SYSTEMS and OFF-GRID RENEWABLE ENERGY SYSTEMS

1. PURPOSE and AUTHORITY

This document describes the general provisions and technical requirements for connecting solar-energy systems (and other renewable-energy generating equipment) to SGCPC's power system. Most of these will be solar energy, or "photovoltaic", referred also as "PV systems", although these requirements of the Bahamas Electricity Act 2024 (also referred to as "EA2024" or "Electricity Act") also apply to wind and other non-fossil-fuel sources.

These requirements ensure:

1. The safety of SGCPC technicians, agents, customers, and the public.
2. The safety and compatibility of the renewable-energy system.
3. High standards of power reliability and quality for all customers.

This document sets out the:

- Capacity limits for PV systems (Section 2).
- Application and interconnection process for all systems (Section 3).
- General conditions for connecting a system to the Grid (Section 4).
- Technical interconnection requirements (Section 5).
- Glossary (Appendix A).

SGCPC is licensed by The Bahamas Utilities Regulation and Competition Authority (URCA) as an Authorized Public Electricity Supplier Licensee (APESL) in accordance with the 2024 Electricity Act. SGCPC has the authority and responsibility to manage the supply of electricity to all customers in the service area that are connected to the SGCPC grid and ensure customers comply with regulations developed by URCA.

All Customer-owned systems require SGCPC approval. Off-Grid systems also require a permit from URCA.

For definitions and further technical information, please refer to the SGCPC Glossary and Definitions document available on the SGCPC website.

2. CAPACITY LIMITS

The allowable self-generation capacity for a Customer-owned, PV System is based on several factors.

- The maximum allowable power generation capacity for the entire grid.
- The maximum allowable power generation capacity that will ensure that customers are not producing more energy than they are consuming.
- The integrity of the grid is maintained by limiting the potential for exceeding distribution circuit limitations.

The calculations are equivalent to those approved by URCA for Bahamas Power and Light on Family Islands with equivalent power demand peaks.

This grid-tied PV program is available on a 'first-come, first-served' basis up to a maximum total based on the capacity of PV and ESS installed and operated by SGCPC. of 250 kW-AC (350 kW-DC) of total, combined, grid-tied power capacity. No grid-tied Customer-generation facilities will be allowed or approved above this limit until further notice. This is in line and is more lenient and flexible than BPL's interconnection allowances.

The allowable installed capacity for any premise will be the smaller of the following three criteria. Refer to Table 1 for summary.

A. **Maximum Cap**: 30 kW-DC

B. **Net-Consumer**: "Installed Power Capacity" is less than "Annual Energy Consumption" divided by the "Yield".

Where:

Installed Power Capacity is the total nameplate power capacity of the PV inverters shown on the submitted plans and confirmed during the installation process, denoted as kW-AC.

Annual Energy Consumption is the total recorded energy consumption recorded by the premise meter for the previous year, denoted as kWh.

Yield is as defined in the Glossary and Definitions, and specified as 2,000 kWh/kW-AC.

For example, if a Customer consumed 10,000 kWh in the previous year, the allowed power capacity for a grid-tied PV System would be 10,000 kWh / 2000 kWh/kW = 5 kW-AC.

The calculation is to ensure that no Customer exceeds their annual expected energy consumption through self-generation..

C. **Distribution Circuit Integrity**:

C.1 Residential customers may install PV Systems with power capacity less than or equal to:

2 kW-AC + Average Customer Demand

"Average Customer Demand" (ACD) is the Customer's total consumption in kilowatt hours (kWh) during the preceding 12 months, divided by 8,760 (the number of hours in a year). The calculation for ACD will be rounded up to the nearest whole number.

For example, a Customer with ACD of 1.3 kW would be allowed to install a system with a maximum size of 4kW. This is based on:

1.3 kW ACD is rounded up to 2 kW, and 2 kW + 2 kW = 4 kW-AC.

C.2 Commercial Customers may install PV Systems with power capacity less than or equal to:

15 kW + Average Customer Demand

Table 1: PV System Limits

Parameter	Residential	Commercial Customer
A. Maximum Power	30 kW-AC	
B. Net Consumer	Annual Energy Consumption / 2000 kWh/kW-AC	
C. Distribution Circuit Integrity	2 kW-AC + ACD	15 kW-AC + ACD

Capacity limits do not apply to Off-Grid installations because these installation configurations will never have their PV or ESS interconnected to the grid.

3. APPLICATION AND INTERCONNECTION PROCESS FOR ALL SYSTEMS

This describes the application and interconnection processes for all customers.

SGCPC recommends requesting a preliminary conference and guidance BEFORE signing a contract and buying your system equipment. This will help ensure compliance with regulations and not committing your investment until you have confidence in its useability and permit-ability.

On-Grid PV Systems, with or without ESS, require SGCPC written approval and do not require URCA approval.

Off-Grid Systems require URCA written approval. No SGCPC submission is required.

All SGCPC forms are available on the SGCPC website. URCA forms are available on the URCA website.

SGCPC supports the installation of Customer-owned systems. SGCPC is not obligated to approve or allow the connection to the Grid of any installation that is non-compliant, unsafe, or unfit for purpose.

Customers should refer to the SGCPC GIA for a listing of the submittal requirements.

SGCPC will review the application and provide its response, either approving or denying the application, within 28 days of receipt of a completed application. Workload may require extended timeline.

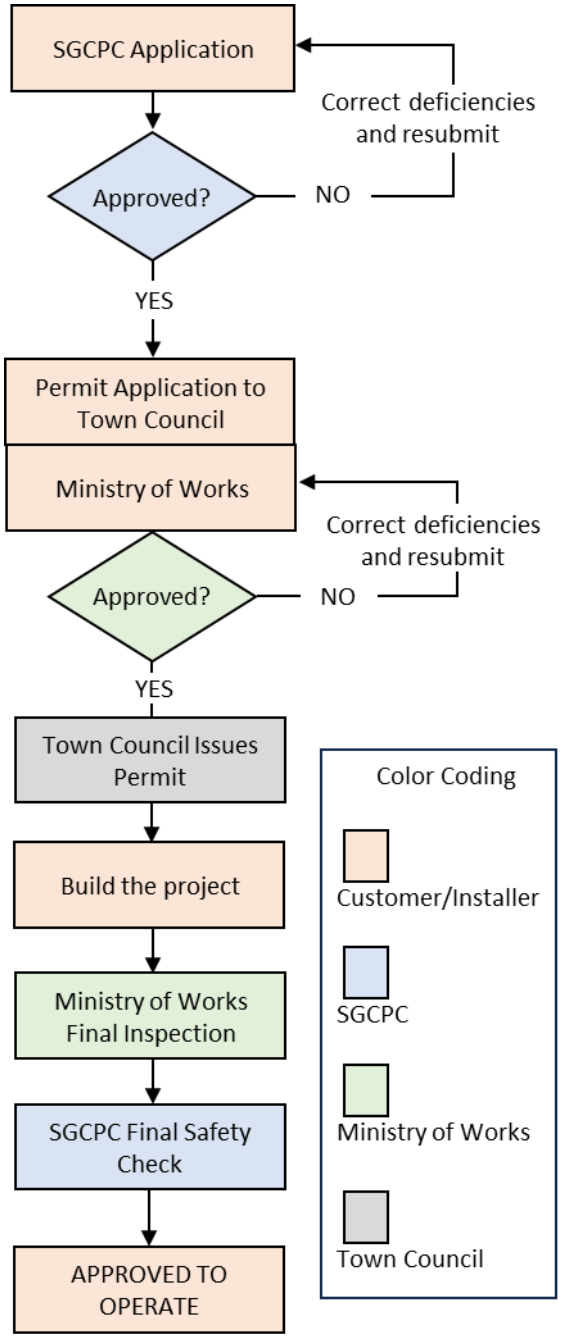
The process for submitting and securing approvals for your project are as shown in the flowchart.

The system shall be installed according to the technical specifications in the SGCPC Grid Interconnection Requirements and GIA Terms and Conditions.

Once the installation is complete and Customer receives approved final inspection from Ministry of Works, Customer shall notify SGCPC and request final safety testing to operate the system. SGCPC will perform safety and functionality tests of the PV System within 21 calendar days after written request from the Customer.

SGCPC will carry out inspections and tests in accordance with Section 5 of this document and will advise the applicant in writing whether the system qualifies for operation in parallel with the Grid.

Should SGCPC find during the inspection that the system is not compliant with the requirements of this GIR document or the approved application, SGCPC will reject the request to connect to the Grid and disconnect and lock out an interconnected system.



The Customer may take corrective action to bring the system into compliance with the requirements. SGCPC will perform a second safety and functionality test upon request from the Customer.

Customers with operating installations that have not been permitted or approved must also follow this process to secure an approved GIA and permit from Town Council before continuing to operate that installation.

4. FEES FOR INTERCONNECTION

The fees for services is a “user fee” structure. SGCPC does not expect the Community-at-large to help pay for each PV System customer’s fees, because that would not be fair to the Community.

Non-recurring fees apply only once and are payable before the system is reviewed and inspected by SGCPC. Payment of applicable fees is required before operation will be approved by SGCPC.

Recurring fees are due periodically and will be billed by SGCPC in the same manner as electricity usage. Refer to the REP Fee Structure Addendum posted on the SGCPC website under “Resources & Blogs” for specific details.

Failure to pay applicable fees will be subject to same penalties as Customer failure to pay their periodic electricity bill.

5. GENERAL CONDITIONS

This section includes the conditions that apply to all customers before SGCPC approves any installation.

5.1 Customers Must Be in Good Standing

Persons seeking to acquire and connect systems to the Grid must be SGCPC customers in good standing.

For rented properties, the applicant must obtain and provide SGCPC written approval from the property owner authorizing the installation and fully indemnifying SGCPC with respect to damages from the installation, maintenance, operation, or removal of the installation.

5.2 Unauthorized Connections

For the purposes of public and utility personal safety and according to URCA regulations and the Electricity Act, SGCPC reserves the right to disconnect any Customer who connects or has connected a system to the Grid without written authorization from SGCPC.

Should SGCPC decide to disconnect a system from the Grid, it shall notify URCA within two (2) days of doing so, giving reasons for the disconnection. A Customer whose system has been disconnected pursuant to this requirement may have the matter reviewed by URCA by making a written request to URCA.

5.3 Public Authorization and Permitting

A Customer-owned system must be located exclusively within the customer’s owned or rented property and observe all building codes and property line setbacks as required by Town Council. As with any premise construction and electrical installation, approval from Town Council and a permit from Ministry of Works are required. Refer to Section 6 for relevant codes and standards.

5.4 System Architecture

Pursuant to the EA-2024, SGCPC supports customers installing their own solar-energy systems because that progresses the Bahamas toward our national renewable energy goals. SGCPC allows two configurations for Customer-owned systems.

(A) PV System (with or without an ESS). Represented by Figures 1 and 2, below.

(B) Off-Grid. Represented by Figure 3, below.

SGCPC customers may install either PV System configuration on their premises. The Off-Grid configuration still requires all documentation and submittals and approvals, but the owner of the Off-Grid system does not need to be an SGCPC Customer. The Off-Grid system requires URCA written approval before SGCPC approves the operation of that system.

Customers can switch from one architecture to another as their needs may change over time. In that case, a new application shall be submitted to SGCPC, and the applicable approval process and fees will be required before that change is approved. SGCPC will inspect all installations at least once a year to ensure the

installation is still compliant with the approved GIA.

5.4.1. PV System (No ESS): The building/property is connected to the grid and the system in parallel at the same time. That is, energy can flow through the SGCPC Meter in either direction and the PV System and Grid can both be connected to the Main AC Panel at the same time and power those loads at the same time. Additionally, the PV System may be isolated from the Grid using an ATS or MTS and supply electricity to the Main AC Panel loads in parallel with a backup genset. Refer to Figure 1.

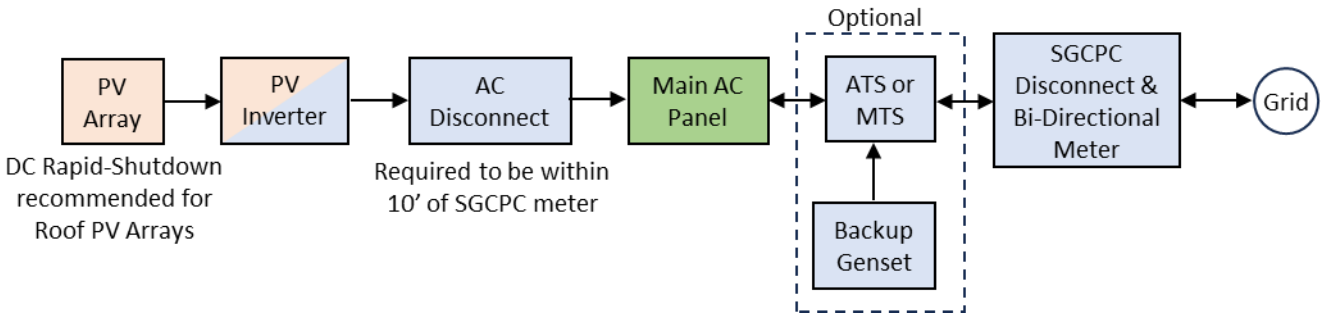


Figure 1: Diagram of Grid-Tied PV System Without ESS Interconnection and Metering Configuration

5.4.2. PV System (With ESS): A PV System with ESS requires a means to isolate the voltage-source equipment (ESS or backup genset) from the Grid in the event the conditional parameters of the grid exceed those listed in Table 2, below. This may be accomplished using the (a) internal circuitry of the power electronics (if the equipment is UL listed for this purpose), or (b) using an external ATS/MTS. Refer to Figure 2.

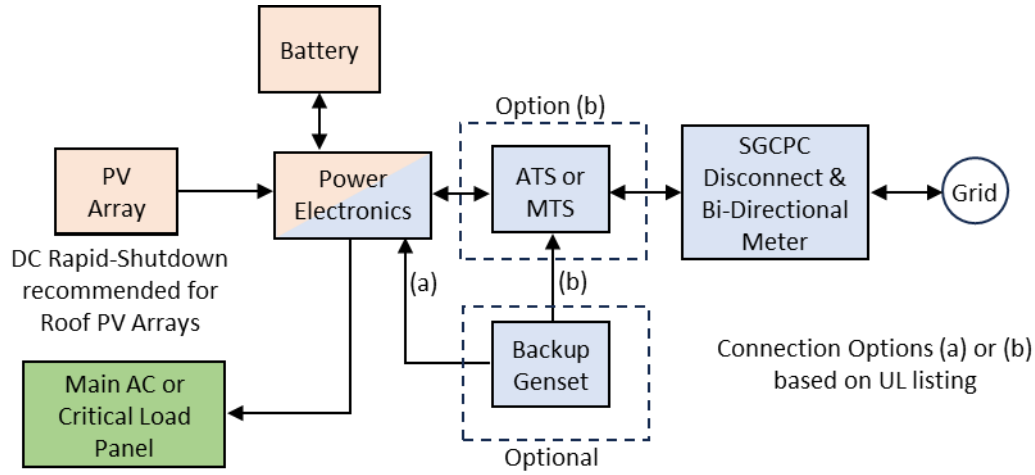


Figure 2: Diagram of PV System with ESS Interconnection and Metering Configuration

5.4.3. Off-Grid: The building/property is disconnected from the Grid. There are no utility service conductors or cables connected to the building or its electrical loads. Refer to Figure 3.

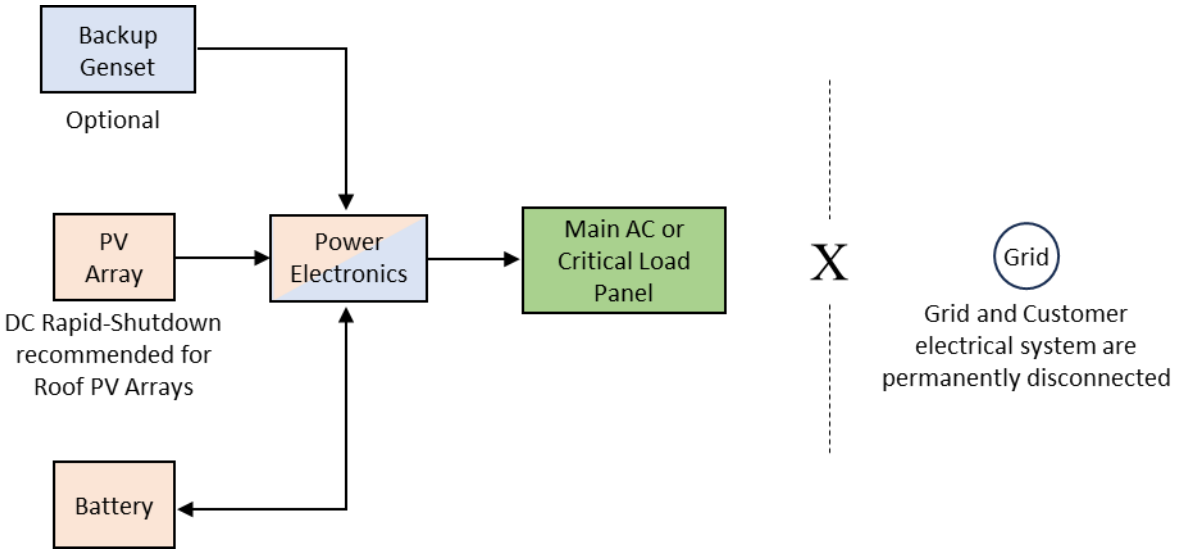


Figure 3: Diagram of Off-Grid PV and ESS Interconnection and Metering Configuration

5.5 Metering

Upon final inspection of a PV System and permission to operate is granted by SGCPC, SGCPC will furnish and install a new SGCPC-Owned bi-directional meter at the premises. Older existing SGCPC meters do not record energy exported to the Grid. The new bi-directional meter will ensure consumed and exported energy is accurately recorded.

5.6 Labelling

Buildings and structures with a grid-tied PV system must, where practicable, have disconnecting means grouped together. Where such an arrangement is not practicable, there must be a permanent plaque posted on or near each disconnecting means, indicating the location of all other service boxes supplying power to the building.

Grid-tied systems that include batteries or other energy storage systems shall be labelled in a conspicuous, legible, and permanent manner with a suitable warning sign at the location of the service disconnecting means of the premises.

Labeling shall comply with the National Electrical Code (NEC) 2020 Article 690. This includes placarding of conduits containing DC conductors and rapid-shutdown components. A graphic summary of labeling requirements is posted on the SGCPC website, “Resources & Blogs” page.

5.7 Insurance

The owner of a PV system or PV Microgrid that is configured as Grid-Tied or Transfer Switch must maintain general liability insurance in amounts not less than:

- $50,000 for systems with capacity less than or equal to 5kW
- $100,000 for systems with capacity greater than 5kW, but less than or equal to 10kW
- $250,000 for systems with capacity greater than 10kW.

An endorsement of a homeowner’s policy providing the required amount of coverage is acceptable to meet this insurance requirement. Failure to maintain the insurance coverage will render the Grid Interconnection Agreement invalid.

SGCPC does not accept responsibility for the failure of the Customer to renew its insurance policy.

Proof of insurance must be provided prior to SGCPC approving the GIA. This coverage is to provide, at a minimum, protection in the event of electrical or mechanical failure or malfunction of the installation that causes loss, damage injury or death to persons or property. SGCPC may from time to time require the homeowner to verify the existence of valid insurance coverage.

5.8 Indemnification

The owner of a grid-tied system must indemnify SGCPC, its agents, and third parties for losses and damages resulting from the operation of the system, except when the loss or damage occurs due to the negligence or willful misconduct of SGCPC, its agents, or third parties. SGCPC and its agents will indemnify the Customer for all loss to third parties resulting from the operation of the Grid except where SGCPC and its agents have used reasonable care in the exercise of their functions or when the loss occurs due to the negligence or willful misconduct of the Customer. Submission of the GIA implies acceptance of this Indemnification requirement.

5.9 Future Modifications and Expansion

The Customer must obtain written approval from SGCPC and the Ministry of Works Electrical Inspection Department, prior to modifying, expanding, or altering the approved system. The Customer must present an approved Electrical Inspection Certificate to SGCPC, and must obtain written approval from SGCPC, before interconnecting the modified system to the Grid. The Customer may be required to execute a new Grid Interconnection Agreement, if applicable.

6. TECHNICAL INTERCONNECTION REQUIREMENTS

This section provides the technical requirements for SGCPC approval of installations of PV Systems or Off-Grid Systems.

6.1 Equipment Certification

Equipment shall be placarded by the manufacturer indicating compliance with the following standards and listings. Documentation provided with the GIA shall include data sheets indicating these listings.

IEEE-1547 – Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

UL 1741 – Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

UL 9540 – Energy Storage Systems and Equipment, if the ESS is permanently installed.

(IEC 62933-5-1 and 2 is an accepted alternative for UL-9540)

UL 1998 – Software in Programmable Components

UL 1973 – ANSI/CAN/UL Batteries for Use in Stationary and Motive Auxiliary Power Applications

UL 62109 – Safety of Power Converters for Use in Photovoltaic Power Systems

(IEC 62109 is an accepted alternative for UL-62109)

UL 1703 – Flat-Plate Photovoltaic Modules and Panels

Electrical wiring shall conform with national standards, as set by the Ministry responsible for Building Regulation under Buildings Regulations (Chapter 200).

All components, inclusive of but not limited to inverters, AC panels, charge controllers and batteries, must be accompanied by the manufacturers' specifications sheets, installation/operation manuals, and other details relevant to the inverters function.

These documents must be provided to Ministry of Works at the time of permit application and to SGCPC with the Grid Interconnection Application (GIA).

The year version of each standard or listing shall be 2018 or more-current-year version that is closest to the year of installation.

All small wind turbine systems must meet UL 6142 requirements as well as any applicable local code requirements.

6.2 Rapid Shutdown

PV arrays installed on the roof of residential dwellings and commercial buildings represent a potential electrical and fire safety hazard to occupants, residents, and emergency responders. Installation of rapid-shutdown devices is required by Section 64-218 of the Canadian Electrical Code (CEC). Customers should ensure compliance with the year-version of the CEC in effect at the time of application.

6.3 Normal Voltage and Frequency

The maximum DC voltage shall not exceed 600 VDC for residential installations and 1000 VDC for commercial installations.

The voltage of the PV Inverter or ESS power electronics shall match the grid voltage configuration at the Customer's Point of Common Coupling (POCC). Should the grid voltage deviate, the PV Inverter shall respond as described in Table 2.

The PV Inverter shall operate only in grid-following mode as a current source at a 60Hz frequency. Should the grid frequency deviate, the PV Inverter shall respond as described in Table 2.

For three-phase systems, compliance shall be proven by certification to successfully disconnect when only one or two phases is out of tolerance, and not necessarily two or all three phases.

Table 2: Technical Requirements

Voltage Condition (% of Nominal Voltage)	Maximum Time to Disconnect
V <50%	0.16 second – (10 cycles)
50% < V < 88%	2 seconds – (120 cycles)
110% < V < 120%	1 second – (60 cycles)
V > 120%	0.16 second – (10 cycles)
Frequency	**Maximum Time to Disconnect**
F < 59.4 Hz	0.16 second – (10 cycles)
F > 60.6 Hz	0.16 second – (10 cycles)

6.4 AC Disconnect

All systems connected to the SGCPC grid shall include a visible and lockable AC disconnect that will visibly and physically isolate all generating components (PV and/or ESS) from the grid. The AC Disconnect shall be in a location accessible to SGCPC at or near SGCPC's meter. Required placarding shall be as described in the Solar Labeling attachment on the SGCPC website.

6.5 Electrical Islanding

Customer-owned PV Systems may operate in an islanded condition that does not export power or energy to the grid when the grid is in an abnormal condition as noted in Table 2. In these instances, the onsite system may supply premise electrical loads as follows.

(a) A **PV System without ESS** may be physically disconnected from the grid using an Automatic Transfer Switch (ATS) or Manual Transfer Switch (MTS) and thence operate interconnected to an onsite backup

genset supplying electricity to premise loads.

(b) A **PV System with ESS** may isolate from the grid using its internal UL-listed circuitry or an ATS or MTS and supply electricity to premise loads.

In no case or instance shall a backup genset or ESS export power to the grid when the parameters in Table 2 are exceeded. Customer-owned systems found to be operating outside these requirements pose an immediate safety threat to personnel and will be immediately disconnected and locked out from the SGCPC grid until corrected.

6.6 Voltage Flicker

Voltage flicker is an increase or decrease in voltage over a short period of time and is normally associated with fluctuating loads or motor starting. A flicker problem is site-specific and depends on the characteristics of the changes in load. A flicker is considered objectionable when it either causes a modulation of lighting levels sufficient to be irritating to humans or it causes equipment to malfunction. The PV System shall not cause objectionable flicker for other Customers on the Grid.

6.7 DC Injection

The system shall not inject a DC current greater than 0.5% of the unit's rated output current at the POCC after a period of 6 cycles following connection to the Grid.

6.8 Harmonic Distortion

The harmonic current injection arising from the system shall not exceed the values listed in Table 3 – (excluding any harmonic currents associated with harmonic voltage distortion present on the Grid without the system connected).

Table 3: Distortion Limitations

Total Harmonic Distortion Limit (of rated current)		5.0%
Maximum Distortion		
Harmonic Numbers	Even Harmonics	Odd Harmonics
h < 11	1.0%	4.0%
10 < h < 17	0.5%	2.0%
18 < h < 23	0.4%	1.5%
24 < h < 35	0.2%	0.6%
h > 35	0.1%	0.3%

Additionally, the THD shall comply with URCA Mandate, as listed in Table 4.

Table 4: URCA THD Mandate

Level	Bus Voltage at POCC	Individual Harmonic, h ≤ 50	Total Harmonic Distortion, THD
A	V ≤1.0 kV	5.0%	8.0%