Caribbean Utilities Company, Ltd.

Transmission & Distribution (T&D) Code

Effective Date: January 1, 2015

Section 27.3: "The Licensee shall, within six months of issue of this Licence, prepare and submit to the Authority a T&D Code. The T&D Code shall be accompanied by a plan for its implementation of the T&D Code which shall among other provisions compare the standards of the Interim T&D Code to those of the T&D Code. Once the Authority approves the T&D Code and the said implementation plan, the Licensee shall implement and comply with such T&D Code."

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1 Overview

1.1 Introduction

This Transmission and Distribution (T&D) Code is designed to facilitate the development, maintenance and operation of an efficient, coordinated and economical system for the transmission & distribution of electricity, to facilitate the generation and supply of electricity and to promote the security and efficiency of the power system as a whole. All T&D System users (Users), namely, the Engineering Services Department (ESD), System Operations Department (SOD), Production Maintenance Department (PMD), Electrical Maintenance Department (EMD) including substation maintenance and Lines Operations Department (LOD), of the T&D System are required to comply with the T&D Code. Also, all Customers and any Independent Power Producer (IPP) that interconnects with and supplies power to the T&D System would become a User and must comply with this T&D Code.

Throughout this document the following personnel are used interchangeably with their designated departments as follows:

- T&D Engineer - ESD
- T&D System Operator - SOD
- Controls Engineering - EMD
- Generation Engineer - PMD

Other useful definitions are as follows:

- Generator – an entity that is connected to the T&D System for the purposes of supplying electricity to the grid
- Generation Unit – the machinery and ancillary equipment used to produce electricity
- User(s) – includes all entities, persons or customers that interact with the T&D System.
- T&D System – includes all substations, T&D lines and equipment used to receive and deliver electricity
- Customer – individuals or entities that are connected to the T&D System for the purposes of consuming electricity. This also includes CORE Customers that may supply renewable energy to the Grid
- Ancillary Services – Those services necessary to support the transmission of electric power from seller to purchaser given the obligations of control areas and transmitting utilities within those control areas to maintain reliable operations of the interconnected transmission system.

The T&D Code covers all material technical aspects relating to connections to, and the operation and use of, the T&D System including, the operation of the electric lines, electrical plant and apparatus connected to it.

The T&D Code also specifies the data required from system Users for use in the planning and operation of the T&D System, including demand forecasts, generator data, availability of generating sets, and intended dates of overhaul of large generating sets or interconnection outages.

The T&D Code shall be reviewed annually or earlier, if required, and any proposed changes must be mutually approved by the T&D Licensee and the Electricity Regulatory Authority (ERA).

The T&D Code is divided into the following sections:

1.2 Planning and Development Code

The Planning and Development Code solicits certain information from Users in order for the T&D Engineer to undertake the planning and development of the T&D System.

1.3 Connection Code

The Connection Code specifies the minimum technical, design and operational criteria which must be complied with by all Users at connection sites and for substations and generators connected to or seeking connection with the T&D System.

1.4 T&D System Operating Code

The T&D System Operating Code is divided into several sections and addresses: demand forecasting; operational planning, including the coordination of generation and T&D outages; testing and monitoring; system dispatch; demand control; operational/event communications and reports; safety coordination; contingency planning; identification of high voltage (HV) apparatus at other sites; and system tests.

1.5 Customer Service Code

The Customer Service Code is based on the contractual agreement outlining the Terms of Service when providing electricity to electric system customers (Customers) and includes a description of the practices to be followed with respect to the billing of Customers and the metering of the electricity consumed by Customers.

2 Planning and Development Code

2.1 Objective

The Planning and Development Code allows for the supply of pertinent information needed from Users in order for the T&D Engineer to undertake effective planning and development of the T&D System. The Planning and Development Code also allows for certain information to be supplied to the Users by the T&D Engineer. The Planning and Development Code therefore specifies the detailed technical and design criteria and procedures to be applied by the T&D Engineer in the planning and development of the T&D System and to be taken into account by Users in the planning and development of their own systems.

This Planning and Development Code provides a framework for planning the T&D system to meet the present and future needs of the Customers. Good long-range planning assures that the existing T&D plant is fully utilized and yearly additions are incorporated into the system's overall development. T&D plant upgrades and additions are designed to provide for future power delivery requirements in an economical and reliable manner.

The T&D Engineer is responsible for developing a long-range plan to provide timely modifications to the T&D System and ensure that capacity is available for the economic and reliable supply of power. The ESD provides consistency in planning new facilities and upgrades to existing facilities to meet load growth requirements and maintain acceptable reliability across the T&D System. An effective T&D asset management plan would ensure that the existing T&D facilities are fully utilized before new additions and upgrades are added, while reliability is maintained at an acceptable level.

2.2 Scope

The scope of the Planning and Development Code is established to cover all aspects of repairs, upgrades and extensions to the T&D System that may arise from, but not limited to, the following:

a. New Customer connections or the modification of existing customer connections;

b. Replacement of existing T&D facilities as a result of overloads due to capacity constraints or reliability issues; and

c. New Generation Supply such as CUC generation, an Independent Power Producer (IPP) generation, or Consumer Owned Renewable Energy (CORE) generation also referred to herein as Generators.

This Planning and Development Code applies to all Users, T&D System Operators, and Customers.

2.3 Planning and Design

It is the role of the T&D Engineer to determine the appropriate expansion, modification, or repair needed to the T&D System to accommodate the addition/modification of Customers' connections or the addition/modification of Generator connections in order to maintain the current safety and reliability standards. Such works on the T&D System may therefore occur at any of the following locations:

a. At a substation or at an interconnection site where a generating unit (firm or non-firm) and/or apparatus is connected to the T&D System. If additional firm generation capacity is needed, the T&D Licensee shall prepare a Certificate of Need (CON) which must include the size and timing of the required generation capacity required for Grand Cayman. The CON must be filed no less than three years in advance of the projected need, for review and approval by the Electricity Regulatory Authority (ERA). This will allow sufficient time for the ERA to conduct the solicitation and for the potential bidders to develop such project(s) on Grand Cayman. At this time the only interconnection to the T&D System is that of CUC's generation. Distribution substations are designed to include two or more step-down transformers, each sized such that the full load of the substation can be carried without interruption or derating when one transformer is out of service. Each transformer and transmission line utilizes a dedicated node in the 69 kV bus switchgear. For substations where there are 4 or less 69 kV nodes, the 69 kV bus work shall be configured as a ring bus with 4 breakers. For 5 or greater 69 kV nodes, a breaker and a half bus configuration may, at the T&D Engineer's discretion, be required to maintain

reliability standards. Generation interconnections require generator step up (GSU) transformer capacity so that when removing a GSU from service generating capacity not greater than the maximum allowable generating unit size, twenty percent of system peak load, is prevented from connecting to the grid;

b. On the Transmission System which is presently configured with two loops originating at and returning to CUC's North Sound Plant. The loops are designed to run in closed parallel mode with protection settings which allow for the faulted links in the loop to be isolated by protection or for maintenance purposes without loss of power or without reduction of voltage below acceptable levels at any one substation; and

c. On the Distribution System, where feeders are designed and routed such that one or more back-feeds are available from adjacent feeders and from adjacent substations. Upgrades to distribution lines or additional substations are needed when the following conditions occur:

    i. Peak load for the service area exceeds 65% of the rated load carrying capacity of the feeder; and / or

    ii. Main line voltage drops below 5% of nominal system voltage.

The T&D Engineer must use the appropriate engineering analyses to determine the parts of the T&D System that need to be repaired, modified or extended. The types of analyses to be used include, but are not limited to:

a. Spatial load growth modeling

b. Short circuit analysis

c. Feeder load balancing

d. Voltage drop analysis

e. Relay coordination study

f. Reliability analysis

2.4 Planning Procedures

The Planning Procedures are established as a guide to ensure that the appropriate steps are taken to effectively plan and develop the T&D System to accommodate additional customers and generation.

Firstly, the pertinent information regarding the Generators and/or Customers must be obtained. Next, the opportunities available for connecting to and using the T&D System, with indications of the parts of the T&D System most suited for new connections and/or receipt of new generation supply, will be determined. And finally, the plans and designs based on the data gathered will be developed.

The data required to facilitate effective planning and development is outlined as follows:

2.4.1 Customer Demand Data

The historic, current and forecasted customer demand data must be analyzed to facilitate the development of projected load demand. Historic and current Customer load demand is obtained from CUC's System Control and Data Acquisition (SCADA) system, while forecasted Customer load demand data is derived from a combination of information received from Customers on planned load connections and historic system demand trends.

Wherever possible, the following Customer demand data must be obtained:

a. Details of any individual loads which have characteristics significantly different from the typical range of residential or commercial load demand;

b. Type of load, both active and reactive power;

c. Harmonic content the customer expects its demand would impose on the T&D System; and

d. Extent of potential large load fluctuations.

2.4.2 Generator Data

Generators, existing or proposed, shall provide the T&D Engineer with data relating to their plant and apparatus, both current and forecasted, as specified in 2.4.2.1 thru 2.4.2.4 as applicable.

2.4.2.1 Demand

For each Generating Unit which has an associated Unit Transformer, the value of the demand supplied through this Unit Transformer when the Generating Unit is at Rated MW output is to be provided.

2.4.2.2 Synchronous Generating Unit and Associated Control System Data

The following Synchronous Generating Unit and associated control system data shall be supplied:

a. Synchronous Generating Unit Parameters
   i. Rated terminal volts (kV)
   ii. Rated MVA
   iii. Rated MW
   iv. Minimum Generation MW
   v. Short circuit ratio
   vi. Direct axis synchronous reactance
   vii. Direct axis transient reactance
   viii. Direct axis sub-transient reactance
   ix. Direct axis short-circuit transient time constant
   x. Direct axis short-circuit sub-transient time constant
   xi. Quadrature axis synchronous reactance
   xii. Quadrature axis sub-transient reactance
   xiii. Quadrature axis short-circuit sub-transient time constant
   xiv. Stator time constant
   xv. Stator leakage reactance
   xvi. Armature winding direct-current resistance
   xvii. Turbogenerator inertia constant (MW sec/MVA)
   xviii. Rated field current (amps) at Rated MW and MVAR output and at rated terminal voltage

b. Parameters for Generating Unit Step-Up Transformers
   i. Rated MVA
   ii. Voltage ratio
   iii. Positive sequence reactance (at max, min, and nominal tap)
   iv. Positive sequence resistance (at max, min, and nominal tap)

v. Zero phase sequence reactance

vi. Tap changer range

vii. Tap changer step size

viii. Tap changer type: on load or off circuit

c. Excitation Control System Parameters

i. DC gain of Excitation Loop

ii. Rated field voltage

iii. Maximum field voltage

iv. Minimum field voltage

v. Maximum rate of change of field voltage (rising)

vi. Maximum rate of change of field voltage (falling)

vii. Details of Excitation Loop described in block diagram form showing transfer functions of individual elements

viii. Excitation System Nominal Response

ix. Rated Field Voltage

x. No-Load Field Voltage

xi. Excitation System On-Load Positive Ceiling Voltage

xii. Excitation System No-Load Positive Ceiling Voltage

xiii. Excitation System No-Load Negative Ceiling Voltage

xiv. Details of Excitation System described in block diagram form showing transfer functions of individual elements

xv. Details of Over-excitation Limiter described in block diagram form showing transfer functions of individual elements

xvi. Details of Under-excitation Limiter described in block diagram form showing transfer functions of individual elements

xvii. Dynamic characteristics of Over-excitation Limiter

xviii. Dynamic characteristics of Under-excitation Limiter

d. Speed/Load Control Parameters

Incremental Droop values (in %) are required for each Generating Unit at six MW loading points as detailed in section 2.4.2.4 (a). In addition to the droop values, the following data is also required:

i. Speed/Load control Block Diagram showing transfer function of individual elements including acceleration sensitive elements

ii. Speed/Load control system Time Constant (in seconds)

iii. Speed/Load control setpoint Range (%)

iv. Average Gain (MW/Hz)

v. Speed/load control deadband

vi. Deadband

– Maximum Setting (±Hz)

- Normal Setting (±Hz)
- Minimum Setting (±Hz)

vii. Where the Generating Unit speed/load control does not have a selectable deadband facility, then the actual value of the deadband need only be provided

e. Unit Control Options

The following unit control options data is required for each Generator:

i. Maximum Droop (%)

ii. Normal Droop (%)

iii. Minimum Droop (%)

iv. Maximum Frequency deadband (±Hz)

v. Normal Frequency deadband (±Hz)

vi. Minimum Frequency deadband (±Hz)

vii. Maximum output deadband (±MW)

viii. Normal output deadband (±MW)

ix. Minimum output deadband (±MW)

x. Frequency settings between which Unit Load Controller Droop applies:

- Maximum (Hz)
- Normal (Hz)
- Minimum (Hz)

xi. State if sustained response is normally selected

f. Plant Synchronization Characteristics

The following synchronization characteristic data is required for each generator:

i. Ramp-up rate to Rated Capacity

ii. Ramp-down rate from Rated Capacity

iii. Regulating range

iv. Load rejection capability while still Synchronized and able to supply Load

v. Voltage, frequency, phase dead band and delay times for initiating circuit breaker closure

vi. All generating units must have a sync check relay

2.4.2.3 Response Data for Frequency Changes

The information detailed below is required to describe the actual frequency response capability profile of the connection conditions.

a. Loading points at which data is required

Response values are required at six capacity loading points for each Generator. Primary and Secondary Response values need not be provided for capacity loading points which are below Minimum Generation. The loading points for the required data are:

i. Designed Minimum Capacity Operating Level

ii. 50% of Rated Capacity

iii. 70% of Rated Capacity

iv. 80% of Rated Capacity

v. 90% of Rated Capacity

vi. 100% Rated Capacity

When data is provided after the Generator is first synchronized, the capacity loading points may take any value between Designed Minimum Operating Level and 100% Rated Capacity but the value of the Designed Minimum Operating Level must still be provided if it does not form one of the capacity loading points.

b. Primary and Secondary Response to falling frequency

Primary and Secondary Response values for a -0.5 Hz ramp are required at the six capacity loading points listed in "a." above.

c. High frequency response to frequency rise

High Frequency Response values for a +0.5 Hz ramp are required at the six capacity loading points listed in "a" above.

2.4.2.4 Black Start Generator (BSG) information

The following information must be supplied to the T&D Engineer about the connected Generators.

a. Expected time for each BSG to be synchronized following a total blackout. The assessment should include the generating facility's ability to re-synchronize all BSG's, if all were running immediately prior to the total blackout or partial blackout. Additionally this should highlight any specific issues (i.e. those that would impact on the BSG's time to be synchronized) that may arise, as time progresses without external supplies being restored.

b. Step Loading Capability. This should be provided in either graphical or tabular format showing the estimated step loading capability from zero MW to Rated Capacity. Any particular 'hold' points should also be identified. The data for each BSG should be provided for the condition of a 'hot' unit that was synchronized just prior to the total blackout or partial blackout and also for the condition of a 'cold' unit. The step loading assessment should be done against a frequency variation of 59 Hz – 61Hz.

2.4.3 Generation System Data

All generation connected to the T&D System or seeking connection must provide the following information:

2.4.3.1 User's System Layout

Each User shall provide a Single Line Diagram, depicting both its existing and proposed arrangement(s) of load current carrying Apparatus relating to both existing and proposed Connection Points.

a. The Single Line Diagram must include all parts of the Generation System operating at grid voltage throughout.

b. At the User's discretion, the Single Line Diagram can also contain additional details of the Generation Electrical System not already included above, and also details of the transformers connecting the Generator's Electrical System to a lower voltage.

c. The Single Line Diagram must include the points at which Demand data and fault in-feed data are supplied.

d. The above mentioned Single Line Diagram shall include:

i. electrical circuitry (i.e., overhead lines, identifying which circuits are on the same structures, underground cables, power transformers, reactive compensation equipment and similar equipment); and

ii. substation names (in full or abbreviated form) with operating voltages.

e. For each circuit shown on the Single Line Diagram provided under Section 2.4.3.1, the following details relating to that part of the Generation System must be provided:

Circuit Parameters:

i. Rated voltage (kV)

ii. Operating voltage (kV)

iii. Positive phase sequence reactance

iv. Positive phase sequence resistance

v. Positive phase sequence susceptance

vi. Zero phase sequence reactance (both self and mutual)

vii. Zero phase sequence resistance (both self and mutual)

viii. Zero phase sequence susceptance (both self and mutual)

f. The following information about the Generation equipment connected to the T&D System shall be supplied:

Switchgear. For all circuit breakers:

i. Rated voltage (kV)

ii. Operating voltage (kV)

iii. Rated 3-phase rms short-circuit breaking current, (kA)

iv. Rated 1-phase rms short-circuit breaking current, (kA)

v. Rated 3-phase peak short-circuit making current, (kA)

vi. Rated 1-phase peak short-circuit making current, (kA)

vii. Rated rms continuous current (A)

viii. DC time constant applied at testing of asymmetrical breaking abilities (secs)

Switchgear. For the substation infrastructure (including, but not limited to, switch disconnects, current transformers, line traps, busbars, through bushings, etc):

i. Rated 3-phase rms short-circuit withstand current (kA)

ii. Rated 1-phase rms short-circuit withstand current (kA).

iii. Rated 3-phase short-circuit peak withstand current (kA)

iv. Rated 1- phase short-circuit peak withstand current (kA)

v. Rated duration of short circuit withstand (secs)

vi. Rated rms continuous current (A)

A single value for the entire substation may be supplied, provided it represents the most restrictive item of current carrying apparatus.

2.4.3.2 Lumped System Susceptance

For all parts of the Generation System which are not included in the Single Line Diagram provided under Section 2.4.3.1, the equivalent lumped shunt susceptance at nominal Frequency shall be provided. This should include shunt reactors connected to cables which are not normally in or out of service independent of the cable (i.e. they are regarded as part of the cable).

In particular, this should not include:

a. Independently switched reactive compensation equipment connected to the Generation System specified under; or

b. Any susceptance of the Generation System inherent in the Demand (Reactive Power) data.

2.4.3.3 Reactive Compensation Equipment

For all independently switched reactive compensation equipment, including that shown on the Single Line Diagram, power factor correction equipment associated directly with Customers' Plant and Apparatus, the following information is required:

a. Type of equipment (e.g. fixed or variable);

b. Capacitive and/or inductive rating or its operating range in MVAR;

c. Details of any automatic control logic to enable operating characteristics to be determined; and

d. The point of connection to the User's System in terms of electrical location and System voltage.

2.4.3.4 Short Circuit Contribution

To allow CUC to calculate fault currents, each User is required to provide data, calculated in accordance with Good Industry Practice.

a. The data should be provided for all Generating Units synchronized to that Generator's Local System. For each Generator Local System it must be ensured that the pre-fault network conditions reflect a credible System operating arrangement.; and

b. The list of data items required, in whole or part, under the following provisions, is set out in 2.4.3.1. Each of the relevant following provisions identifies which data items in the list are required for the situation with which that provision deals.

   The fault currents in sub-paragraphs (a) and (b) of the data list in 2.4.3.1 should be based on an AC load flow that takes into account any pre-fault current flow across the Point of Connection being considered.

Measurements made under appropriate System conditions may be used to obtain the relevant data.

2.4.3.5 Transient Voltage Data

In order to facilitate transient voltage analysis, the following information is required for each Generation Unit, together with a Single Line Diagram, as follows:

a. Busbar layout plan(s), including dimensions and geometry showing positioning of any current and voltage transformers, through bushings, support insulators, disconnects, circuit breakers, surge arresters, etc.;

b. Electrical parameters of any associated current and voltage transformers, stray capacitances of wall bushings and support insulators, and grading capacitances of circuit breakers;

c. Electrical parameters and physical construction details of lines and cables connected at that busbar;

d. Electrical parameters of all plant e.g., transformers (including neutral earthing impedance or zig-zag transformers, if any), series reactors and shunt compensation equipment connected at that busbar (or to the tertiary of a transformer) or by lines or cables to that busbar;

e. Basic insulation levels (BIL) of all Apparatus connected directly, by lines or by cables to the busbar;

f. Characteristics of over voltage Protection devices at the busbar and at the termination points of all lines, and all cables connected to the busbar;

g. Fault levels at the lower voltage terminals of each transformer connected directly or indirectly to the T&D System without intermediate transformation; and

h. An indication of which items of equipment may be out of service simultaneously during Planned Outage conditions.

2.4.3.6 Protection Data

The following information is required which relates only to Protection equipment which can trip or inter-trip or close any Connection Point circuit-breaker or any Transmission or Distribution circuit-breaker. This information must be submitted to the T&D Engineer for approval at least, sixty (60) days prior to commissioning, and need not be supplied on a routine annual basis thereafter, although the T&D Operator should be notified if any of the information changes

a. A full description, including estimated settings, for all relays and Protection systems installed or to be installed on the Generator's Local System;

b. A full description of any auto-reclose facilities installed or to be installed on the Generator's Local System, including type and time delays;

c. A full description, including estimated settings, for all relays and Protection systems installed or to be installed on the generator, generator transformer, station transformer and their associated connections;

d. For Generating Units having (or intended to have) a circuit breaker at the generator terminal voltage, clearance times for electrical faults within the Generating Unit zone; and

e. The most probable fault clearance time for electrical faults on any part of the Generator's Local System directly connected to the T&D System.

2.4.3.7 Harmonic Data

It is occasionally necessary for the T&D Engineer to evaluate the production/magnification of harmonic distortion on the T&D System and the Generator's Local System, especially when connecting equipment such as capacitor banks. At the T&D Engineer's reasonable request, and at least 60 days prior to commissioning, data with respect to the Interconnection Site is required,

including current and forecast data, and where not already supplied under 2.4.3.1, the following:

Overhead lines and underground cable circuits of the Generator's Local sub-T&D System must be differentiated and the following data provided separately for each type:

a. Positive phase sequence resistance

b. Positive phase sequence reactance

c. Positive phase sequence susceptance

and for all transformers connecting the Generation System to a lower voltage:

a. Rated MVA

b. Voltage ratio

c. Positive phase sequence resistance

d. Positive phase sequence reactance

and at the lower voltage points of those connecting transformers:

a. Equivalent positive phase sequence susceptance;

b. Connection voltage and MVAR rating of any capacitor bank and component design parameters if configured as a filter;

c. Equivalent positive phase sequence interconnection impedance with other lower voltage points;

d. The minimum and maximum demand (both MW and MVAR) that could occur;

e. Harmonic current injection sources in amps at the Connection voltage points. Where the harmonic injection current comes from a diverse group of sources, the equivalent contribution may be established from appropriate measurements;

f. Details of traction loads, e.g., connection phase pairs, continuous variation with time, and

g. An indication of which items of equipment may be out of service simultaneously during Planned Outage conditions.

2.4.3.8 Voltage Data

It is occasionally necessary for the T&D Engineer to undertake detailed voltage assessment studies (e.g., to examine potential voltage instability, voltage control co-ordination or to calculate voltage step changes). At the T&D Engineer's reasonable request and at least 60 days prior to commissioning, the following data should be provided if not already supplied under 2.4.3.1:

For all circuits of the Generator's Local System:

a. Positive Phase Sequence Reactance

b. Positive Phase Sequence Resistance

c. Positive Phase Sequence Susceptance

d. MVAR rating of any reactive compensation equipment

and for all transformers connecting the Generator's Local System to a lower voltage:

a. Rated MVA

b. Voltage Ratio

c. Positive phase sequence resistance

d. Positive Phase sequence reactance

e. Tap-changer range

f. Number of tap steps

g. Tap-changer type: on-load or off-circuit

h. AVC/tap-changer time delay to first tap movement

i. AVC/tap-changer inter-tap time delay

and at the lower voltage points of those connecting transformers:

a. Equivalent positive phase sequence susceptance

b. MVAR rating of any reactive compensation equipment

c. Equivalent positive phase sequence interconnection impedance with other lower voltage points

d. The maximum Demand (both MW and MVAR) that could occur

e. Estimate of voltage insensitive (constant power) load content in % of total load at both winter peak and 75% off-peak load conditions.

2.4.3.9 Short Circuit Analysis

Where prospective short-circuit currents on equipment owned, operated or managed by CUC are greater than 90% of the equipment rating, and in the T&D Engineer's reasonable opinion more accurate calculations of short-circuit currents are required, then at the T&D Engineer's request, data with respect to the Connection Site, current and forecast, and where not already supplied under 2.4.3.1 must be submitted as follows:

General Short Circuit Data for use throughout this section (69 KV transmission system)

a. The following is the list of data utilized in this part of the Planning and Development Code. It also contains rules on the data which generally apply:

   i. Root mean square of the symmetrical three-phase short circuit current infeed at the instant of fault, (I1");

   ii. Root mean square of the symmetrical three-phase short circuit current after the sub-transient fault current contribution has substantially decayed, (I1');

   iii. The zero sequence source resistance and reactance values of the Generator's Local System as seen from the node on the Single Line Diagram provided under section 2.4.3.1 (or Station Transformer high voltage terminals or Generating Unit terminals, as appropriate) consistent with the in-feed;

   iv. Root mean square of the pre-fault voltage at which the maximum fault currents were calculated;

   v. The positive sequence X/R ratio at the instant of fault;

   vi. The negative sequence resistance and reactance values of the User's System seen from the node on the Single Line Diagram provided under section 2.4.3.1 (or Station Transformer high voltage terminals, or Generating Unit terminals if appropriate) if substantially different from the values of positive sequence resistance and reactance which would be derived from the data provided above;

vii. A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the short circuit current between zero and 10 cycles at 0.5 cycles intervals;

viii. The active power being generated pre-fault by Generators;

ix. The reactive compensation shown explicitly on the Single Line Diagram that is switched in;

x. The Power Factor of the Users equipment;

xi. The positive sequence X/R ratio of the equivalent at the Common Collection Busbar;

xii. The minimum zero sequence impedance of the equivalent seen from the Common Collection Busbar;

xiii. The additional rotor resistance and reactance (if any) that is applied to the Generator under a fault condition;

xiv. A continuous trace and a table showing the root mean square of the positive, negative and zero sequence components of the retained voltage at the fault point and Generator terminals, or the Common Collection Busbar if an equivalent Single Line Diagram and associated data as described in Section 2.4.3.1 is provided, representing the limiting case, which may involve the application of a non-solid fault, required to not cause operation of the protective control;

b. In considering this data, unless the T&D Engineer is notified accordingly at the time of data submission, the T&D Engineer will assume that the time constant of decay of the sub-transient fault current corresponding to the change from I1" to I1', (T") is not significantly different from 2.4 cycles (40ms). If that assumption is not correct in relation to an item of data, the T&D Engineer must be informed at the time of submission of the data.

c. The value for the X/R ratio must reflect the rate of decay of the DC component that may be present in the fault current and hence that of the sources of the initial fault current. All shunt elements and loads must therefore be deleted from any system model before the X/R ratio is calculated.

d. In producing the data, "time step analysis" or "fixed-point-in-time analysis" may be used with different impedances.

e. If a fixed-point-in-time analysis with different impedances method is used, then in relation to the data submitted under (a) (i) above, the data will be required for "time zero" to give I1". The figure of 7.2 cycles (120ms) is consistent with a decay time constant T" of 2.4 cycles (40ms), and if that figure is different, then the figure of 7.2 cycles (120ms) must be changed accordingly.

f. Where a "time step analysis" is carried out, the X/R ratio may be calculated directly from the rate of decay of the DC component. The X/R ratio is not that given by the phase angle of the fault current if this is based on a system calculation with shunt loads, but from the Thevenin equivalent of the system impedance at the instant of fault with all non-source shunts removed.

For all circuits of the Generator's Local System

i. Positive phase sequence resistance

ii. Positive phase sequence reactance

iii. Positive phase sequence susceptance;

iv. Zero phase sequence resistance (both self and mutuals)

v. Zero phase sequence reactance (both self and mutuals)

vi. Zero phase sequence susceptance (both self and mutuals)

and for all transformers connecting the Generator's Local System to a lower voltage:

i. Rated MVA

ii. Voltage Ratio

iii. Positive phase sequence resistance (at max, min and nominal tap)

iv. Positive Phase sequence reactance (at max, min and nominal tap)

v. Zero phase sequence reactance (at nominal tap)

vi. Tap changer range

vii. Earthing method: direct, resistance or reactance

viii. Impedance if not directly earthed

and at the lower voltage points of those connecting transformers:

i. The maximum Demand (in MW and MVAR) that could occur;

ii. Short-circuit infeed data in accordance with the General Short Circuit Data above unless the Generator's lower voltage network runs in parallel with the Power Plant's Local System, when to prevent double counting in each node infeed data, a Thevenin equivalent comprising the data items of the General Short Circuit Data above for each node together with the positive phase sequence interconnection impedance between the nodes shall be submitted.

2.4.4 Network Connection

To allow a User to model the T&D System, the T&D Engineer will provide the following Network Data to Users, calculated in accordance with good industry practice

2.4.4.1 Single Point of Connection

For a Single Point of Connection to a Generator's Local System, as an equivalent 69 kV or 13 kV source, the data (as at the HV side of the Point of Connection reflecting data given to the T&D Engineer by Users) will be given to a User as follows:

The data items listed under the following parts of Section 2.4.4.3:

(a) (i), (ii), (iii), (iv), (v) and (vi)

and the data items shall be provided in accordance with the detailed provisions of Section 2.4.4.3 (b) - (e).

2.4.4.2 Multiple Point of Connection

For a Multiple Point of Connection to a Generator's Local System, the equivalent will normally be in the form of a ð model or extension with a source at each node and linking impedance. The data at the Connection Point will be given to a User as follows:

The data items listed under the following parts of Section 2.4.4.3:

(a) (i), (ii), (iv), (v), (vi), (vii) and (viii)

and the data items shall be provided in accordance with the detailed provisions of Section 2.4.4.3 (b) - (e).

When an equivalent of this form is not required the T&D Engineer will not provide the data items listed under the following parts of Section 2.3.4.3:

(a) (vii) and (viii)

2.4.4.3 Data Items

a. The following is a list of data utilized in this part of the Planning and Development Code. It also contains rules on the data which generally apply.

   i. Symmetrical three-phase short circuit current in-feed at the instant of fault from the T&D System, (I1");

   ii. Symmetrical three-phase short circuit current from the T&D System after the sub-transient fault current contribution has substantially decayed, (I1');

   iii. The zero sequence source resistance and reactance values at the Point of Connection, consistent with the maximum in feed below;

   iv. The pre-fault voltage magnitude at which the maximum fault currents were calculated;

   v. The positive sequence X/R ratio at the instant of fault;

   vi. The negative sequence resistance and reactance values of the T&D System seen from the Point of Connection, if substantially different from the values of positive sequence resistance and reactance which would be derived from the data provided above;

   vii. The initial positive sequence resistance and reactance values of the two (or more) sources and the linking impedance(s) derived from a fault study constituting the Thevenin equivalent and evaluated without the User network and load and;

   viii. The corresponding zero sequence impedance values of the Thevenin equivalent.

b. To enable the model to be constructed, the T&D Engineer will provide data based on the following conditions:

   i. The initial symmetrical three phase short circuit current and the transient period three phase short circuit current will normally be derived from the fixed impedance studies. The latter value should be taken as applying at times of 7.2 cycles (120ms) and longer. Shorter values may be interpolated using a value for the subtransient time constant of 2.4 cycles (40ms). These fault currents will be obtained from a full System study based on load flow analysis that takes into account any existing flow across the point of connection being considered.

   ii. Since the equivalent will be produced for the 69 kV or 13 kV parts of the T&D System the T&D Engineer will provide the appropriate grid transformer data.

   iii. The positive sequence X/R ratio and the zero sequence impedance value will correspond to the T&D source network only, that is with the section of network if any with which the equivalent is to be used excluded. These impedance values will be derived from the condition when all Generating Units are synchronized to the T&D System and will take account of active sources only including any contribution from the load to the fault current. The passive component of the load itself or other system shunt impedances should not be included.

3. Connection Code

3.1 Objectives

The Connection Code specifies the minimum technical, design and operational criteria which must be complied with by the T&D Engineer at Connection Sites and by Generating Units connected to or seeking connection with the T&D System. Once the minimum criteria have been met, the basic rules for connection to the T&D System will be developed and communicated.

3.2 Scope

The Connection Code applies to the T&D Engineer and all Users, which in this case means:

a. T&D System Operator

b. Users (ESD, PMD, LOD, & EMD)

c. Customers

Currently, CUC's power plant is the only generating plant connected to the T&D System. As such, the requirements of the Connection Code are satisfied internally with the Engineering department gathering the required information from the PMD and EMD and utilizing it to design, modify or extend the T&D System to accommodate the Connection.

Customers are bound by the signed contract and provisions in the Terms of Service in the Customer Service Code.

3.3 Customer Generation less than 20 kVA for residential customers and less than 100 kVA for commercial customers including all CORE generation.

This Connection Code provides the requirements for parallel interconnection of single phase small generators that are rated at 20 kW or less for residential customers and 100 kW or less for non-residential customers. This includes all Consumer Owned Renewable Energy (CORE) generation which is limited to 20 kW for residential customers and 100 kW for commercial customers. An application form for Customer Generation is provided in Appendix C.

3.3.1 Generator, Inverter and Protective Equipment Technical Requirements

The Generator must be single phase only. Three phase Generators are not covered by this Connection Code although multiple single phase Generators meeting all requirements of this Connection Code may be allowed at the sole discretion of the CUC.

3.3.1.1 Required Standards

The Customer must certify the following requirements:

a. The installation of the generator and all equipment in the system must comply with the latest published edition of IEEE 929 and IEEE 1547 as applicable;

b. Future IEEE Standards and/or Recommended Practices: IEEE P1547.1, P1547.2 and P1547.3 are still proposed draft documents and still in working groups at the time of writing this Standard. Generators interconnected after these standards are published may be required to comply with these IEEE documents;

c. The Customer's inverter or interconnection protection system must be tested and listed for compliance with the latest published edition of Underwriters Laboratories, Inc. (UL) 1741;

d. The Generator must pass the anti-islanding test in UL 1741; and

e. Any protection settings affecting anti-islanding performance must not be adjusted after passing anti-islanding tests.

3.3.1.2 Additional Photovoltaic (PV) System Requirements

The Customer must certify that the generator meets the following requirements:

a. The installation of the generator and all equipment in the system must comply with the latest published edition of IEEE 929; and

b. The Generator is a non-islanding type as defined in IEEE 929.

3.3.1.3 Electrical Contractors and NEC Code Inspections

All installed wiring, protection devices, cabinets and connectors, etc. must comply with the latest published edition of the NEC as used by the local jurisdiction and all applicable local codes.

3.3.1.4 Isolation Device

A visible Isolation device adjacent to the point of service is required. The CUC in its sole discretion determines if the device is suitable.

3.3.2 Distribution Circuit Level Saturation

The cumulative total of the maximum rated output of all interconnected generation shall not exceed fifty (50) percent of the rated capacity of the CUC 13kV distribution circuit. This limit will be determined by the T&D engineer on a case-by-case basis.

3.3.3 Limitations of existing distribution facilities

The generator shall meet each of the following requirements to qualify for interconnection and each requirement must be maintained after commissioning:

a. **Distribution Capacity Limitation:** The maximum rated output of the generator or total aggregate of multiple generators shall not exceed the capacity or ratings of the distribution facilities as determined by the CUC. Sample Interconnection schematics are listed in Appendix A;

b. **Secondary, Service and Service Entrance Limitation:** The generator capacity shall be less than the capacity of the distribution owned secondary, service and service entrance cable connected to the Point of Common Coupling. The CUC will make this determination after reviewing the distribution installed facilities;

c. **Transformer Loading Limitation:** The generator shall not have the ability to overload the distribution transformer or any CUC transformer winding beyond manufacturer or nameplate ratings;

d. **Integration with distribution Grounding:** The grounding scheme of the generator shall comply with IEEE 1547;

e. **Balance Limitation:** The generator shall not create a voltage imbalance of more than 3% if the distribution transformer, with the secondary connected to the Point of Common Coupling, is a three-phase transformer; and

f. Any changes or upgrades to the distribution system to accommodate the generator will be determined by the T&D Engineer pursuant to CUC standards.

3.3.4 Commissioning, Maintenance and Inspections

The Customer or Customer's authorized representative shall perform commissioning, and maintenance as outlined in this section for all generator equipment. All testing shall be documented and the T&D Engineer shall be granted the right to audit the documentation. The T&D Engineer reserves the right to require and witness testing of the Customer's generator. The Customer's generator is subject to inspection by a CUC representative at a mutually agreeable time, as the T&D Engineer deems necessary.

3.3.4.1 Commissioning

The manufacturer's recommended and required commissioning, installation and functional tests shall be completed, with successful results, in accordance with the manufacturer's published recommendations. Commissioning tests in IEEE 1547 shall also be completed with successful results unless these IEEE 1547 tests are duplications of the manufacturer tests. After obtaining the final electrical inspection, the Customer shall invite the T&D Engineer to the commissioning test and perform the test at a mutually agreed date but not later than 25 days after the invitation.

3.3.4.2 Maintenance and Testing

Maintenance shall be performed in accordance with the manufacturer's published maintenance procedures. Periodic testing shall be completed with successful results in accordance with the manufacturer's published recommendations for periodic testing at, or before, the recommended testing intervals. If the manufacturer does not publish recommendations for periodic testing, suitable testing shall be performed that assures proper protection for the distribution, system at an interval not to exceed two years. All test results shall be documented and available to the T&D Engineer for review upon request.

3.4 Generation Greater than 300 kVA Connected to the Radial Distribution System

This Connection Code provides the minimum control and protection requirements for safe and effective operation of Generation Equipment, greater than 300 kVA interconnecting with the CUC radial distribution system including a generator owned by individuals, companies, or agencies, other than CUC, within the CUC service area. It is emphasized that these requirements are general and may not cover all details in specific cases.

A generator greater than 300kVA may only interconnect directly to the distribution system through a line designed for radial operation. The Customer must be Primary Metered as defined by CUC's tariffs. Primary Metering requirements are defined elsewhere. Interconnections shall not be made to primary feeders supplying secondary network systems. Generator size limitations are outlined in Section 3.4.5 - Classification of Generator Installations. In general, 50 percent of the distribution circuit conductor rating is the upper limit for generation interconnection as determined by the T&D Engineer.

The T&D Engineer will evaluate applications for interconnections to primary systems (fused loops). If approved, these interconnections shall be made through a CUC installed and owned fused disconnect switch installed on the primary side of the customer owned transformer. The installation of the fused switch shall be at the Generator's cost.

Interconnection requirements as well as specific electrical requirements for parallel operation with the CUC system are provided for substation and distribution interconnections of synchronous generators, induction generators, and DC generators with inverters.

Appendix C contains a sample form interconnection agreement to be used by the Generator and CUC. This interconnection agreement is subject to approval by the ERA.

Appendix D contains an application form to be used by the Generator and CUC to document the specific characteristics of the installation. This application shall be coordinated by CUC's T&D Engineer.

Responsibility for protection of the generator against possible damage resulting from parallel operation lies solely with the Generator.

The CUC transmission lines may have automatic instantaneous reclosing and distribution feeders may have automatic instantaneous and time delay reclosing with a dead time as short as 12 cycles and as long as 30 seconds. It is the Generator's responsibility to protect its equipment from being reconnected out-of-synchronism with the CUC system after automatic reclosing of a CUC circuit breaker. The Generator connected to the distribution system can also be affected by a transmission line breaker reclosure. It is the Generator's responsibility to protect its equipment from these reclosures. The Generator shall provide high speed protective relaying to remove its equipment from the utility circuit prior to the automatic reclosure. This requirement cannot be met by direct transfer trip (DTT) equipment.

3.4.1 Generating Criteria

It is the policy of CUC to permit any applicant to operate a Generator in parallel with the CUC electric system whenever such operation can take place without adversely affecting other CUC customers, the general public, CUC equipment and CUC personnel. To minimize this interference, the Generator shall meet the following criteria:

A. Voltage

The Generator shall produce voltages within ± 5% of nominal when operating in parallel with the CUC system. (Nominal voltage on the CUC distribution system is 13.8 kV). The Generator shall provide an automatic means of disconnecting its generating equipment from CUC's facilities, unless stated otherwise by the T&D Engineer, as follows:

Voltage Range (% of base voltage)	Clearing Time (seconds)
V < 50	0.16
50 ≤ V < 88	2.0
110 < V > 120	1.0
V ≥ 120	0.16

Base voltages are nominal CUC system voltages. The clearing time is the time between the start of the abnormal condition and the Generator ceasing to energize the CUC system. The clearing times indicated are default times and may be adjusted based upon application specific requirements subject to the T&D Engineer's review and approval.

The requirement to automatically disconnect under the conditions stated above may be different if the Generator is not connected to the feeder experiencing the fault. Where practicable it is desirous for generators to remain on the system during transient faults on the T&D system. The protection settings for the specific generator and location will accomplish this.

B. Flicker

The generator shall not cause voltage variations on the CUC system exceeding those defined on the Border Line of Visibility in Appendix E - Voltage Flicker Curves.

C. Voltage Dip

The voltage dip on a primary circuit due to inrush current shall not exceed 2 volts on a 120 volt base.

D. Frequency

The Generator shall provide an automatic means of disconnecting its generating equipment from CUC's facilities for over and under frequency situations. The final under frequency set point shall be determined to best support the operation of the CUC system. Underfrequency and overfrequency set points will be determined by the T&D Engineer.

E. Harmonics

$$\% \text{ Total Harmonic Distortion (THD)} = \frac{\sqrt{\sum_{i=2}^{\infty} h_i^2}}{h_1} x100 \quad (1)$$

$$\text{While a Single Component \% Distortion} = \frac{h_i}{h_1} x100 \quad (2)$$

Where:

hi = The magnitude of the ith harmonic of either voltage or current.

hl = the magnitude of the fundamental voltage or current.

For non-type tested units, the Generator(s) shall provide manufacturer's harmonic testing reports.

The total harmonic voltage or current distortion created by a Generator must not exceed 5% of the fundamental 60 Hz voltage or current waveform. Any single harmonic shall not exceed 3% of the fundamental frequency.

F. Power Factor

Generators utilizing synchronous generators shall produce or absorb VARs such that the overall power factor at the delivery point (location of CUC's revenue metering equipment) is between 0.90 and 1.0 leading or between 0.90 and 1.0 lagging. CUC's System Operator may request Generator to adjust the power factor at the delivery point, within the above stated limits. If CUC is required to produce VAR capacity from its system to accommodate the Generator, it shall be at the Generator's expense.

For Generators utilizing induction generators with a nameplate power factor below 1.0, CUC shall provide, at the Generator's expense, VAR capacity from its system to bring such generators' power factor to 1.0.

G. External Fault and Line Clearing

The Generator shall be responsible for disconnecting from the CUC system within 5 cycles of the occurrence of a fault on the CUC distribution system using its relaying. Backup relaying must coordinate with CUC's protective relaying.

Note: The maximum available symmetrical short circuit current from CUC on the 13kV distribution system is 16,000 amperes and is exclusive of any other Generators that may be connected to the same CUC substation.

H. DC Injection

The Generator shall not inject DC current greater than 0.5% of the full rated output current at the point of interconnection with the CUC system.

I. Unintentional Islanding

In the event that an unintentional island in which the Generator energizes a portion of the CUC system across the interconnection point, the Generator shall follow the operating plan that has been adopted with the CUC T&D Engineer.

3.4.2 General Requirements

Each Generator operating in parallel with the CUC system shall have its interconnection control and protection designs reviewed and accepted by the T&D Engineer.

The specific design requirements of the protection system depend on the generator type, size, and other site specific considerations. The Generator shall meet the requirements of this T&D Code and all applicable sections of the NEC and all applicable local codes. To eliminate unnecessary costs and delays, a Generator interconnection one-line drawing should be submitted to the T&D Engineer for acceptance prior to the commencement of construction and ordering of equipment. Seven (7) copies of the following must be submitted before a final acceptance can be given to the Generator's design:

A. Generator Interconnection one-line drawing;

B. Relay Functional diagram showing all current transformer (CT) and potential transformer (PT) circuits, relay connections, and protective control circuits. All interconnections with CUC's circuits should be clearly labeled (See Appendix F for an example of an acceptable relay functional);

C. Three line AC schematic diagrams of transformers and bus relay protection;

D. Interconnection breaker AC and DC schematics;

E. Protective relay equipment list including manufacturer model number, relay ranges, manufacturer's bulletins, curves and proposed settings;

F. Generator, transformer, and breaker nameplate information including generator transient, generator harmonic characteristics (non type tested generators), sub-transient, and synchronous impedances and transformer positive and zero sequence impedances (Appendix D);

G. Producer generator protection scheme;

H. Interconnection breaker speed curve; and

I. All drawings should incorporate CUC's requirements for the name and number description of major equipment (switches, breakers, etc.).

If the generator is installed without prior written acceptance of the equipment by CUC, it shall be done at the Generator system's own risk. The Generator shall be solely responsible for all costs associated with the replacement of any equipment that has not been accepted by CUC. Final acceptance of the interconnection by CUC will be contingent upon CUC's acceptance of all of the Generator's interconnection equipment.

If the Generator makes changes in the design of the project, any previous information furnished by CUC shall be subject to review and possible changes.

At the completion of construction, functional tests of all protective equipment shall be performed by a qualified testing company acceptable to CUC, and CUC reserves the right to witness such tests. If these tests are successful, and the protective relay settings have been correctly applied, CUC shall permit the interconnection to be energized.

To accomplish the interconnection and to provide for continuing operations in a safe, economical and efficient manner, CUC shall prepare and deliver Operating Instructions to the Generator prior to interconnecting the facility. The Operating Instructions shall include but not be limited to defining requirements for:

A. Maintaining proper voltage and frequency and for putting into effect voltage changes as required from time to time.

B. Phasing and synchronizing the facility and CUC's system.

C. Taking feeders out of service for maintenance during a system emergency or system pre-emergency conditions and restoring such feeders to service.

D. Controlling the flow of real and reactive power.

E. Periodic maintenance of the interconnection circuit breaker and related facilities.

F. Procedure for communication between electrical operations personnel of the Generator and CUC.

The Generator shall also ensure the availability of a telephone handset, for use by CUC personnel during testing and maintenance of the Generator's equipment.

The Generator shall be required to have a qualified testing company, acceptable to CUC, perform maintenance, trip tests, and recalibration tests on its protective relaying devices once every two (2) years. A copy of the test results shall be sent to CUC for review, comment, and acceptance, no later than five (5) working days after completion of tests.

3.4.3 Control and Protection Requirements

3.4.3.1 Engineering Studies

Engineering studies shall be performed by CUC prior to the signing of an interconnection agreement and at the expense of the Generator to determine the exact electrical configuration of the interconnection installation and to identify any required additions, changes, or modifications to the CUC system. Major equipment requirements such as circuit breakers and special protective relaying shall also be studied. Items requiring investigation are as follows:

A. Equipment short circuit duty.

B. Feeder breaker relay protection coordination due to in-feed for three phase and line to ground faults.

C. Branch fusing coordination due to fault current in-feed from Generator's equipment.

D. Breaker Failure requirements.

E. Deadline operating restraints.

F. VAR requirements.

G. MVA limitations of generation because of location on the CUC feeder.

H. Protective relay coordination for three phase and line to ground faults on the CUC system and the Generator's generator installation.

I. Protective Relay Alarm Breaker Trip (required for Generators utilizing only one microprocessor relay).

3.4.3.2 Equipment Requirements

The following requirements apply to the interconnection of equipment of all generators operating in parallel with the CUC distribution system:

A. All additions or changes required to protective relay and control equipment on the CUC system shall be installed by CUC at the Generator's expense. All additions or changes to relay and control equipment required at the point of interconnection shall be paid for and installed by the Generator;

B. The Generator shall be solely responsible for synchronizing its generator(s) with the CUC system;

C. The Generator may provide a primary voltage interconnection breaker or secondary voltage breaker based on the total installed generator nameplate kVA rating. The breaker shall be located in the Generator's substation. If the

interconnection breaker is a switchgear breaker, it shall be a draw out type with provisions for installing a ground and test device;

D. The interconnection breaker shall be capable of withstanding 220% of the interconnection breaker rated operating voltage;

E. For interconnection breakers rated at 480 V or less operating voltage the breaker shall be rated to withstand the greater of 220% of the operating voltage or two times the rated operating voltage of the interconnection breaker plus 1,000 volts;

F. An isolation disconnect switch (Utility Disconnect Switch) that is readily accessible to CUC at all times located within 10 feet of the CUC metering point or within 10 feet of the CUC service entrance, lockable with a 3/8 inch shank CUC lock, visible-break and load break rated shall be installed to isolate the generator from the CUC system. If the breaker is a drawout type and the Generator provides a ground and test device acceptable to CUC, CUC will evaluate allowing the Generator to omit the isolation disconnect switch;

G. The Generator may be isolated from the CUC system by means of an isolating transformer. If this option is selected, the generator shall have a wye grounded/delta or a wye grounded/delta/wye transformer with the wye grounded winding configuration on the CUC side. See Appendix B for the technical explanation of this requirement. A ground fault current limiting neutral reactor shall be installed if required by CUC on non-dedicated feeder installations;

H. The Generator's system can opt not to use the wye-grounded (utility side)/delta (Generator side) isolation transformer if all of the following conditions are met:

1. The primary connected transformer must be a wye-grounded/wye-grounded transformer, and the generator must be effectively grounded. The generator neutral reactor is normally used to limit ground fault current and protect the generator windings. The generator neutral reactor must be sized such that it both prevents over-voltages and allows enough ground fault current to be detected by the Generator's relaying for faults on the CUC distribution feeder;

2. The Generator must provide protective relaying that detects faults on the CUC system, including ground faults; and

3. The Generator must meet the harmonic requirements of the interconnect guide and test data supporting this is provided.

I. A Generator with a total connected primary and/or secondary interconnect generator nameplate rating of greater than 1500kVA shall require a SCADA system Remote Terminal Unit (RTU) installation. The term 'RTU' will be understood to allow any Data Acquisition Equipment such as Programmable Logic Controller (PLC), Intelligent Electronic Device (IED), or Distributed Control System (DCS) that is compliant with the functional requirements herein;

The RTU will be paid for by the Generator or purchased by the Generator. The RTU shall provide CUC with supervisory trip control of the interconnection breaker(s) to the CUC control room. It shall also provide telemetry of key operating parameters of the Generator's facility, which shall include but not be limited to:

1. Status indication of interconnection breaker(s), generator breaker(s), and all other devices that are in series with these breakers.

2. Status indication of various alarms such as loss of DC to interconnection breaker(s), loss of DC to RTU, loss of AC to RTU battery charger, loss of relaying communication channel, microprocessor relay alarm, etc.

3. Run-time telemetry for current, voltage, watts, VARS, and power factor for all interconnection breaker(s).

4. Pulse accumulation of MWHR (in/out) and MVARHR (in/out) for the facility.

The location of the RTU shall depend on the proximity of the generator to the interconnecting CUC substation. The generator shall not be allowed to operate in parallel if the RTU or its associated communication line is out of service. The RTU shall be maintained and repaired at the Generator's expense.

All reasonable costs for additional hardware and software for CUC's master supervisory computer in compliance with CUC's equipment and design standards that are necessary for its interconnection shall be charged to the Generator.

J. For facilities interconnected to CUC by means of a dedicated feeder, a breaker shall be installed at the Generator's expense in the CUC substation. For a non-dedicated feeder, a disconnect device controlled by CUC shall be installed at the Generator's expense at the point of interconnection with the CUC system;

K. The Generator shall be responsible for tripping its interconnection breaker if a fault occurs on the electric facilities serving its installation. Whenever the CUC supply is de-energized, the Generator's interconnection breaker shall be tripped by voltage and/or frequency relays and transfer tripped from CUC's interconnection substation. The interconnection breaker shall be automatically locked out and prevented from closing into a de-energized or partially de-energized (loss of one phase) CUC system. The interconnection breaker close circuit shall include a synch check and an over/under voltage permissive contact to prevent closing the breaker when unfavorable voltage conditions exist;

L. The DTT receiving terminal shall provide two outputs: a trip output and an alarm output to indicate a loss of transfer trip condition. The trip output shall energize a utility type target relay with multiple output contacts. One (1) output contact of the target relay shall trip the interconnection breaker. A second output contact of the target relay and the alarm contact of the DTT terminal shall be wired to the RTU. The DTT terminal and associated target relay shall be mounted indoors;

M. The alarm for the loss of a DTT communications must relay the alarm at the CUC central control room. In the event of DDT communications line loss, the Generator shall cease parallel operation with the CUC system;

N. The required dedicated transfer trip lease line shall be ordered by CUC. Installation, maintenance and subsequent monthly charges shall be charged to the Generator;

O. The Generator shall make provisions to terminate the lease line with a double pole double throw open knife blade switch adjacent to the transfer trip equipment. The Generator will not be allowed to parallel with the CUC system if its transfer trip or associated lease line is out of service;

P. For Generator's utilizing only one microprocessor relay, the interconnection breaker or the generator breaker(s) must be tripped when the Generator's protective relaying system goes into a malfunction or trip condition. This trip shall also trip a lock-out relay that requires manual intervention before the

breaker(s) can be reclosed following successful clearing of the relay alarm condition(s);

Q. The following are the minimum Relay Requirements for the interconnection breaker:

1. Phase overcurrent relays (one per phase) with instantaneous and voltage restraint time delay elements are required as well as one ground overcurrent relay with instantaneous and time delay elements. Each element of the phase and ground relays shall have its own target;
2. Over/under voltage relays and over/under frequency relays are required on CUC's side of the interconnection breaker;
3. Directional power relays may be required to limit power flow to contractual agreements;
4. Directional overcurrent relays shall be required at sites where the generator's load requirements from CUC exceed the Generators generating capability. Any exceptions to this requirement shall be approved by CUC;
5. Transformer differential relaying shall be required for interconnections using transformer banks greater than 1,500 kVA;
6. Negative sequence overcurrent relays; and
7. All interconnection breaker relays and required generator breaker relays shall be approved by CUC. Interconnection breaker relays must be capable of being calibrated and tested in their installed position to verify proper application of all relay settings and full functionality of the relay circuit(s).

R. All breakers shall be DC trip and close. Trip and close circuits of the interconnection breaker must be separately fused. Loss of DC and low DC voltage alarms shall be wired to the RTU;

S. The station battery shall be sized for an eight hour duty cycle in accordance with IEEE Standard 485-1983. At the end of the duty cycle the battery shall be capable of tripping and closing all breakers;

T. All solid state relays requiring an auxiliary power source shall be powered from the station battery. AC to DC converters are unacceptable;

U. All relaying CTs shall have a minimum accuracy of C200. Saturation current shall not be more than 10% of fault current. Interconnection relaying and telemetering shall have dedicated CTs;

V. Three PTs shall be installed on the CUC side of the interconnection breaker and shall be connected wye-grounded/wye-grounded. Three red indicating lights, one per phase, connected phase to ground in the PT secondary, shall be installed to provide visual verification of potential on each phase. Three (3) single phase over/under voltage relays, associated with the high side breaker, shall be connected phase to ground to these PTs;

W. During emergency conditions, all interconnection breakers shall be capable of being tripped by CUC via supervisory control. CUC will consider tripping the generator breaker instead of the interconnection breaker if the system configuration permits. Interconnection breaker and generator breaker(s) status will be transmitted to CUC via the RTU. The supervisory equipment shall be installed and paid for by the Generator;

A digital meter or MW, MVAR, current, voltage and power factor transducers mounted in flexitest drawout cases shall be connected to the interconnection breaker CTs and line PTs and wired to the analog inputs of the RTU. CUC shall furnish the Generator with the necessary wiring drawings to connect the transducers to the supervisory equipment. If less than 1500 KVA, the transfer trip system will be used for CUC supervisory trip;

X. Synch check relays are required across the interconnection breaker of a synchronous generator unless otherwise specified. A total of four potential transformers shall be required on the interconnection, three on CUC's side of the breaker (as specified #22) and one on the Generator's. Synch check relays shall be installed for manual synchronizing. Automatic synchronizing equipment shall be optional, however, it shall not permit the exclusion of a synch check relay;

Y. The CUC substation feeder breaker may require a set (3) of line side potential transformers to monitor the presence of voltage on the distribution feeder and to provide voltage to a synch check or voltage relay, which shall prevent closing the breaker into an unsynchronized Generator's generator. All reasonable costs in compliance with CUC's equipment and design standards incurred to purchase and place this system in service shall be at the Generator's expense;

Z. The kVAR requirements of an induction generator, operating at 100% load, will be determined and the Generator will be charged that portion of the cost to install one or more 900kVAR supervisory controlled distribution capacitor banks to provide the reactive supply;

AA. Voltage and frequency relays shall be installed at the CUC substation to disconnect the Generator from the CUC bus in the event that this bus becomes isolated from the CUC system and the Generator's generator continues to carry the connected CUC load. These relays shall be installed at the Generator's expense;

BB. Interconnection breaker(s) for Generator owned generator(s) on the distribution system, unless otherwise specified, shall be automatically tripped for all trips of the CUC substation feeder breaker. A generator breaker contact may be used to disable transfer trip of the interconnection breaker when the generator breaker is open. The communication tripping channel and transfer tripping equipment at the CUC substation and at the Generator's facility shall be purchased and installed at Generator's expense, as part of the relay protection scheme. The transfer trip equipment and associated transfer trip communication channel shall be specified by CUC; and

CC. The transformer configuration of an existing CUC transformer that is to become Customer-owned in a new primary metered installation must be verified in the field. The Generator will bear the cost of a replacement wye-wye transformer, which may be greater than the cost of purchasing the in-place CUC transformer.

3.4.4 Maintenance and Operating Requirements:

The following requirements apply to all Generator installations.

A. The protective devices (relays, circuit breakers, etc.) required to disconnect the Generator's generation shall be owned, operated, and maintained by the Generator at its expense;

B. All final relay setting calculations for the Generator's interconnection breaker shall be submitted for review and acceptance by CUC, to assure protection of CUC equipment

and reliability of service to the adjacent CUC customers. The Generator shall be required to change relay settings, if necessary, to accommodate changes in the CUC system;

C. If the Generator elects to install a solidly grounded neutral, CUC will require that it be tested every two (2) years;

D. It shall be the Generator's responsibility to have calibration and functional trip tests performed on its fault and isolation protection equipment. These tests shall be performed prior to placing equipment in service and once every two (2) years thereafter. Copies of these test results shall be submitted to CUC no later than five working days after completion of tests. All the testing and calibration shall be performed by a qualified independent testing organization, acceptable to CUC, in accordance with industry standards and shall be submitted to CUC for review and acceptance. Interconnection breaker speed curves shall be verified using a Cincinnati Analyzer or an equivalent. Battery tests shall meet the requirements of IEEE Standard 450-1987. CUC reserves the right to witness and accept or reject the results of all tests. CUC shall be notified of the testing two (2) weeks in advance;

E. After the generator is placed in service, CUC reserves the right to test or review on request the calibration and operation of all protective equipment including relays, circuit breakers, batteries, etc. at the interconnection, as well as review the Generator's complete maintenance records. A review of the calibration and operation of protective equipment may include CUC-witnessed trip testing of the interconnection breaker from its associated protective relays;

F. The failure of the Generator to maintain its equipment in a manner acceptable to CUC or to furnish maintenance records on demand may result in the Generator being prevented from operating in parallel with the CUC system;

G. If CUC is requested to work at the Generator's generating site, CUC operating and maintenance personnel shall inspect the site to insure that all CUC safety requirements have been met. If not, commencement of the requested work shall be delayed until conditions are deemed safe by CUC;

H. CUC reserves the right to test for or to request the Generator to supply certified test reports for harmonic content at the point of interconnection. The % Total Harmonic Distortion (THD) measurements shall be taken with a spectrum analyzer. Inverter installations shall be required to take two sets of measurements; one with the inverter isolated and the other with the inverter connected to the CUC system. The current harmonic levels should be observed and recorded at 0, 1/2, 3/4, and full power measurements.

- If the % THD exceeds the limits outlined in section 3.5.2.D the Generator shall install filters to meet the required limits.
- If at any time during parallel operation harmonic distortion problems affecting other customers' equipment can be traced to the Generator's generator, the Generator's generating equipment shall be immediately disconnected from the CUC system and shall remain disconnected until the problem is corrected.

I. The Generator shall close the interconnection circuit breaker only after obtaining approved switching orders from the responsible CUC operator as defined in the T&D Operating Code (Section 4). No automatic reconnect shall be incorporated in the design. CUC reserves the right to open the disconnecting device to the Generator for any of the following reasons:

1. System Emergency or System Pre-Emergency
2. Substandard conditions existing with the Generator's generating and/or protective equipment

3. Failure of the Generator to maintain its equipment in accordance with the agreed upon schedule
4. Failure of Generator to make maintenance records available to CUC on request
5. Interference by the Generator's generation system with the quality of service rendered by CUC to its customers
6. Personnel safety
7. To eliminate conditions that constitute a potential hazard to the general public

3.4.5 Classification of Generator Installations

Generation installations are classified into two types - those interconnecting to the CUC system on a dedicated radial feeder and those interconnecting on a non-dedicated feeder (refer to Appendix A).

Maximum Gross Generation Capacity*	
Distribution Voltage	
Interconnection	13Kv
1. Dedicated Radial Feeder	10MVA
2A.i Synchronous Generators Non-Dedicated Feeder Main	3.0 MVA
Branch	1.5 MVA
2A ii. Primary Metered Secondary Protection	1.5 MVA .
2B.i Induction Generators Non-Dedicated Feeder Main	2.5 MVA
Branch	1.0 MVA
2B. ii Induction Generators Non-Dedicated Primary Metered Secondary Protection Main	1.5 MVA
Branch	1.0 MVA

** These generation capacities are on a per-Generator basis. It should be noted, however, that the aggregate generation (sum of the total gross generation of all Generators connected to a particular segment of the CUC system) on a non-dedicated 13 kV distribution feeder must not exceed 5 MVA. The maximum capacity of the aggregate generation connected to a 13 kV branch circuit is 1.5 MVA. The maximum aggregate generation connected to one CUC 13 kV substation is 10 MVA. The maximum aggregate generation shall also be limited to approximately one-third of the MVA rating of the step-down transformer at CUC's substation.*

The aggregate generation may be further limited by the load and fault duty capability of the substation equipment and connecting distribution feeder. CUC shall evaluate each application in accordance with good industry practices before deciding on the maximum MVA allowed onto the CUC system at a given point.

Special relay coordination problems may exist for non-dedicated feeder installations since all Generators may not be on-line at the same time. Each situation shall be evaluated on its own merits and in accordance with good industry practices.

3.4.6 Communications

In order to ensure safe and efficient control of the T&D System, telecommunications between Users and the T&D Systems Operator must be established in accordance with the requirements set down below.

3.4.6.1 Control Radio and Control Telephone Systems

Control Radio is the principal method by which Generation and T&D personnel must communicate to the T&D Systems Operator for the purposes of control of the Total System in both normal and emergency operating conditions.

Control Telephone is the principal method by which Customers must communicate to the T&D Systems Operator.

Proper radio/phone etiquette must be used at all times.

3.4.6.2 Operational Metering

a. The Controls Engineer shall provide SCADA outstation interface equipment. The Generation Engineer shall provide such voltage, current, frequency, active power and reactive power measurement outputs and plant status indications and alarms to the T&D SCADA outstation interface equipment as required by the Controls Engineer.

b. For the avoidance of doubt, for active power and reactive power measurements, circuit breaker and disconnector status indications, the outputs and status indications must each be provided to the T&D System Operator on an individual Generator Unit basis. In addition, where identified, active power and reactive power measurements from Unit Transformers and/or Station Transformers must also be provided.

3.4.6.3 Busbar Voltage

The Controls Engineer shall provide the Generation Engineer at each Grid Entry Point where Generating Units are connected, with appropriate voltage signals to enable the Generation Department to obtain the necessary information to permit the Generating Units to be synchronized to the T&D System. The term "voltage signal" shall mean in this context, a point of connection on (or wire or wires from) a relevant part of T&D Plant and/or Apparatus at the Grid Entry Point, to which the Generator in relation to the Plant and/or Apparatus to be attached, will be able to attach its Plant and/or Apparatus (normally a wire or wires) in order to obtain measurement outputs in relation to the busbar.

3.5 Generation Connected to the Transmission System

This section of the Connection Code has been prepared to identify the technical requirements for connecting Transmission Connected Generation (TCG) to the CUC 69 kV transmission system.

Rather than give detailed technical specifications this document provides a general overview of the functional objectives and requirements to be met in the design of facility connections. These requirements are written to establish a basis for maintaining reliability, power quality, and a safe environment for the general public, power consumers, maintenance personnel and the equipment. This Facility Connection Requirements document is revised from time to time to reflect changes or clarifications in planning, operating, or interconnection policies.

All TCGs operating generators rated 10 MVA or greater must adhere to the requirements outlined in this document. CUC shall evaluate each installation to determine the maximum TCG MVA which can be connected to the CUC system at a particular location without exceeding the load carrying capability, fault duty, and interrupting capability of the CUC equipment.

Control and protection requirements as well as specific electrical requirements for parallel operation with the CUC system are provided for transmission interconnections of synchronous generators.

Should a TCG desire to interconnect induction generators and DC generators with inverters to CUC's transmission system, then engineering studies shall be performed, at the TCG's expense, to determine specific interconnection requirements.

Appendix C contains a sample form interconnection agreement to be used by the Generator and CUC. This interconnection agreement is subject to approval by the ERA.

Appendix D is an application form to be used by the TCG and CUC to document the specific characteristics of the installation. This application shall be coordinated by the T&D Engineer.

Responsibility for protection of the TCG's generating system against possible damage resulting from parallel operation lies with the TCG.

The CUC transmission lines have automatic instantaneous reclosing with a dead time as short as 12 cycles. It is the TCG's responsibility to protect its equipment from being reconnected out-of-synchronism with the CUC system after automatic reclosing of a CUC circuit breaker. It is also the TCG's responsibility to protect its equipment from these reclosures. The TCG shall provide high speed protective relaying to remove its equipment from the utility circuit prior to the automatic reclosure.

3.5.1 General Requirements

TCG generators shall be connected to the transmission system rated at 69 kV. This connection can be made at the CUC substation or at a point on a transmission line. A substation connection shall require a dedicated circuit breaker. A system or bus configuration could require more than one dedicated circuit breaker. All dedicated circuit breakers shall be sized to meet the voltage, load current, and short circuit interrupting requirements at the substation.

A connection to a point on a transmission line shall require the installation of a substation at the point of connection. The substation shall have at least two circuit breakers equipped with high speed line relaying as specified by CUC. Three terminal line configurations are not acceptable. The design of the substation should conform to the requirements in the Planning and Development Code (Section 2).

CUC shall evaluate and analyze each proposed installation prior to accepting any interconnection configuration.

Each TCG facility which is to be operated in parallel with the CUC system shall submit its control and protection designs to CUC for review and acceptance.

The specific design requirements of the protection system depend on the generator type, size, and other site specific considerations. The TCG shall meet the requirements of this Connection Code and all applicable local codes. To eliminate unnecessary costs and delays, a facility substation one-line drawing and relay functional diagram(s) should be submitted to CUC for acceptance prior to the commencement of construction and ordering of equipment. Seven (7) copies of the following must be submitted by the TCG:

A. Substation one-line drawing.

B. Relay functional diagram showing all CT and PT circuits, relay connections, and protective control circuits. All interconnections with CUC's circuits should be clearly labeled (See Appendix F1 for an example of an acceptable relay functional).

C. Three line AC schematic diagrams of transmission lines, transformers and bus relay protection.

D. Interconnection breaker AC and DC schematics.

E. Protective relay equipment list including manufacturer model number, relay ranges, manufacturer's bulletins, curves and proposed settings.

F. Generator, transformer, and breaker nameplate information including generator transient, subtransient, and synchronous impedances with time constants and transformer positive and zero sequence impedances.

G. TCG generator protection scheme.

H. Interconnection breaker speed curve.

I. All drawings should incorporate CUC's requirements for name and number description of the major equipment (switches, breakers, etc.).

If the TCG installs equipment without prior written acceptance of the equipment by CUC, it shall be done at the TCG's own risk. The TCG shall be solely responsible for all costs associated with the replacement of any equipment that has not been accepted by CUC. Final acceptance of the

interconnection by CUC will be contingent upon CUC's acceptance of all of the facility's interconnection equipment.

If the TCG makes changes in the design of the project, any previous information furnished by CUC shall be subject to review and possible changes. At the completion of construction, a qualified testing company acceptable to CUC shall perform functional tests of all protective equipment. CUC reserves the right to witness such tests. The functional tests of all protective equipment include, but are not limited to, trip tests and relay calibrations. If these tests are successful, and the protective relay settings have been correctly applied, CUC shall permit the interconnection to be energized.

3.5.2 Generating Criteria

It is the policy of CUC to permit any applicant to operate generating equipment in parallel with the CUC electric system whenever such operation can take place without adversely affecting other CUC customers, the general public, CUC equipment and CUC personnel. To minimize this interference, the TCG's generation shall meet the following criteria:

A. Voltage

Nominal voltage on the CUC transmission system is 69 kV and is operated within a voltage bandwidth of +5/-5% of the nominal voltage.

B. Flicker

The TCG shall not cause voltage variations on the CUC system exceeding those defined on the Border Line of Visibility in Appendix E - Voltage Flicker Curves.

C. Frequency

The Project will meet the under frequency guidelines specified. The over-frequency trip setting of the Protective Functions shall be specified by the CUC T&D Engineer. The final time delay will be determined by CUC based on review of the Project design.

D. Harmonics

The total harmonic voltage or current distortion created by a TCG-owned generator must not exceed 5% of the fundamental 60 Hz voltage or current waveform. Any single harmonic shall not exceed 3% of the fundamental frequency.

$$\% \text{ THD} = \frac{\sqrt{\sum_{i=2}^{\infty} h_i^2}}{h_1} x100 \quad (3)$$

While a Single Component % Distortion = $\frac{h_i}{h_1} x100$ (4)

Where:

hi = The magnitude of the ith harmonic of either voltage or current.

hl = the magnitude of the fundamental voltage or current.

E. Power Factor

Synchronous generators produce or absorb VARS such that the power factor at the delivery point (location of CUC's revenue metering equipment) is between 0.90 and 1.0 leading or 0.90 and 1.0 lagging. CUC's system operator may request TCG to adjust the power factor at the delivery point, within the above stated limits.

F. External Fault and Line Clearing

For interconnections at voltages up to and including 69kV, the TCG shall be responsible for disconnecting its generating equipment from the CUC system within 2 cycles of the occurrence of a fault on a CUC transmission line connected directly to the interconnect breaker using its primary relaying. Backup relaying must clear this fault in 18 cycles. The short circuit currents on the transmission system are available from CUC on request.

3.5.3 Planning and Engineering Studies

Engineering studies shall be performed by CUC prior to the signing of an interconnection agreement and at the expense of the Generator to determine the exact electrical configuration of the interconnection installation and to identify any required additions, changes, or modifications to the CUC system. Major equipment requirements such as circuit breakers and special protective relaying shall also be studied. Items requiring investigation are as follows:

1. Equipment short circuit duty
2. Impact on electric system stability
3. Breaker failure requirements
4. Deadline operating restraints
5. VAR requirements for induction generators
6. MVA limitations of generation because of location on the CUC system
7. Protective relay coordination for three phase and line to ground faults on the CUC system and the TCG's generator installation

3.5.4 Control and Protection Requirements

The following requirements apply to the interconnection equipment of all generators operating in parallel with the CUC transmission system:

A. All additions or changes required to protective relay and control equipment on the CUC system shall be installed by CUC at the TCG's expense. All additions or changes to relay and control equipment required at the point of interconnection shall be paid for and installed by the TCG.

B. The TCG shall be solely responsible for synchronizing its generator(s) with the CUC system.

C. All TCG-owned generators shall be isolated from the CUC system by means of an isolating transformer. All installations shall have a wye grounded/delta or a wye grounded/delta/wye transformer with the wye grounded winding configuration on the CUC side. See Appendix B for the technical explanation of this requirement. A ground fault current limiting neutral reactor shall be installed if required by CUC.

D. CUC shall install, own, control, operate and maintain (at the TCG's expense) a visible manual load break or motor-operated disconnecting device on CUC's side of the point(s) of interconnection. Devices shall be capable of being padlocked.

E. A SCADA system RTU paid for by the TCG shall be required at each generating site. The RTU shall provide CUC with supervisory trip control of the interconnection breaker(s) to CUC Central Control Room. It shall also provide telemetry of key operating parameters of the TCG's facility which shall include, but not be limited to:

   i. Status indication of interconnection breaker(s), generator breaker(s), and all other devices that are in series with these breakers;

ii. Status indication of various alarms such as loss of DC to interconnection breaker(s), loss of DC to RTU, loss of AC to RTU battery charger, loss of relaying communication channel, etc.;

iii. Telemetry of current, voltage, watts, VARS, power factor for all interconnection breakers;

iv. Pulse accumulation of MWHR (in/out) and MVARHR (in/out) for the facility; and

v. The RTU will be equipped with the ability to control the generator set point that is to be transmitted from the CUC Control Room Master Control System to the TCG via telemetry.

The location of the RTU shall depend on the proximity of the TCG to the CUC interconnecting substation. The TCG shall not be allowed to operate in parallel if the RTU or its associated communications channels are out of service. The RTU shall be maintained and repaired by CUC at the TCG's expense.

All reasonable costs for additional hardware and software for CUC's mainframe supervisory computer that are necessary for its interconnection shall be charged to the TCG.

Whether the RTU is purchased by the TCG or by CUC (at the TCG's expense), it shall be delivered to CUC for testing and programming. At this time, loss of DC/AC relays, fuses, and various terminal blocks will be installed within the RTU cabinet by CUC at the TCG's expense.

The TCG shall make provisions adjacent to the RTU to terminate the communications line to the RTU equipment. Installation, maintenance and subsequent charges shall be charged to the TCG.

F. All TCGs shall provide an interconnection breaker on CUC's side of their isolation transformer. The breaker shall be located in the TCG's substation. A disconnecting switch in series with the TCG's circuit breaker shall be installed as a visible disconnect. The circuit breaker and switch shall be installed at the TCG's expense.

G. The TCG shall be responsible for tripping its interconnection breaker if a fault occurs on the electric facilities serving its installation, thereby disconnecting its generation and isolating transformer as a source of fault current within 6 cycles after the occurrence of a fault for interconnections at 69kV. Whenever the CUC supply is de-energized, the TCG's interconnection breaker shall be tripped by voltage and/or frequency relays and transfer tripped from CUC's interconnection substation. The interconnection breaker shall be automatically locked out and prevented from closing into a de-energized or partially de-energized (loss of one phase) CUC system. The interconnection breaker close circuit shall include a synch check and an over/under voltage permissive contact to prevent closing the breaker when unfavorable voltage conditions exist.

H. The following are the minimum relay requirements for the interconnection breaker:

i. Dual (primary and backup) transmission line relaying systems using fiber optic cables as the pilot channels are required. The line differential relays shall include directional phase and ground impendence elements (21 and 21G) and ground directional overcurrent elements. CT's for this relaying shall be on the generator side of the interconnect breaker. CUC shall specify the type of relays and CT ratios;

ii. Back-up phase overcurrrent with instantaneous and time delay functions are required as well as one ground overcurrent relay with instantaneous and time delay functions connected on the transformer neutral;

iii. Over/under frequency protection is required;

iv. Over/under voltage protective functions are required;

v. Directional power relays may be required to limit power flow to contractual agreements;

vi. Directional overcurrent relays shall be required at sites where the TCG's load requirements from CUC exceed the TCGs generating capability. Any exceptions to this requirement must be approved by CUC; and

vii. Breaker failure relaying is required to trip all breakers in the zones of protection adjacent to the interconnection breakers.

All interconnection breaker relays and required generator breaker relays must be utility grade. Interconnection breaker relays will require Flexitest Switches for current, voltage, output and input connections to facilitate maintenance, inspection, testing, and adjustments.

I. DTT, independent of any permissive transfer trip, is required. Should the transmission line primary relaying system(s) not provide this capability, separate equipment will be required. The communication medium shall be determined by CUC. CUC shall specify and order the transfer trip communications channels. Installation, maintenance, and subsequent monthly charges shall be charged to the TCG. A loss of transfer trip alarm point shall be wired to the RTU. The TCG shall terminate fibers adjacent to the transfer trip equipment in a wall mounted fiber patch panel. The TCG shall not be allowed on line if the transfer trip or associated communication medium is out of service.

J. All breakers shall be DC trip and close. Trip and close circuits of the interconnection breaker shall be separately fused. A loss of DC alarm shall be wired to the RTU.

K. A visible disconnect is required at the TCG's equipment on the generator side of the interconnection breaker.

L. Control, CT, and telemetering leads which interconnect to CUC shall have a minimum size and stranding of 19/25, 19/22, and #18 STP, respectively. All control, CT and telemetering leads shall be terminated using ring type connectors.

M. The station battery shall be sized for an eight hour duty cycle in accordance with IEEE Standard 485-1983. At the end of the duty cycle the battery shall be capable of tripping and closing all breakers. A low voltage DC alarm shall be wired to the RTU.

N. All relaying CTs shall have a minimum ANSI accuracy of C800, at the selected tap. The TCG shall provide a CT shorting block for each CT circuit.

O. All microprocessor relays requiring an auxiliary power source shall be powered from the station battery. AC to DC converters are not acceptable.

P. Three PTs with dual secondary windings shall be installed on the TCG side of the interconnection breaker and shall be connected wye grounded/wye grounded-open delta. The open delta secondary winding is required for ground fault protection on the 69kV system. Three red indicating lights, one per phase, connected phase to ground in the PT secondary, shall be installed to provide visual verification of potential on each phase.

Q. During emergency conditions, all interconnection breakers shall be capable of being tripped by CUC via supervisory control. CUC will consider tripping the generator breaker instead of the interconnection breaker if the system configuration permits. Interconnection breaker and generator breaker(s) status shall be transmitted to CUC via the RTU. The supervisory equipment shall be installed and paid for by the TCG.

R. Synchronous generators shall be equipped with synchronizing capability across the generator breaker. A total of four potential transformers shall be required on the interconnection breaker, one on CUC's side of the breaker (as specified in F) and three on the TCG's side. Synch check relays shall be installed for manual synchronizing. Closing into the CUC system without a functioning synch check relay is not permitted. Automatic synchronizing equipment shall be optional.

S. Voltage and frequency relays are required at the CUC substation to disconnect the TCG's generator from the CUC bus in the event that this bus becomes isolated from the CUC system and the TCG's generator continues to carry the connected CUC load. These relays shall be installed at the TCG's expense.

T. Additional control and protection equipment that, depending on the parameters of each interconnection, could be required for installation on the CUC system include, but are not limited to:

i. Digital transient recorder for 69kV interconnections

ii. Sequence of event recorder for 69kV interconnections

iii. Additional primary relaying systems to existing CUC transmission line to ensure fault clearing within "new" stability parameters resulting from the TCG's generation

iv. Expansion/addition of SCADA RTUs on the CUC side of the interconnection

v. Upgrade of breaker failure relaying protection

vi. Recloser blocking of transmission line breakers

vii. Zero sequence voltage relaying

3.5.5 Maintenance and Operating Requirements

The following requirements apply to all TCG-owned installations.

1. The protective devices (relays, circuit breakers, etc.) required to disconnect the TCG's generation shall be owned, operated, and maintained by the TCG at its expense.

2. All final relay setting calculations for the TCG's interconnection breaker shall be submitted for review and acceptance by CUC to assure protection of CUC equipment and reliability of service to the adjacent CUC customers. The TCG shall be required to change relay settings, if necessary, to accommodate changes in the CUC system.

3. It shall be the TCG's responsibility to have calibration and functional trip tests performed on its fault and isolation protection equipment. These tests shall be performed prior to placing equipment in service and once every two (2) years thereafter. Copies of these test results shall be submitted to CUC no later than five working days after completion of tests. All the testing and calibration shall be performed by a qualified independent testing organization acceptable to CUC, in accordance with industry standards. Interconnection breaker speed curves shall be verified using a Cincinnati Analyzer or an equivalent. Battery tests shall meet the requirements of IEEE Standard 450-1987. CUC reserves the right to witness and accept or reject the result of all tests. CUC shall be notified of the date of testing two (2) weeks in advance. An electronic copy of the accepted test results will be provided to the ERA for its records by the TCG.

4. After the TCG's equipment is in service, CUC reserves the right to test, at the TCG's expense, or review on request the calibration and operation of all protective equipment including relays, circuit breakers, batteries, etc. at the interconnection as well as review the TCG's complete maintenance records pursuant to an agreed upon procedure with the TCG . A review of the calibration and operation of protective equipment may include CUC-witnessed trip testing of the interconnection breaker from its associated protective relays.

5. The failure of the TCG to maintain its equipment in a manner acceptable to CUC or to furnish maintenance records pursuant to an agreed upon procedure with the TCG shall result in the TCG being prevented from operating in parallel with the CUC system.

6. If CUC is requested to work at the TCG's generating site, CUC operating and maintenance personnel shall inspect the site to insure that all CUC safety requirements have been met.

If not, commencement of the requested work will be delayed until conditions are deemed safe by CUC.

7. CUC reserves the right to test for or to request the TCG to supply certified test reports for harmonic content at the point of interconnection. The % THD measurements shall be taken with a spectrum analyzer.

   Inverter installations shall be required to take two sets of measurements; one with the inverter isolated and the other with the inverter connected to the CUC system. The current harmonic levels should be observed and recorded at 0, 1/2, 3/4, and full power measurements.

   If the % THD exceeds the limits outlined in section 3.5.2.D are exceeded, the TCG shall install filters to meet the required limits.

   If at any time during parallel operation harmonic distortion problems affecting other customers' equipment can be traced to the TCG's generator, the TCG's generating equipment shall be immediately disconnected from the CUC system and shall remain disconnected until the problem is corrected.

8. The TCG shall close the interconnection circuit breaker only after obtaining approved switching orders from the responsible CUC operator as defined in the T&D Operating Code (Section 4). CUC reserves the right to open the disconnecting device to the TCG for any of the following reasons:

   a. System Emergency or System Pre-Emergency.

   b. Substandard conditions existing with the TCG's generating and/or protective equipment.

   c. Failure of the TCG to maintain its equipment in accordance with the agreed upon schedule.

   d. Failure of TCG to make maintenance records available to CUC pursuant to an agreed upon procedure with the TCG .

   e. Interference by the TCG's generation system with the quality of service rendered by CUC to its customers.

   f. Personnel safety.

   g. To eliminate conditions that constitute a potential hazard to the general public.

9. To accomplish the interconnection and to provide for continuing operations in a safe, economical and efficient manner, CUC shall prepare and deliver Operating Instructions to the TCG prior to interconnecting the facility. The Operating Instructions shall include but not be limited to, defining requirements for:

   a. Maintaining proper voltage and frequency and for putting into effect voltage changes as required from time to time.

   b. Phasing and synchronizing the facility and CUC's system (if a synchronous generator).

   c. Taking transmission lines out of service for maintenance during a system emergency or system pre-emergency conditions and restoring such lines to service.

   d. Controlling the flow of real and reactive power.

   e. Periodic maintenance of the interconnection circuit breaker and related facilities.

   f. Procedure for communication between electrical operations personnel of the TCG and CUC.

10. The TCG shall also ensure the availability of a telephone handset for use by CUC personnel during testing and maintenance of the TCG's equipment.
11. The TCG shall be required to have a qualified testing company acceptable to CUC, perform maintenance, trip tests, and recalibration tests on its protective relaying devices once every two (2) years. A copy of the test results shall be sent to CUC for review, comment, and acceptance, no later than five (5) working days after completion of tests. An electronic copy of the accepted test results will be provided to the ERA for its records by the TCG.
12. The TCG will notify CUC whenever equipment modifications are made that change ratings or performance characteristics of the TCG's equipment.

3.6 General Generation Performance Characteristics

3.6.1 T&D Performance Characteristics

The T&D Engineer shall ensure that the T&D System complies with the following technical, design and operational criteria in relation to the part of the T&D System at the Connection Site with Generating Units.

a. Grid Frequency Variations

The Frequency of the T&D System shall be nominally 60 Hz and shall be controlled within the limits of 59.5 - 60.5 Hz unless exceptional circumstances prevail.

The System Frequency could rise to 62 Hz or fall to 57 Hz in exceptional circumstances. Design of Generation Plant and Apparatus must enable operation of that Plant and Apparatus within that range in accordance with the following:

Frequency Range	Requirement
57.5 Hz - 62 Hz	Continuous generation operation is required
55 Hz - 57.5 Hz	Operation for a period of at least 15 seconds is required each time the frequency is below 57.5 Hz.

b. Grid Voltage Variations

The voltage on the T&D System at each Connection Site with a Generating Unit will normally remain within ±5% of the nominal value unless abnormal conditions prevail. The minimum voltage is -10% and the maximum voltage is +10% unless abnormal conditions prevail, but voltages between +5% and +10% will not last longer than 15 minutes unless abnormal conditions prevail. Under fault conditions, voltage may collapse transiently to zero at the point of fault until the fault is cleared.

c. Voltage Waveform Quality

All Plant and Apparatus connected to the T&D System, and that part of the T&D System at each Connection Site, should be capable of withstanding the following distortions of the voltage waveform in respect of harmonic content and phase unbalance:

i. Harmonic Content

ii. Phase Unbalance

Under Planned Outage conditions, the maximum Phase (Voltage) Unbalance on the T&D System should remain below 2% unless abnormal conditions prevail.

Protection of Generating Units and their connections to the T&D System must meet the minimum requirements given below. These are necessary to reduce to a practical minimum the impact on the T&D System of faults on localized circuits dedicated to the Generators.

d. Fault Clearance Times

The fault clearance times for faults on any Generating Unit or Customer equipment directly connected to the T&D System, and vice versa, from fault inception to the circuit breaker arc extinction, shall be set out in accordance with what is agreed on a case by case basis.

The times specified in accordance with what is agreed on a case by case basis shall not be longer than:

i. 2 cycles at 69 kV

ii. 5 cycles at 13 kV

But this shall not prevent a substation having a faster fault clearance time.

Slower fault clearance times for faults on the Network and Customers equipment may be agreed in accordance with what is agreed on a case by case basis but only if System requirements in T&D Engineer's view permit.

e. Circuit Breaker Fail Protection

In the event of failure of the Protection systems provided to meet the above fault clearance time requirements, Back-Up Protection shall be provided by the Generators or the Customer as the case may be. Such Protection will also be required to withstand, without tripping, the loading incurred during the clearance of a fault on the T&D System by breaker fail Protection at 69 kV or 13 kV.

In the event, following operation of a Protection system, of a failure to interrupt fault current by these circuit-breakers within the Fault Current Interruption Time, the circuit breaker fail Protection is required to initiate tripping of all the necessary electrically adjacent circuit-breakers so as to interrupt the fault current within the next 6.0 cycles.

f. Loss of Excitation

The Generating Unit must provide Protection to detect loss of excitation on a Generating Unit and initiate a Generating Unit trip.

g. Differential Protection

Where appropriate, the T&D Engineer will specify the requirement for Generating Units to include Differential Protection.

h. Signals from Sales Meter

All Generating Units will be equipped with current and voltage transformers (accuracy of CT's and PT's +/- 2% as per ANSI standards) supplying all sales meters at a voltage to be specified by the T&D Engineer.

i. Work On Protection Equipment

All work on the busbar Protection, circuit-breaker fail Protection relays, AC or DC wiring (other than power supplies or DC tripping associated with the Generating Unit) must be prior approved by the T&D Systems Operator. The T&D Engineer reserves the right to have a representative present while such works are undertaking.

j. Protection Coordination

Protection and relay settings will be coordinated across the Connection Point to ensure effective disconnection of faulty Apparatus. Accuracy of CT's and PT's as per ANSI standards 3%).

k. Step Up Transformer Connection to 69 kV

Step up Transformers connecting to the 69 kV Transmission system needs to have vector grouping Ynd11, with an impedance value of 8%Z.

l. Step Up Transformer Connection to 13 kV

Step up Transformers connecting to the 13 kV distribution system need to have vector grouping Ynd11, with an impedance value of 10%Z.

m. Step Down Transformer Connection to 69kV

Step down transformers on the 69 kV Transmission system need to have vector grouping Dyn11, with an impedance value of 8%Z.

n. Synchronizing Function

Connection to the T&D system must have synchronizing function both ways.

3.6.2 Communications

In order to ensure safe and efficient control of the T&D System, telecommunications between Users and the T&D Systems Operator must be established in accordance with the requirements set down below.

3.6.2.1 Control Radio and Control Telephone Systems

Control Radio is the principal method by which Generation and T&D personnel must communicate to the T&D Systems Operator for the purposes of control of the Total System in both normal and emergency operating conditions.

Control Telephone is the principle method by which Customers must communicate to the T&D Systems Operator.

Proper radio/phone etiquette must be used at all times.

3.6.2.2 Operational Metering

a. The Controls Engineer shall provide SCADA outstation interface equipment. The Generation Engineer shall provide such voltage, current, frequency, active power and reactive power measurement outputs and plant status indications and alarms to the T&D SCADA outstation interface equipment as required by the Controls Engineer.

b. For the avoidance of doubt, for Active Power and Reactive Power measurements, circuit breaker and disconnector status indications, the outputs and status indications must each be provided to the T&D Licensee on an individual Generator Unit basis. In addition, where identified, Active Power and Reactive Power measurements from Unit Transformers and/or Station Transformers must also be provided.

3.6.2.3 Busbar Voltage

The Controls Engineer shall provide the Generation Engineer at each Grid Entry Point where Generating Units are connected, with appropriate voltage signals to enable the Generation Department to obtain the necessary information to permit the Generating Units to be synchronized to the T&D System. The term "voltage signal" shall mean in this context, a point of connection on (or wire or wires from) a relevant part of T&D Plant and/or Apparatus at the Grid Entry Point, to which the Generator in relation to the Plant and/or Apparatus to be attached, will be able to attach its Plant and/or Apparatus (normally a wire or wires) in order to obtain measurement outputs in relation to the busbar.

4 T&D System Operating Code

4.1 Demand Forecasts

Demand forecasting is used for operational purposes. In order to match generation output with Demand for electricity in a reliable and efficient way it is necessary to undertake Demand forecasting. Demand forecasting is necessary not just for Active power but for Reactive Power as well. Demand forecasting involves techniques including both informal methods, such as educated guesses, and quantitative methods, such as the use of historical sales data and/or current data from government and public planning departments for future expansion expected. Demand forecasting may be used in decisions regarding:

a. Daily dispatch decisions for reliability;

b. System stability and efficiency;

c. Proper maintenance planning; and

d. Future capacity requirements.

4.2 Operational Planning

In the Operational Planning Phase, Demand forecasting shall be conducted by the System Operations Department, taking account of Demand forecasts furnished by the Planning Department (CUC & GOV), Engineering Services, Financial Services and Customer Service, who shall provide the T&D System Operator with information as requested. The data supplied under the Planning procedures shall also be taken into consideration. Secure operation of the system requires that maintenance of production facilities (Generation Units) should be carried out in a timely and orderly fashion. The mechanisms by which this is achieved is formalized in this section.

The primary objective of Operational Planning is to promote the development and implementation of a Generation Outage Program, consistent with reliability of supply and requirements for the secure and economic operation of the T&D System, and with the needs of Generators in respect of Plant maintenance requirements and resource limitations.

Planning for generator maintenance and financial planning is done annually, while weekly planning meetings are conducted to update the weekly outage schedule. Reserve margins, frequency preservation, relay setting changes are some of the additional items considered when planning.

4.3 Testing and Monitoring

The following items should be considered in this section for appropriate and effective testing and monitoring: Load testing generators (Active and Reactive power limits) with respect to Original Equipment Manufacturer and bid conditions provided, Speed/load control systems compliance - droop and frequency response testing, black start simulations and testing, weather factors (agreed site conditions); ancillary services; testing procedures; fault clearance, voltage quality; etc.

4.4 Systems Dispatch

The T&D System Operator will use the Operational Plan developed in Section 4.2 to ensure that the system load demand is met and optimized economically and efficiently. As such, the following guiding principles shall be followed:

a. Sufficient spinning reserves must be maintained at all times to ensure optimum reliability;

b. each generator must be capable of operating within 0.8 to 1.0 lagging power factor under full load;

c. the T&D System Operator must have full control over all generators' frequency, voltage, apparent and reactive power at all times under normal conditions; and

d. The T&D System Operator will optimize the overall system efficiency by constantly adjusting the individual Generating Units load set points while preserving system frequency and voltage.

4.5 Demand Control

This section is concerned with the provisions to be made by the T&D System Operator, to permit the reduction of Demand in the event of insufficient Active Power generation being available to meet Demand, or in the event of plant breakdown or operating problems (such as in respect of System Frequency, System voltage levels or System thermal overloads) on any part of the T&D System.

Demand control deals with the following:

a. Customer voltage reduction;

b. Customer Demand reduction by Disconnection;

c. Automatic low frequency Demand Disconnection; and

d. Emergency manual Demand Disconnection.

The term "Demand Control" is used to describe any or all of these methods of achieving a Demand reduction. The overall objective of Section 4.5 is to require the provision of facilities, as per Sections 2, 3 and any other information or equipment as determined on a case-by-case basis by the T&D Engineer, to enable the T&D System Operator to achieve reduction in Demand that will either avoid or relieve operating problems on the T&D System, in whole or in part, and thereby enable the T&D System Operator to instruct Demand Control in a manner that does not unduly discriminate against, or unduly prefer, any one or any group of Generators or Customers. It is also to ensure that the T&D System Operator is notified of any Demand Control utilized by Generators or Customers other than following an instruction from the T&D System Operator. Demand Control in all situations relates to the physical organization of the Total System, and not to any contractual arrangements that may exist.

Procedures for notification and implementation shall be in accordance with Section 4.6

4.6 Operation/Event Communication and Reports

This section of the T&D System Operating Code sets out the requirements for the exchange of information in relation to Operations and/or Events on the Total System which have had (or may have had) or will have (or may have) an operational effect:

a. On the T&D System in the case of an Operation and/or Event occurring with the Generating Units; and

b. In the Generating Plant in the case of an Operation and/or Event occurring on the T&D System.

It also describes the types of T&D System warnings which may be issued by the T&D Engineer.

4.6.1. The requirement to notify the T&D System Operator (Section 4.5) relates generally to notifying of what is expected to happen or what has happened and not the reasons why. However, as Section 4.5 provides, when an Event or Operation has occurred on the T&D System which itself has been caused by (or exacerbated by) an Operation or Event within the Generating Plant, the T&D Systems Operator will report what he has been told by the Generation staff in relation to the Operation or Event.

4.6.2 Timing shall be of the essence, and as such, minor system Operations or Events must be reported within 24 hours and major Operations or Events must be reported within 7 working days.

4.7 Safety Co-ordination

This Section specifies the standard procedures to be used for the co-ordination, establishment and maintenance of necessary Safety Precautions when work is to be carried out on or near the T&D System or the Generating Plant and when there is a need for Safety Precautions on HV Apparatus on the other System for this work to be carried out safely.

4.7.1 Energy Control Procedures

CUC's Energy Control Procedures (ECP) must be used when work is to be carried out on or near the T&D System and where the Generating Plant is interconnected to the T&D System. The ECP establishes the administrative controls which ensure the safety of personnel, protection of equipment and continuity of service. The ECP also presents the detailed method and format for requesting, preparing, identifying, placing and removing clearance tags and/or locks.

No work, including switching/isolation, shall be done on any line, electrical, and/or mechanical apparatus without prior arrangement, prior operations planning, and approval from the T&D System Operator.

Under Emergency conditions which are hazardous to life and property, necessary de-energising of lines and immobilising of plant equipment can be done without prior approval. The T&D System Operator must direct the switching when it is possible.

T&D Switching Procedures will be prepared on a "Switching Order" form. The Switching Order will be prepared one week in advance of the project taking place, where possible. The procedures outlined in the Switching Order will be checked for accuracy and signed off by the person preparing the procedure and by a T&D Engineer. T&D Switching Orders must be checked for accuracy and signed off by a second qualified person. The Switching Order will be circulated to all affected parties to ensure awareness of the proposed switching as it may impact areas within their control.

4.8 Contingency Planning

Contingency Planning covers Black Starts which is the implementation of recovery procedures following a Total System Blackout or Partial System Blackout. The objective is to achieve, as far as possible, restoration of the Total System and associated Demand in the shortest possible time, taking into account Generation capabilities and the operational constraints of the Total System. Contingency planning applies to the T&D System Users and Customers.

4.8.1 Blackout and Partial Blackout

During a Total Blackout or Partial Blackout and during the subsequent recovery, the normal Operating Standards may not apply and the Total System may be operated outside normal voltage and Frequency standards.

In a Total Blackout and in a Partial Blackout and during the subsequent recovery, it is likely to be necessary for the T&D System Operator to issue Emergency Instructions which must be responded to without delay by all Users.

4.8.2 Black Start Generator

Certain Generating Units ("Black Start Units") are known as having ability to start-up from a blackout situation and to be capable of energizing a part of the Total System, or be synchronized to a dead System, upon instruction from the T&D System Operator within thirty (30) minutes, without an external electrical power supply ("Black Start Capability").

4.8.3 Black Start Situation

In the event of a Total Blackout, the T&D System Operator will, as soon as reasonably practical, inform Users (or, in the case of a Partial Blackout, Users which in the T&D System Operator's opinion need to be informed) that a Total Blackout, or, as the case may be, a Partial Blackout, exists and that the T&D System Operator intends to implement a Black Start. Following such notification, the steps required for recovery will begin.

4.8.4 Black Start

The procedure necessary for a recovery from a Total Blackout is known as a "Black Start". The procedure for a Partial Blackout is the same as that for a Total Blackout except that it applies only to a part of the Total System. It should be remembered that a Partial Blackout may affect parts of the Total System which are not themselves experiencing an outage.

4.8.5 Instructions from the T&D System Operator

a. The procedures for a Black Start will, therefore, be those specified by the T&D System Operator at the time. Users shall abide by the T&D System Operator's instructions during a Black Start situation, even if these conflict with the normal Operating Plan. The T&D System Operator will issue instructions to a Black Start Generator relating to the commencement of generation or Customer relating to the restoration of Demand, when the power supply is made available to it, and in each case may include the requirement to undertake switching.

b. During a Black Start situation, instructions in relation to Black Start Unit and to Users will be deemed to be Emergency Instructions, and will recognize any differing Black Start operational capabilities (however termed) set out in the relevant capability test reports in preference to the declared operational capability.

c. If during the Demand restoration process any Generating Unit cannot, because of the Demand being experienced, keep within its normal operating parameters, the Generator shall inform the T&D System Operator. The T&D System Operator will, where possible, either instruct Demand to be altered or will re-configure the T&D System or will instruct a User to re-configure its System in order to alleviate the problem being experienced by the Generator. However, CUC accepts that any decision to keep a Generating Unit operating, if outside its normal operating parameters, is one for the Generator to decide and accepts that the Generator may change the normal operating parameters for a defined limited period. If such a change is made without prior notice, then the Generator shall inform the T&D System Operator Manager as soon as practically possible.

4.8.6 Returning the Total System Back to Normal

The T&D System Operator shall, as soon as reasonably practical, inform Users when the Total System could return to normal operation. Any such determination by the T&D System Operator does not mean that any provisions in the Black Start Procedure shall cease to apply. In making the determination that the Total System could return to normal operation, the T&D System Operator would consider, amongst other things, the following:

a. The extent to which the T&D System is contiguous and energized;

b. The integrity and stability of the T&D System and its ability to operate in accordance with the normal operating Standards;

c. The impact that returning to normal may have on transmission constraints and the corresponding ability to maximize the Demand connected;

d. The volume of generation or Demand not connected to the T&D System; and

e. The functionality of normal communication systems.

4.9 Systems Tests

This section of the T&D Operating Code relates to System Tests, which are tests that involve simulating conditions or the controlled application of irregular, unusual or extreme conditions, on the Total System or any part of the Total System, but which do not include commissioning or re-commissioning tests or any other tests of a minor nature.

This section also deals with the responsibilities and procedures for arranging and carrying out System Tests which have (or may have) an effect on the Systems of CUC. Where a System Test proposed by a User will have no effect on the T&D System, then such a System Test does not fall within Section 4.9 and accordingly this section shall not apply to it. A System Test proposed by the T&D Engineer which will have an effect on a Generating Unit will always fall within this Section 4.9.

4.9.1 Proposal Notice

a. Where a User has decided that it would like to undertake a System Test it shall submit a notice (a "Proposal Notice") to the T&D Systems Operator at least three months in advance of the date it would like to undertake the proposed System Test.

b. The Proposal Notice shall be in writing and shall contain details of the nature and purpose of the proposed System Test and shall indicate the extent and situation of the Plant and/or Apparatus involved. The Proposal Notice shall also include a program schedule which states the switching required, the proposed timings and sequence of the switching, the personnel required to be involved and any other information that may be appropriate.

c. If the T&D System Operator is of the view that the information set out in the Proposal Notice is insufficient, it will contact the User who submitted the Proposal Notice (the "Test Proposer") as soon as reasonably practicable, with a written request for further information. The T&D System Operator will not be required to do anything under Section 4.9 until it is satisfied with the details supplied in the Proposal Notice or pursuant to a request for further information.

d. If the T&D System Operator wishes to undertake a System Test, the T&D System Operator shall be deemed to have received a Proposal Notice on that System Test.

4.9.2 Review of System Test Proposal

The T&D System Operator shall review all Proposal Notices within one week of submittal. In reviewing the system test proposal, the T&D System Operator shall consider:

a. The details of the nature and purpose of the proposed System Test and other matters set out in the Proposal Notice;

b. The economic, operational and risk implications of the proposed System Test;

c. The possibility of combining the proposed System Test with any other tests and with Plant and/or Apparatus outages which arise pursuant to the Operational Planning requirements of the T&D System Operator and other Users; and

d. Implications of the proposed System Test on the system stability, in so far as it is able to do so.

4.9.3 Proposal Report

Within two weeks of receiving the Proposal Notice for a System Test, the T&D Systems Operator shall produce a Proposal Report which shall contain:

a. Any proposed changes to the Test Program; and

b. An allocation of costs (including un-anticipated costs) between the affected parties (the general principle being that the Test Proposer will bear the costs).

If the proposed System Test does not meet the T&D System Operator’s safety and operating standards then the request for the test will be denied. The proposer may modify the test procedure/ test program and re-apply.

4.9.4 Final Report

At the conclusion of the System Test, the User shall be responsible for preparing a written report on the System Test (the "Final Report") for submission to the T&D System Operator. The Final Report shall be submitted within two weeks of the conclusion of the System Test unless a different period has been agreed prior to the System Test taking place.

The Final Report shall include a description of the Plant and/or Apparatus tested and a description of the System Test carried out, together with the results, conclusions and recommendations.

5 Customer Service Code

The contractual agreement outlining the Terms of Service when providing electricity to Customer. This document is published separately and distributed to customers and others upon request.

Glossary

AC	Alternating Current
CORE	Consumer Owned Renewable Energy
CT	Current Transformer
CUC	Caribbean Utilities Company
DC	Direct Current
DCS	Distributed Control System
DTT	Direct Transfer Trip
ECP	Energy Control Procedures
EMD	Electrical Maintenance Department
ESD	Engineering Services Department
GOV	Government
GSU	Generator Step Up
HV	High Voltage
IED	Intelligent Electronic Device
LOD	Line Operations Department
MVA	MegaVolt Amperes
MVAR	MegaVolt Amperes Reactive
MVARHR	MegaVolt Amperes Reactive Hour
MWHR	MegaVolt Amperes Hour
PLC	Programmable Logic Controller
PMD	Production Maintenance Department
PT	Potential Transformer
PV	Photovoltaic
RTU	Remote Terminal Unit
SCADA	System Control and Data Acquisition
SOD	System Operations Department
T&D	Transmission & Distribution
TCG	Transmission Connected Generation
THD	Total Harmonic Distortion
UL	Underwriters Laboratories, Inc.

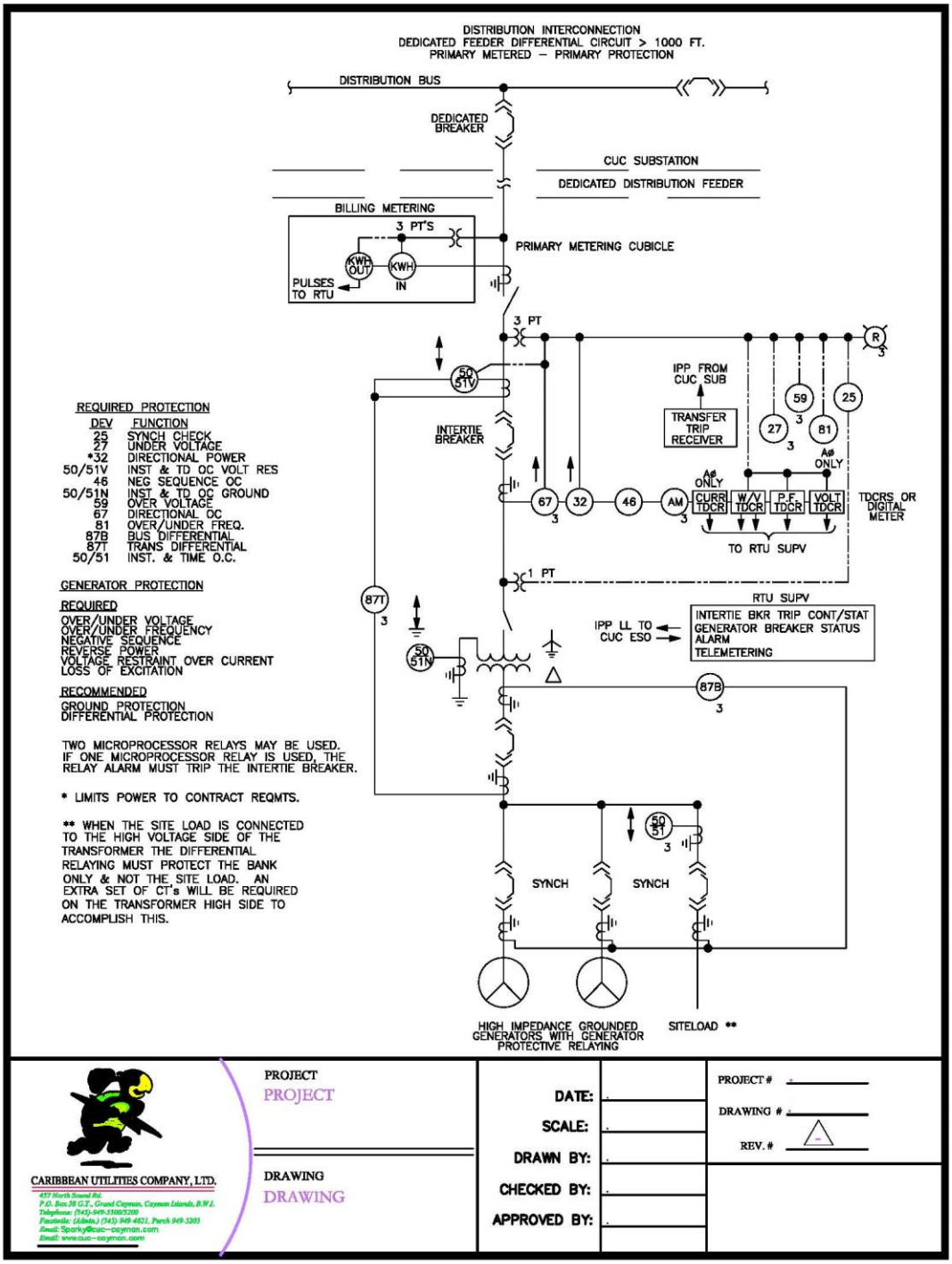
Appendix A

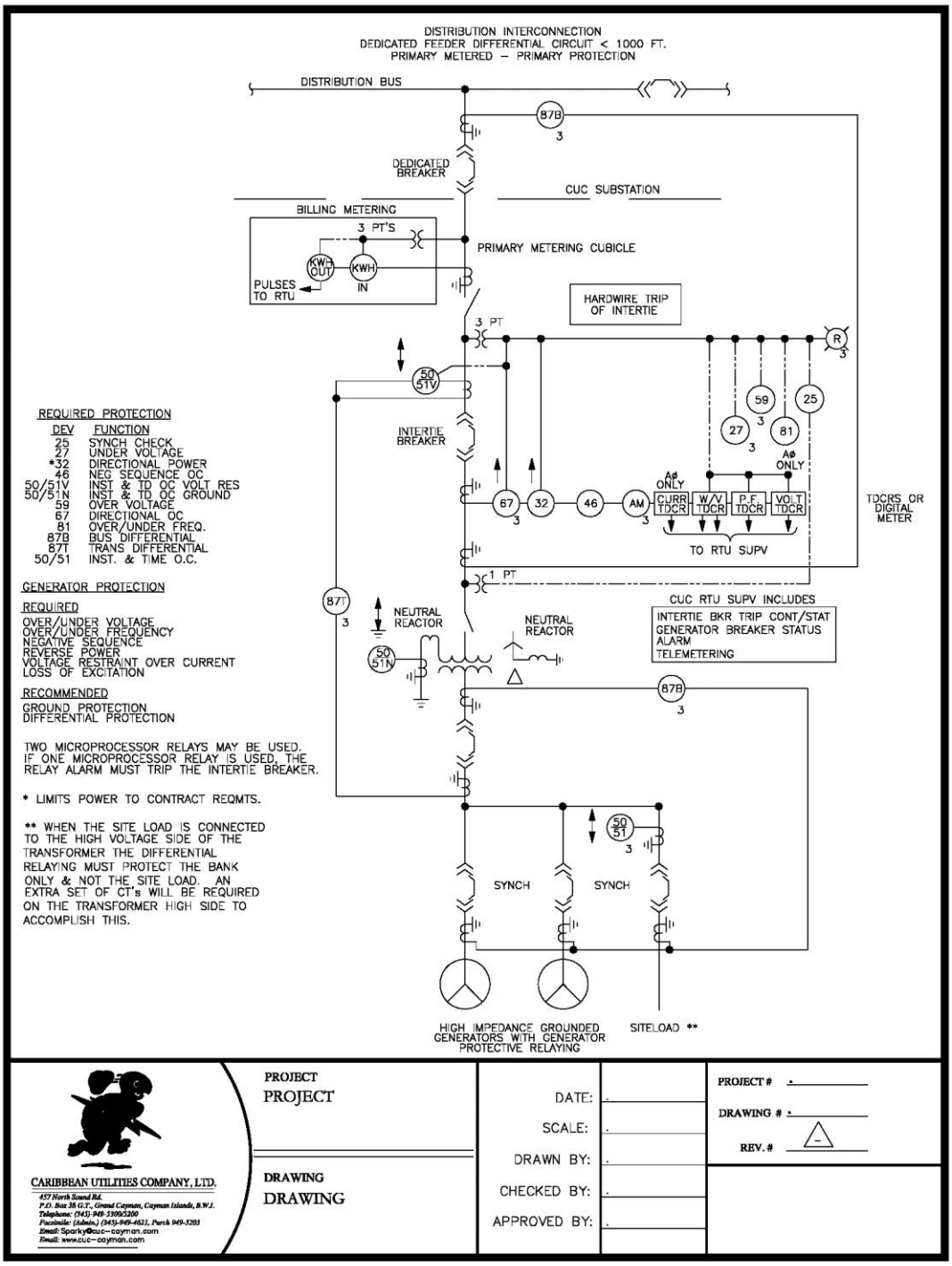
Interconnection Example Drawing List

Note: These are typical connection diagrams. The final designs will be based on the most current standards and must be approved by the T&D Engineer.

1. Dedicated Feeder Relay Circuit Greater Than 1,000 Feet
2. Dedicated Feeder Differential Circuit Less Than 1,000 Feet
3. Non-Dedicated Feeder Primary Metered - Primary Protection
4. Non-Dedicated Feeder Primary Metered - Secondary Protection
5. Commercial Customer Generator Service between 25 kVA and 300 kVA
6. Residential Customer Generator Service less than 20 kVA
7. Commercial Customer Generator Service less than 25 kVA

These drawings are reference examples of typical interconnections. Each project is site specific and may have different requirements.


DISTRIBUTION INTERCONNECTION
DEDICATED FEEDER DIFFERENTIAL CIRCUIT > 1000 FT.
PRIMARY METERED – PRIMARY PROTECTION
DISTRIBUTION BUS
DEDICATED BREAKER
CUC SUBSTATION
DEDICATED DISTRIBUTION FEEDER
BILLING METERING
3 PT'S
KWH OUT
KWH IN
PULSES TO RTU
PRIMARY METERING CUBICLE
3 PT
50 51V
INTERTIE BREAKER
IPP FROM CUC SUB
TRANSFER TRIP RECEIVER
59
25
27
81
R
A⌀ ONLY
67
32
46
AM
CURR TDCR
W/V TDCR
P.F. TDCR
VOLT TDCR
TDCRS OR DIGITAL METER
TO RTU SUPV
1 PT
87T
RTU SUPV
IPP LL TO CUC ESO
INTERTIE BKR TRIP CONT/STAT
GENERATOR BREAKER STATUS
ALARM
TELEMETERING
50 51N
87B
50 51
SYNCH
SYNCH
HIGH IMPEDANCE GROUNDED GENERATORS WITH GENERATOR PROTECTIVE RELAYING
SITELOAD **
REQUIRED PROTECTION
DEV FUNCTION
25 SYNCH CHECK
27 UNDER VOLTAGE
*32 DIRECTIONAL POWER
50/51V INST & TD OC VOLT RES
46 NEG SEQUENCE OC
50/51N INST & TD OC GROUND
59 OVER VOLTAGE
67 DIRECTIONAL OC
81 OVER/UNDER FREQ.
87B BUS DIFFERENTIAL
87T TRANS DIFFERENTIAL
50/51 INST. & TIME O.C.
GENERATOR PROTECTION
REQUIRED
OVER/UNDER VOLTAGE
OVER/UNDER FREQUENCY
NEGATIVE SEQUENCE
REVERSE POWER
VOLTAGE RESTRAINT OVER CURRENT
LOSS OF EXCITATION
RECOMMENDED
GROUND PROTECTION
DIFFERENTIAL PROTECTION
TWO MICROPROCESSOR RELAYS MAY BE USED. IF ONE MICROPROCESSOR RELAY IS USED, THE RELAY ALARM MUST TRIP THE INTERTIE BREAKER.
* LIMITS POWER TO CONTRACT REQMTS.
** WHEN THE SITE LOAD IS CONNECTED TO THE HIGH VOLTAGE SIDE OF THE TRANSFORMER THE DIFFERENTIAL RELAYING MUST PROTECT THE BANK ONLY & NOT THE SITE LOAD. AN EXTRA SET OF CT's WILL BE REQUIRED ON THE TRANSFORMER HIGH SIDE TO ACCOMPLISH THIS.
CARIBBEAN UTILITIES COMPANY, LTD.
PROJECT
PROJECT
DRAWING
DRAWING
DATE:
SCALE:
DRAWN BY:
CHECKED BY:
APPROVED BY:
PROJECT #
DRAWING #
REV. #


DISTRIBUTION INTERCONNECTION
DEDICATED FEEDER DIFFERENTIAL CIRCUIT < 1000 FT.
PRIMARY METERED – PRIMARY PROTECTION
DISTRIBUTION BUS
87B
3
DEDICATED BREAKER
CUC SUBSTATION
BILLING METERING
3 PT'S
PRIMARY METERING CUBICLE
KWH OUT
KWH IN
PULSES TO RTU
HARDWIRE TRIP OF INTERTIE
3 PT
R
3
50 51V
59
25
27
81
3
INTERTIE BREAKER
A∅ ONLY
67
32
46
AM
CURR TDCR
W/V TDCR
P.F. TDCR
VOLT TDCR
TDCRS OR DIGITAL METER
TO RTU SUPV
1 PT
87T
NEUTRAL REACTOR
NEUTRAL REACTOR
50 51N
CUC RTU SUPV INCLUDES
INTERTIE BKR TRIP CONT/STAT
GENERATOR BREAKER STATUS
ALARM
TELEMETERING
SYNCH
SYNCH
HIGH IMPEDANCE GROUNDED GENERATORS WITH GENERATOR PROTECTIVE RELAYING
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REQUIRED PROTECTION
DEV FUNCTION
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27 UNDER VOLTAGE
*32 DIRECTIONAL POWER
46 NEG SEQUENCE OC
50/51V INST & TD OC VOLT RES
50/51N INST & TD OC GROUND
59 OVER VOLTAGE
67 DIRECTIONAL OC
81 OVER/UNDER FREQ.
87B BUS DIFFERENTIAL
87T TRANS DIFFERENTIAL
50/51 INST. & TIME O.C.
GENERATOR PROTECTION
REQUIRED
OVER/UNDER VOLTAGE
OVER/UNDER FREQUENCY
NEGATIVE SEQUENCE
REVERSE POWER
VOLTAGE RESTRAINT OVER CURRENT
LOSS OF EXCITATION
RECOMMENDED
GROUND PROTECTION
DIFFERENTIAL PROTECTION
TWO MICROPROCESSOR RELAYS MAY BE USED. IF ONE MICROPROCESSOR RELAY IS USED, THE RELAY ALARM MUST TRIP THE INTERTIE BREAKER.
* LIMITS POWER TO CONTRACT REQMTS.
** WHEN THE SITE LOAD IS CONNECTED TO THE HIGH VOLTAGE SIDE OF THE TRANSFORMER THE DIFFERENTIAL RELAYING MUST PROTECT THE BANK ONLY & NOT THE SITE LOAD. AN EXTRA SET OF CT's WILL BE REQUIRED ON THE TRANSFORMER HIGH SIDE TO ACCOMPLISH THIS.
CARIBBEAN UTILITIES COMPANY, LTD.
457 North Sound Rd.
P.O. Box 30 G.T., Grand Cayman, Cayman Islands, B.W.I.
Telephone: (345)-949-5200/5200
Facsimile: (Admin.) (345)-949-4621, Purch 949-5203
Email: Sparky@cuc-cayman.com
Email: www.cuc-cayman.com
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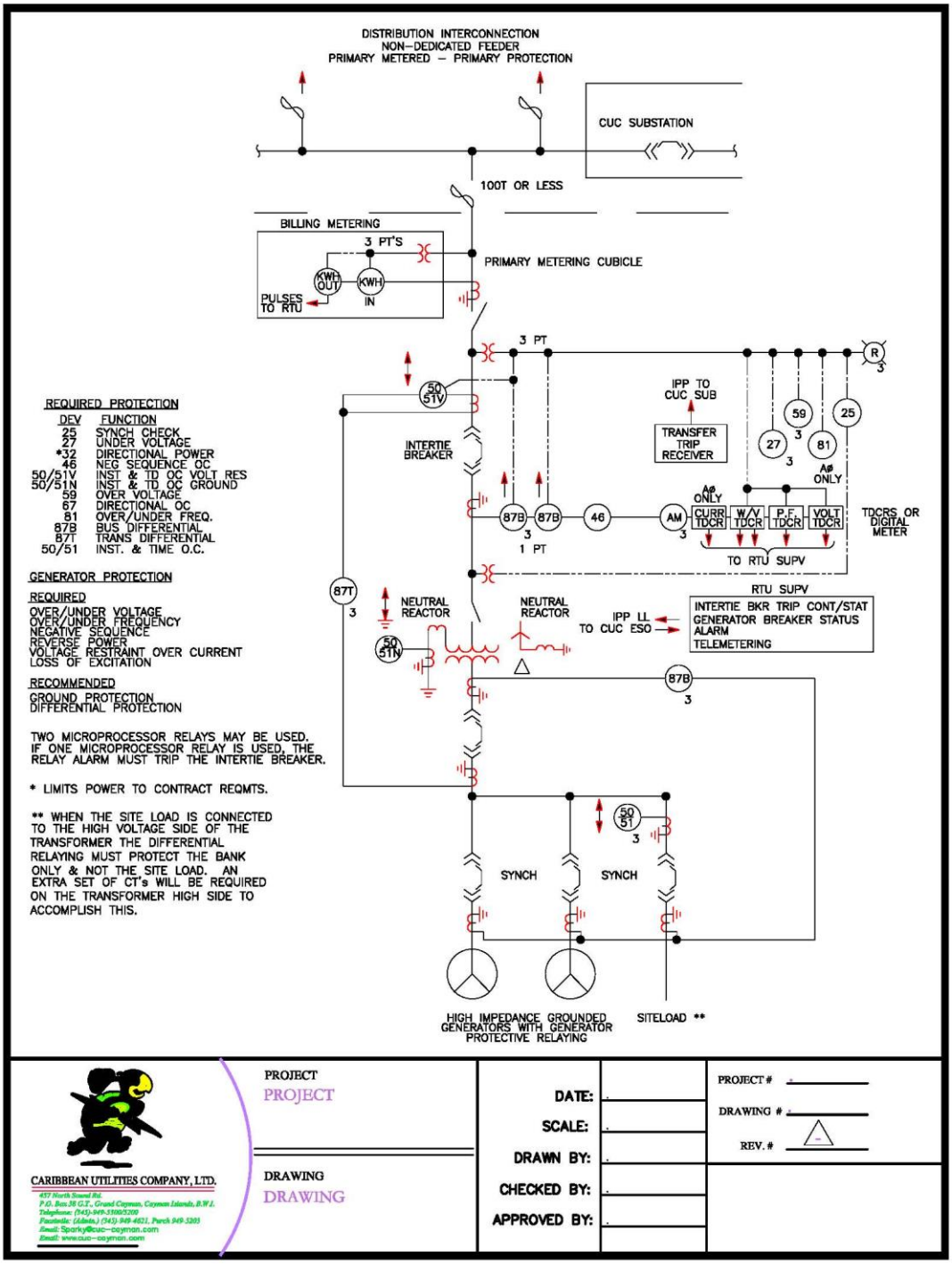
DISTRIBUTION INTERCONNECTION
NON–DEDICATED FEEDER
PRIMARY METERED – PRIMARY PROTECTION
CUC SUBSTATION
100T OR LESS
BILLING METERING
3 PT'S
KWH OUT
KWH IN
PULSES TO RTU
PRIMARY METERING CUBICLE
3 PT
50 51V
INTERTIE BREAKER
IPP TO CUC SUB
TRANSFER TRIP RECEIVER
59
25
27
81
R
A∅ ONLY
87B
46
AM
CURR TDCR
W/V TDCR
P.F. TDCR
VOLT TDCR
TDCRS OR DIGITAL METER
1 PT
TO RTU SUPV
87T
NEUTRAL REACTOR
50 51N
IPP LL
TO CUC ESO
RTU SUPV
INTERTIE BKR TRIP CONT/STAT
GENERATOR BREAKER STATUS
ALARM
TELEMETERING
SYNCH
SYNCH
HIGH IMPEDANCE GROUNDED GENERATORS WITH GENERATOR PROTECTIVE RELAYING
SITELOAD **
REQUIRED PROTECTION
DEV FUNCTION
25 SYNCH CHECK
27 UNDER VOLTAGE
*32 DIRECTIONAL POWER
46 NEG SEQUENCE OC
50/51V INST & TD OC VOLT RES
50/51N INST & TD OC GROUND
59 OVER VOLTAGE
67 DIRECTIONAL OC
81 OVER/UNDER FREQ.
87B BUS DIFFERENTIAL
87T TRANS DIFFERENTIAL
50/51 INST. & TIME O.C.
GENERATOR PROTECTION
REQUIRED
OVER/UNDER VOLTAGE
OVER/UNDER FREQUENCY
NEGATIVE SEQUENCE
REVERSE POWER
VOLTAGE RESTRAINT OVER CURRENT
LOSS OF EXCITATION
RECOMMENDED
GROUND PROTECTION
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TWO MICROPROCESSOR RELAYS MAY BE USED. IF ONE MICROPROCESSOR RELAY IS USED, THE RELAY ALARM MUST TRIP THE INTERTIE BREAKER.
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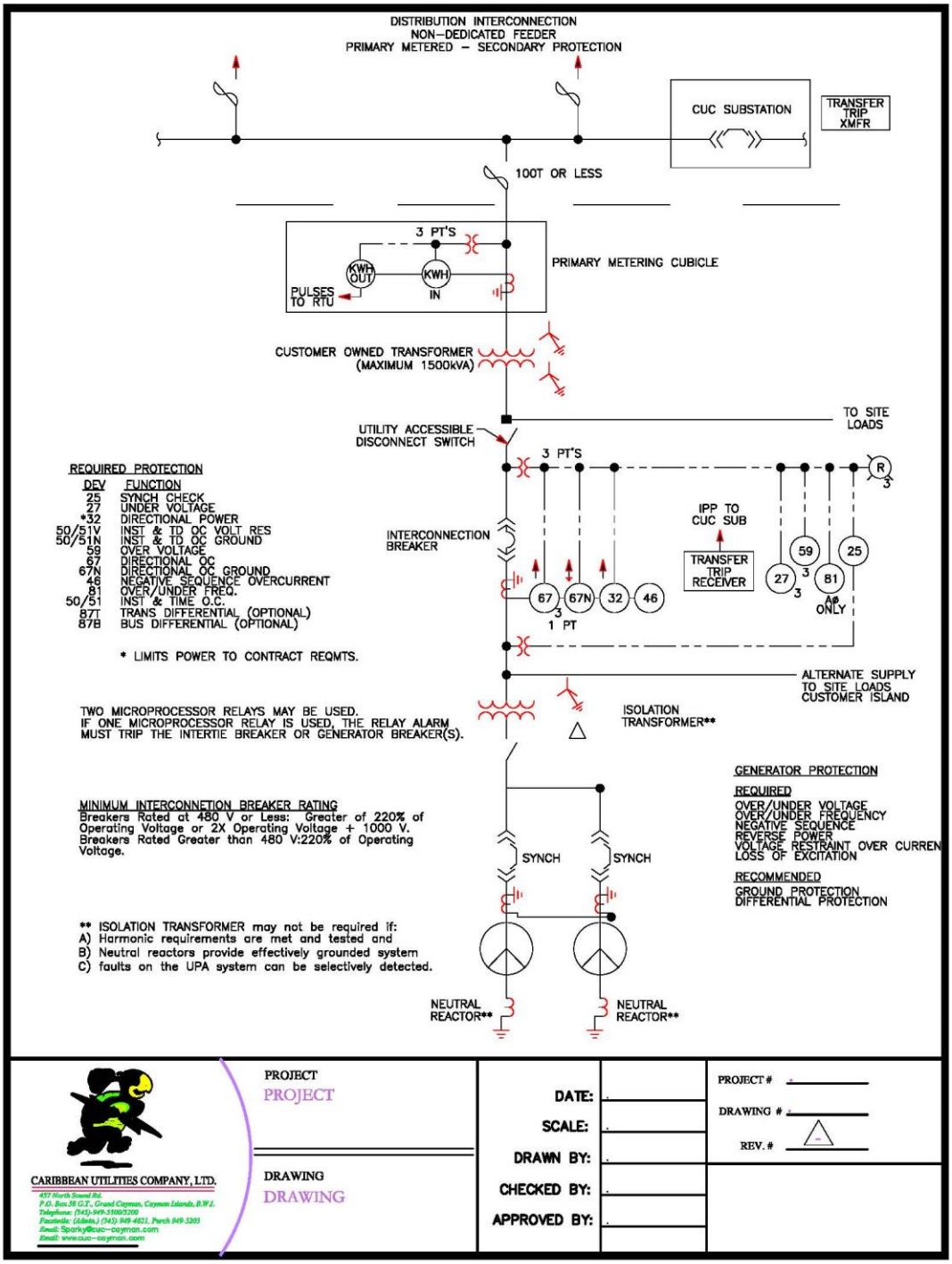
DISTRIBUTION INTERCONNECTION
NON–DEDICATED FEEDER
PRIMARY METERED – SECONDARY PROTECTION
CUC SUBSTATION
TRANSFER TRIP XMFR
100T OR LESS
3 PT'S
KWH OUT
KWH IN
PULSES TO RTU
PRIMARY METERING CUBICLE
CUSTOMER OWNED TRANSFORMER (MAXIMUM 1500kVA)
UTILITY ACCESSIBLE DISCONNECT SWITCH
TO SITE LOADS
3 PT'S
INTERCONNECTION BREAKER
IPP TO CUC SUB
TRANSFER TRIP RECEIVER
67
67N
32
46
1 PT
59
27
81
25
Δφ ONLY
ALTERNATE SUPPLY TO SITE LOADS CUSTOMER ISLAND
ISOLATION TRANSFORMER**
SYNCH
SYNCH
NEUTRAL REACTOR**
NEUTRAL REACTOR**
REQUIRED PROTECTION
DEV FUNCTION
25 SYNCH CHECK
27 UNDER VOLTAGE
*32 DIRECTIONAL POWER
50/51V INST & TD OC VOLT RES
50/51N INST & TD OC GROUND
59 OVER VOLTAGE
67 DIRECTIONAL OC
67N DIRECTIONAL OC GROUND
46 NEGATIVE SEQUENCE OVERCURRENT
81 OVER/UNDER FREQ.
50/51 INST & TIME O.C.
87T TRANS DIFFERENTIAL (OPTIONAL)
87B BUS DIFFERENTIAL (OPTIONAL)
* LIMITS POWER TO CONTRACT REQMTS.
TWO MICROPROCESSOR RELAYS MAY BE USED.
IF ONE MICROPROCESSOR RELAY IS USED, THE RELAY ALARM MUST TRIP THE INTERTIE BREAKER OR GENERATOR BREAKER(S).
MINIMUM INTERCONNETION BREAKER RATING
Breakers Rated at 480 V or Less: Greater of 220% of Operating Voltage or 2X Operating Voltage + 1000 V.
Breakers Rated Greater than 480 V:220% of Operating Voltage.
** ISOLATION TRANSFORMER may not be required if:
A) Harmonic requirements are met and tested and
B) Neutral reactors provide effectively grounded system
C) faults on the UPA system can be selectively detected.
GENERATOR PROTECTION
REQUIRED
OVER/UNDER VOLTAGE
OVER/UNDER FREQUENCY
NEGATIVE SEQUENCE
REVERSE POWER
VOLTAGE RESTRAINT OVER CURREN
LOSS OF EXCITATION
RECOMMENDED
GROUND PROTECTION
DIFFERENTIAL PROTECTION
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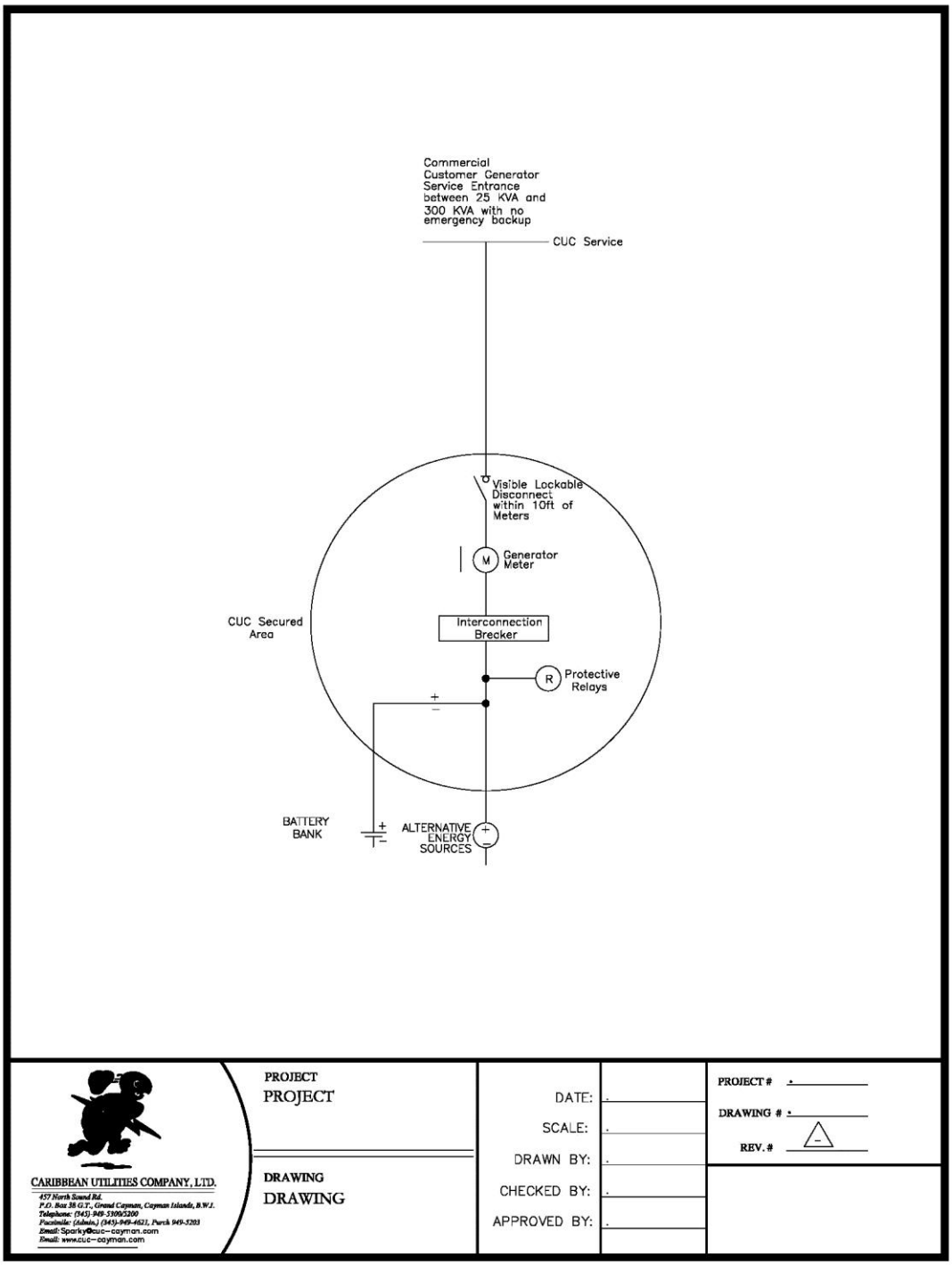
Commercial
Customer Generator
Service Entrance
between 25 KVA and
300 KVA with no
emergency backup
CUC Service
Visible Lockable
Disconnect
within 10ft of
Meters
M
Generator
Meter
CUC Secured
Area
Interconnection
Brecker
R
Protective
Relays
+
−
BATTERY
BANK
+
−
ALTERNATIVE
ENERGY
SOURCES
+
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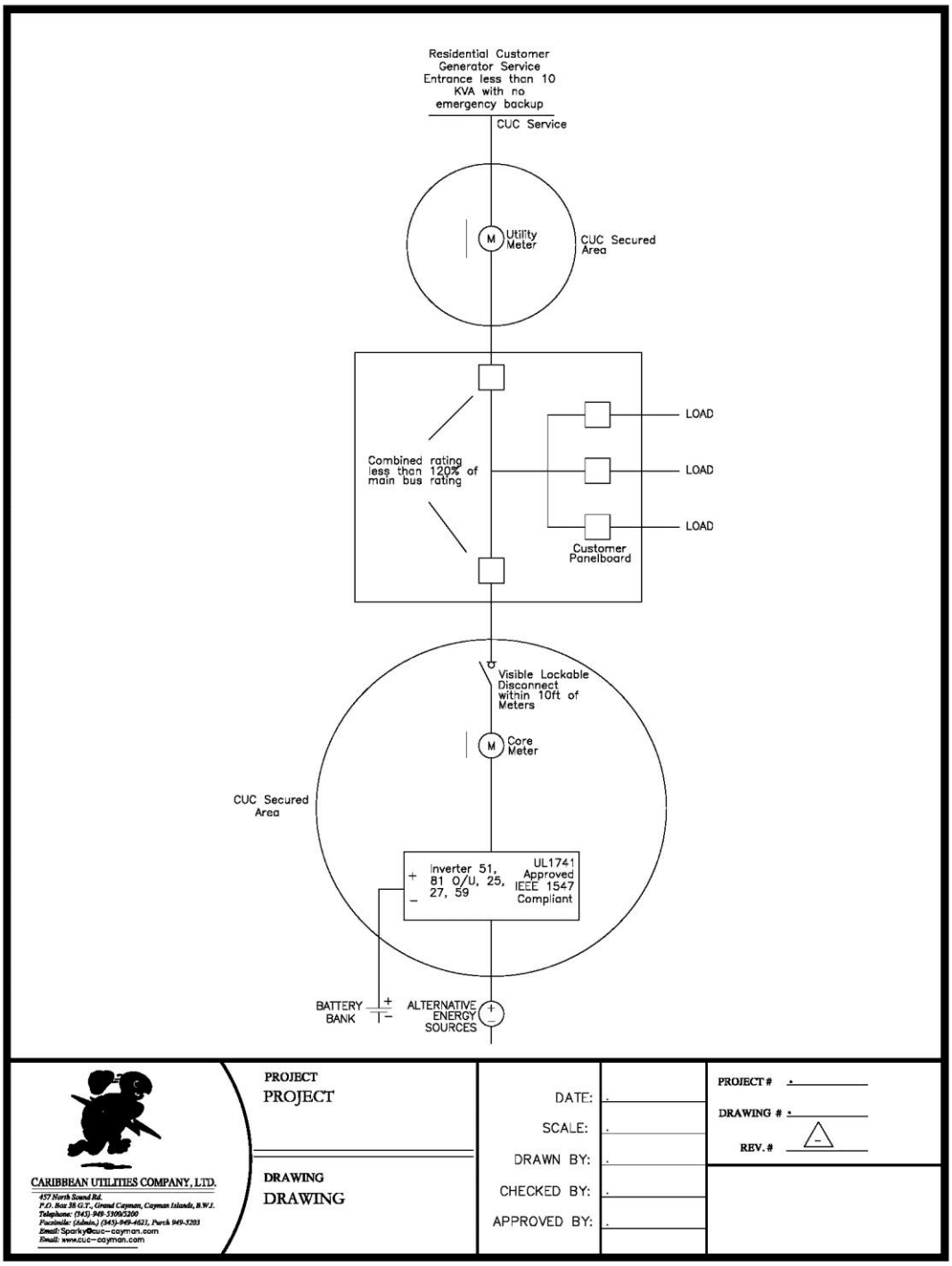
Residential Customer Generator Service Entrance less than 10 KVA with no emergency backup
CUC Service
M Utility Meter
CUC Secured Area
Combined rating less than 120% of main bus rating
LOAD
LOAD
LOAD
Customer Panelboard
Visible Lockable Disconnect within 10ft of Meters
M Core Meter
CUC Secured Area
Inverter 51, 81 O/U, 25, 27, 59
UL1741 Approved IEEE 1547 Compliant
BATTERY BANK
ALTERNATIVE ENERGY SOURCES
CARIBBEAN UTILITIES COMPANY, LTD.
457 North Sound Rd.
P.O. Box 38 G.T., Grand Cayman, Cayman Islands, B.W.I.
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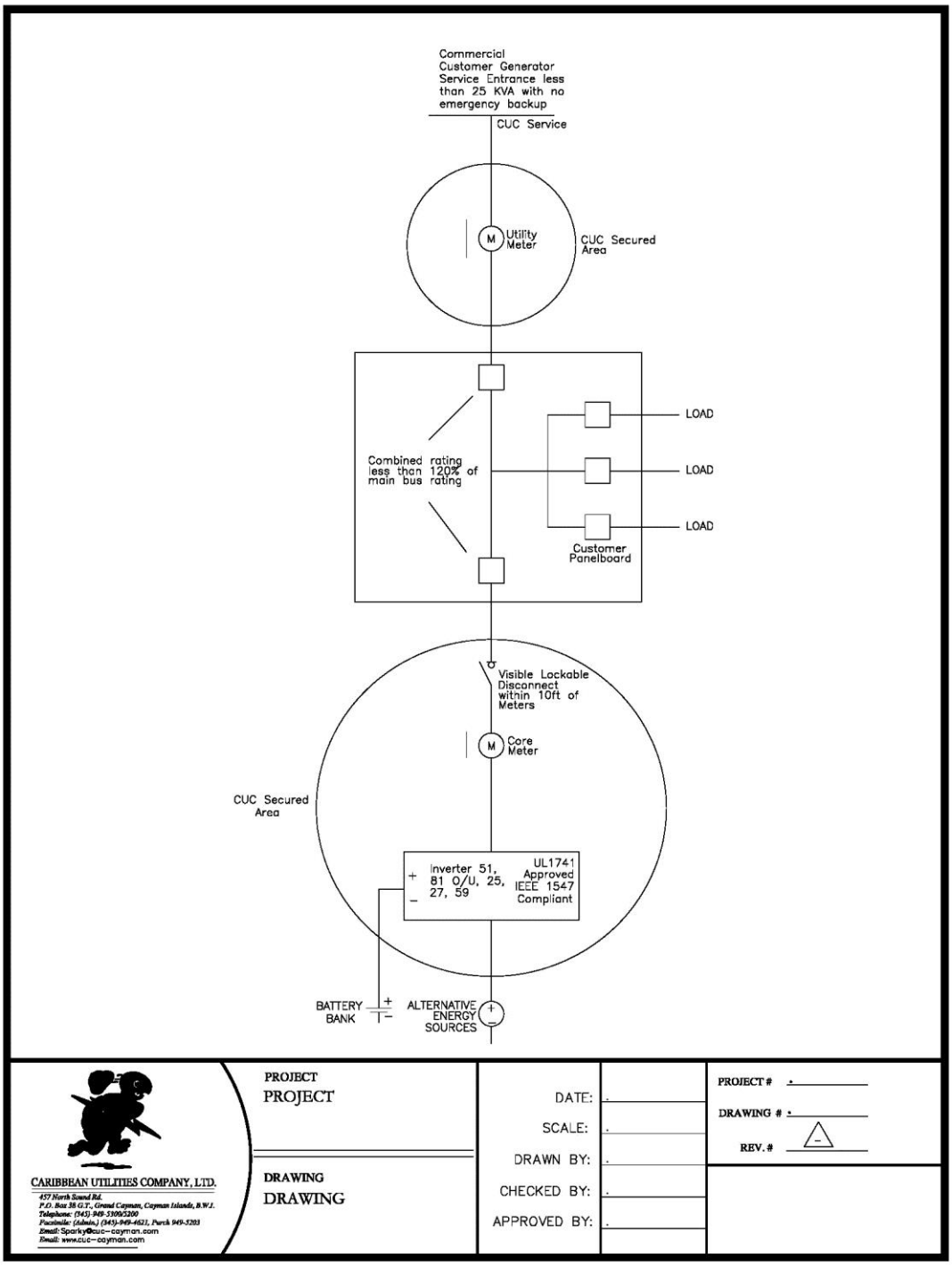
Commercial Customer Generator Service Entrance less than 25 KVA with no emergency backup
CUC Service
M Utility Meter
CUC Secured Area
Combined rating less than 120% of main bus rating
LOAD
LOAD
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Customer Panelboard
Visible Lockable Disconnect within 10ft of Meters
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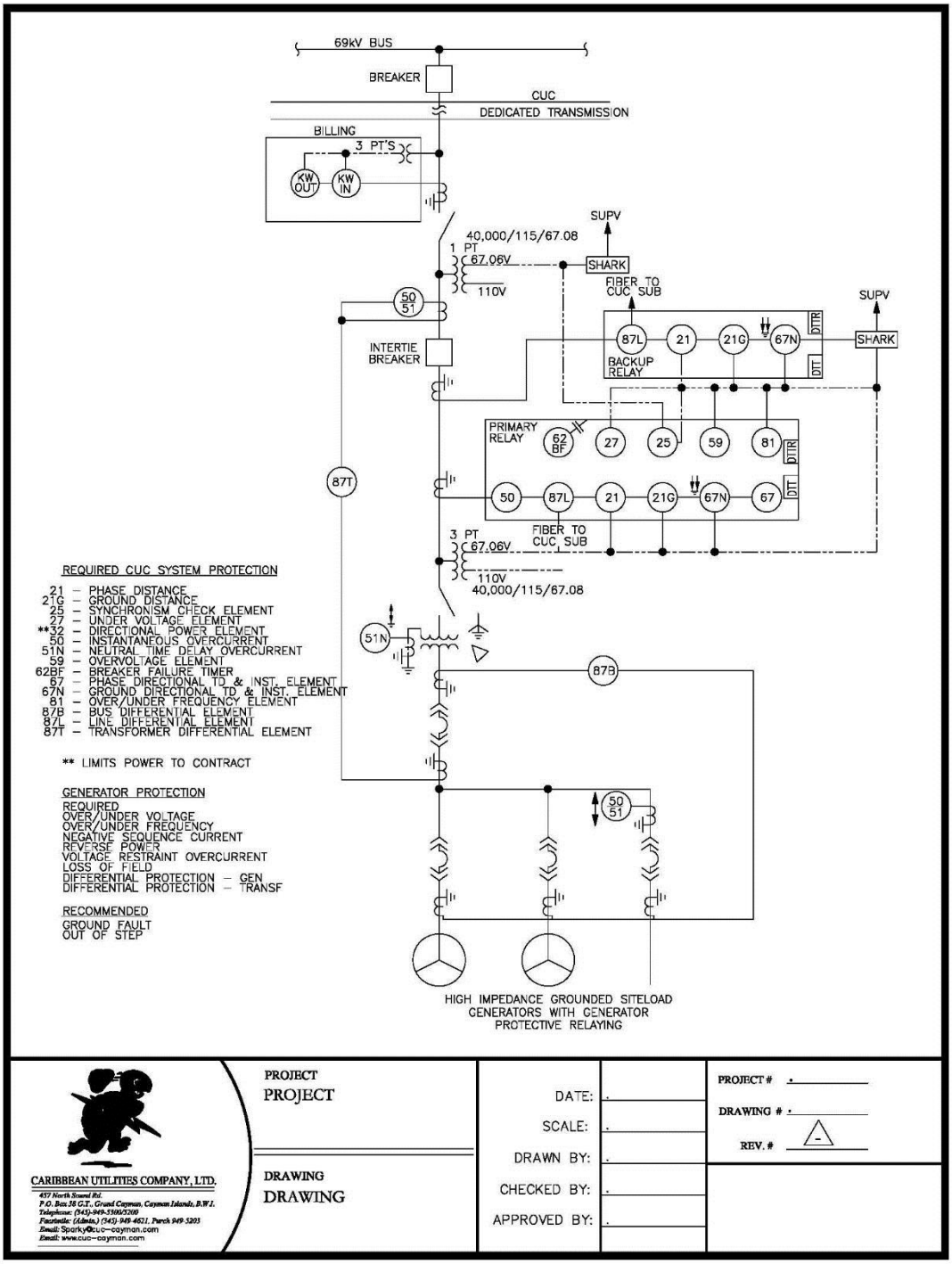
69kV BUS
BREAKER
CUC
DEDICATED TRANSMISSION
BILLING
3 PT'S
KW OUT
KW IN
SUPV
40,000/115/67.08
1 PT
67.06V
110V
SHARK
FIBER TO CUC SUB
50 51
INTERTIE BREAKER
87L
21
21G
67N
DTTR
DTT
BACKUP RELAY
SUPV
SHARK
PRIMARY RELAY
62 BF
27
25
59
81
50
87L
21
21G
67N
67
87T
3 PT
67.06V
110V
40,000/115/67.08
51N
87B
REQUIRED CUC SYSTEM PROTECTION
21 – PHASE DISTANCE
21G – GROUND DISTANCE
25 – SYNCHRONISM CHECK ELEMENT
27 – UNDER VOLTAGE ELEMENT
**32 – DIRECTIONAL POWER ELEMENT
50 – INSTANTANEOUS OVERCURRENT
51N – NEUTRAL TIME DELAY OVERCURRENT
59 – OVERVOLTAGE ELEMENT
62BF – BREAKER FAILURE TIMER
67 – PHASE DIRECTIONAL TD & INST. ELEMENT
67N – GROUND DIRECTIONAL TD & INST. ELEMENT
81 – OVER/UNDER FREQUENCY ELEMENT
87B – BUS DIFFERENTIAL ELEMENT
87L – LINE DIFFERENTIAL ELEMENT
87T – TRANSFORMER DIFFERENTIAL ELEMENT
** LIMITS POWER TO CONTRACT
GENERATOR PROTECTION
REQUIRED
OVER/UNDER VOLTAGE
OVER/UNDER FREQUENCY
NEGATIVE SEQUENCE CURRENT
REVERSE POWER
VOLTAGE RESTRAINT OVERCURRENT
LOSS OF FIELD
DIFFERENTIAL PROTECTION – GEN
DIFFERENTIAL PROTECTION – TRANSF
RECOMMENDED
GROUND FAULT
OUT OF STEP
HIGH IMPEDANCE GROUNDED SITELOAD GENERATORS WITH GENERATOR PROTECTIVE RELAYING
CARIBBEAN UTILITIES COMPANY, LTD.
PROJECT
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Appendix B

Explanation of the Requirement for A Wye Grounded Transformer

All Generator System interconnections with CUC must be grounded sources. During a phase to ground fault on the CUC system, the Generator System's generator can be isolated with the phase to ground fault if the CUC source opens before the Generator System's protective equipment detects the fault condition and isolates from the CUC system. If the generator is not grounded during the period it is isolated with the phase to ground fault, the neutral can shift resulting in overvoltage on the two remaining unfaulted phases. This overvoltage can reach 173% of normal and will damage CUC phase to ground connected load or equipment isolated with the generator. To avoid the possibility of an overvoltage due to a neutral shift, CUC requires that the Generator System's generator interconnect into the CUC system as a grounded source.

The designer of the Generator installation should be aware that the isolation transformer provides a path for zero sequence fault current for all phase to ground faults on the circuit. In order to limit the ground fault current from the Generator System's equipment, CUC may require that the system be designed to limit the zero sequence current (large zero sequence impedance) and still meet the grounding requirements.

There are several methods to ground a source. Accepted method is to use a wye grounded-delta step-up transformer with the generator grounded.

An additional main purpose of the wye-grounded (CUC side)/delta (Generator System side) isolation transformer is to filter out the third harmonics and multiples of the third harmonics and to provide a ground source that enables the Generator System(s) protection to be able to see faults on the CUC system.

Appendix C
Interconnection Agreement

Transmission Connected Generator Interconnection Agreement

Between

Caribbean Utilities Company, Ltd.
and

Dated as of _____XXXX.

1 Article 1. Scope And Limitations Of Agreement 68

2 Article 2. Inspection, Testing, Authorization, And Right Of Access 69

3 Article 3. Effective Date, Term, Termination, Force Majeure And Disconnection 71

4 Article 4. Cost Responsibility For Interconnection Facilities And Distribution Upgrades 73

5 Article 5. Cost Responsibility For Transmission Upgrades 74

6 Article. 6. Billing, Payment, Milestones, And Performance Assurance 74

7 Article. 7. Assignment, Liability, Indemnity, Consequential Damages, And Default 76

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9 Article 9. Confidentiality 80

10 Article 10. Disputes 81

11 Article 11. Taxes 82

12 Article 12. Miscellaneous 82

13 Article 13. Notices 85

14 Article 14. Signatures 87

THIS TRANSMISSION CONNECTED GENERATOR INTERCONNECTION AGREEMENT ("Agreement") is made and entered into this ____ day of _____ XXXX, by and between _____., a _____ organized and existing under the laws of the _____ ("Interconnection Customer" with a Transmission Interconnected Generating Facility), and the Caribbean Utilities Company, Ltd. ("Interconnecting Transmission Owner").

Under this Agreement the Interconnection Customer and Interconnecting Transmission Owner each may be referred to as a "Party" or collectively as the "Parties."

Interconnecting Transmission Owner: Caribbean Utilities Company, Ltd.
Attention: _____
Address: 457 North Sound Road
City: George Town, Country: Grand Cayman, Cayman Islands Zip: KY1-1101
Phone: _____ Fax: _____

Interconnection Customer Information

Interconnection Customer: _____.
Attention: _____
Address: _____
City: _____ Country and/or State: _____ Zip: _____
Phone: _____ Fax: _____

In consideration of the mutual covenants set forth herein, the Parties agree as follows:

1 Article 1. Scope and Limitations of Agreement

1.1 Applicability:

This Agreement shall be used for all Interconnection Requests submitted by the Interconnection Customer under the T&D Code and in accordance with the Electricity Regulatory Authority Law.

1.2 Purpose

This Agreement governs the terms and conditions under which the Interconnection Customer's Generating Facilities and the Interconnection Facilities will interconnect with, and operate in parallel with, the Interconnecting Transmission Owner's facilities that are part of the Network.

1.3 No Agreement to Purchase Power

This Agreement does not constitute an agreement to purchase the Interconnection Customer's power. The purchase of power and other services that the Interconnection Customer may require will be covered under separate agreements, notably the Power Purchase Agreement.

1.4 Limitations

Nothing in this Agreement is intended to affect any other agreement between the Parties.

1.5 Responsibilities of the Parties

(a) The Parties shall perform all obligations of this Agreement in accordance with all Applicable Laws and Regulations, Operating Procedures, and Prudent Operating Practice.

(b) The Interconnection Customer shall construct, interconnect, operate and maintain its Generating Facilities and construct, operate, and maintain its Interconnection Facilities in accordance with the applicable manufacturer's recommended maintenance schedule, this Agreement, the Power Purchase Agreement, the T&D Code and with Prudent Operating Practice.

(c) The Interconnecting Transmission Owner shall construct, operate, and maintain its Network and its Interconnection Facilities in accordance with this Agreement, the Power Purchase Agreement and with Prudent Operating Practice.

(d) The Interconnection Customer agrees to construct its facilities or systems in accordance with applicable specifications that meet or exceed those provided by the U.S. National Electrical Safety Code (NESC), the American National Standards Institute (ANSI), IEEE, Underwriter's Laboratory (UL), and the Operating Procedures in effect at the time of construction and other applicable standards. The Interconnection Customer

agrees to design, install, maintain, and operate its Generating Facilities and its Interconnection Facilities so as to reasonably minimize the likelihood of a disturbance adversely affecting or impairing the system or equipment of the Interconnecting Transmission Owner.

(e) Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for the facilities that it now or subsequently may own unless otherwise specified in the Attachments to this Agreement.

(f) Each Party shall be responsible for the safe installation, maintenance, repair and condition of its respective Interconnection Facilities. The Interconnecting Transmission Owner and the Interconnection Customer, as applicable, shall provide Interconnection Facilities that adequately protect the Interconnecting Transmission Owner's transmission facilities, personnel, and other persons from damage and injury. The allocation of responsibility for the design, installation, operation, maintenance and ownership of Interconnection Facilities shall be delineated in the Attachment 2 [and 3] to this Agreement.

1.6 Parallel Operation Obligations

Once the Generating Facilities has been authorized to commence parallel operation, the Interconnection Customer shall abide by all rules and procedures pertaining to the parallel operation of the Generating Facilities in the T&D Code and the Operating Procedures set forth in Attachment 5 of this Agreement.

1.7 Metering

The Interconnection Customer shall be responsible for the Interconnecting Transmission Owner's reasonable and necessary cost for the purchase, installation, operation, maintenance, testing, repair, and replacement of metering and data acquisition equipment specified in Attachment 2 of this Agreement. The Interconnection Customer's metering (and data acquisition, as required) equipment shall conform to applicable industry rules and Operating Procedures.

1.8 Reactive Power

The Interconnection Customer shall design its Generating Facilities to maintain a composite power delivery at continuous rated power output at the Delivery Point at a power factor within the range of 0.95 leading to 0.80 lagging, unless the Interconnecting Transmission Owner has established different requirements that apply to all similarly situated generators on a comparable basis and in accordance with Operating Procedures.

1.9 Capitalized terms used herein shall have the meanings specified in the Glossary of Terms in Attachment 1 or the body of this Agreement.

2 **Article 2. Inspection, Testing, Authorization, and Right of Access**

2.1 Equipment Testing and Inspection

(a) The Interconnection Customer shall test and inspect its Generating Facilities and its Interconnection Facilities prior to interconnection. The Interconnection Customer shall notify the Interconnecting Transmission Owner of such activities no fewer than [**Fifteen Calendar Days]** prior to such testing and inspection. Testing and inspection shall occur on a Business Day, unless otherwise agreed by the Parties. The Interconnecting Transmission Owner may, at its own expense, send qualified personnel to the Generating Facilities site to inspect the interconnection and observe the testing. The Interconnection Customer shall provide the Interconnecting Transmission Owner a written test report when such testing and inspection is completed.

(b) The Interconnecting Transmission Owner shall provide the Interconnection Customer written acknowledgment that it has received the Interconnection Customer's written test report. Such written acknowledgment shall not be deemed to be or construed as any representation, assurance, guarantee, or warranty by the Interconnecting Transmission Owner of the safety, durability, suitability, or reliability of the Generating Facilities or any associated control, protective, and safety devices owned or controlled by the Interconnection Customer or the quality of power produced by the Generating Facilities.

2.2 Authorization Required Prior to Parallel Operation

(a) The Interconnecting Transmission Owner shall use Reasonable Efforts to list applicable parallel operation requirements in Attachment 5 [outstanding] of this Agreement. Additionally, the Interconnecting Transmission Owner shall notify the Interconnection Customer of any changes to these requirements as soon as they are known. The Interconnecting Transmission Owner shall make Reasonable Efforts to cooperate with the Interconnection Customer in meeting requirements necessary for the Interconnection Customer to commence parallel operations by the Commercial Operation Date.

(b) The Interconnection Customer shall not operate its Generating Facilities in parallel with the Interconnecting Transmission Owner’s transmission facilities without prior written authorization of the Interconnecting Transmission Owner. The Interconnecting Transmission Owner will provide such authorization in accordance with Appendix C and Section 3 of the T&D Code and the Electricity Regulatory Authority Law (2010 Revision).

2.3 Right of Access

Each Party shall have the right, but shall have no obligation to: (i) observe the other Party’s(ies’) tests and/or inspection of any of its System Protection Facilities and other

protective equipment, including Power System Stabilizers; (ii) review the settings of the other Party's(ies') System Protection Facilities and other protective equipment; and (iii) review the other Party's(ies') maintenance records relative to the Interconnection Facilities, the System Protection Facilities and other protective equipment. Each Party may exercise these rights from time to time as it deems necessary upon reasonable notice to the other Parties. The exercise or non-exercise by a Party of any such rights shall not be construed as an endorsement or confirmation of any element or condition of the Interconnection Facilities or the System Protection Facilities or other protective equipment or the operation thereof, or as a warranty as to the fitness, safety, desirability, or reliability of same. Any information that a Party obtains through the exercise of any of its rights under this Article 2.3 shall be governed by Article 9.

3 Article 3. Effective Date, Term, Termination, Force Majeure and Disconnection

3.1 Effective Date

This Agreement shall become effective upon execution by the Parties (the "Effective Date"), subject to acceptance by the Electricity Regulatory Authority**.** The Interconnecting Transmission Owner shall promptly file this Agreement with the Electricity Regulatory Authority upon execution**.**

3.2 Term of Agreement

Subject to acceptance by the Electricity Regulatory Authority, this Agreement shall become effective on the Effective Date and shall continue until the date of expiry or termination of the Power Purchase Agreement.

3.3 Termination or expiry of Agreement

(a) Upon termination or expiry of this Agreement, the Generating Facilities will be disconnected from the Interconnecting Transmission Owner's Interconnection Facilities and Network. All costs required to effectuate such disconnection shall be borne by the Interconnection Customer.

(b) The termination or expiry of this Agreement shall not relieve any Party of its liabilities and obligations, owed or continuing at the time of the termination.

(c) The provisions of this article shall survive termination or expiration of this Agreement.

3.4 Force Majeure and Electric System Emergency

To the extent the Interconnecting Transmission Owner is prevented by Electric System Emergency, or either Party is prevented by Force Majeure from carrying out, in whole or part, its obligations under this Agreement and such Claiming Party gives notice and details of the Force Majeure or Electric System Emergency to the other Party as soon as practicable,

then, unless this Agreement provides otherwise, the Claiming Party shall be excused from the performance of its obligations (other than the obligation to make payments then due or becoming due with respect to performance prior to the Force Majeure or Electric System Emergency). The Claiming Party in so far as it is within its power to do so, shall remedy the Force Majeure or Electric System Emergency with all reasonable dispatch. The non-Claiming Party shall not be required to perform or resume performance of its obligations to the Claiming Party during the suspension of the obligations of the Claiming Party excused by Force Majeure or Electric System Emergency.

3.5 Routine Maintenance, Construction, and Repair

(a) Outage Authority and Coordination.

The Interconnecting Transmission Owner shall have the authority to coordinate facility outages in accordance with the Operating Documents, Operating Procedures, or successor documents. Each Party may in accordance with the Operating Documents, Operating Procedures, or successor documents, in coordination with the other Party, remove from service any of its respective Interconnection Facilities that may impact the other Party's facilities as necessary to perform maintenance or testing or to install or replace equipment, subject to the oversight of Interconnecting Transmission Owner in accordance with the Operating Documents, Operating Procedures, or successor documents.

(b) Outage Schedules.

Outage scheduling, and any related compensation, shall be in accordance with the applicable provisions of the Operating Documents, Operating Procedures, or successor documents.

(c) Forced Outages

During any forced outage, the Interconnecting Transmission Owner may suspend interconnection service to effect immediate repairs on the Network. The Interconnecting Transmission Owner shall use Reasonable Efforts to provide the Interconnection Customer with prior notice. If prior notice is not given, the Interconnecting Transmission Owner shall, upon request, provide the Interconnection Customer written documentation after the fact explaining the circumstances of the disconnection.

(d) Curtailment

The Interconnecting Transmission Owner will notify the Interconnection Customer as soon as practicable if, based on Prudent Operating Practices, operation of the Generating Facilities may cause disruption or deterioration of service to other customers served from the Network, or if operating the Generating Facilities could cause damage to the Interconnection Facilities. Supporting documentation used to reach the decision to disconnect or reduce power shall be provided to the Interconnection Customer upon request. If, after notice, the Interconnection Customer fails to remedy the adverse operating effect within a reasonable time, the Interconnecting Transmission Owner may disconnect or reduce the power exported to the Network by the Generating Facilities and/or the Interconnection Facilities. The Interconnecting

Transmission Owner shall provide Interconnection Customer with five Business Day notice of such Curtailment, except for routine maintenance, repair, construction, or an Electric System Emergency. In relation to each such Curtailment, the Interconnecting Transmission Owner shall be excused from the performance of its obligations. Following each such Curtailment, the Interconnecting Transmission Owner in so far as it is within its power to do so, shall seek to reinstate the full interconnection of the Generating Facilities and/or the Interconnection Facilities with all reasonable dispatch. The Interconnection Customer shall not be required to perform or resume performance of its obligations to the Interconnecting Transmission Owner during the duration of a Curtailment undertaken in accordance with this article.

(e) Modification of the Generating Facilities

The Interconnection Customer must receive written authorization from the Interconnecting Transmission Owner before making any change to the design, structure or generating capacity of the Generating Facilities. Such authorization shall not be unreasonably withheld. Modifications shall be done in accordance with Prudent Operating Practice. If the Interconnection Customer makes such modification without the Interconnecting Transmission Owner's, as appropriate, prior written authorization, the latter shall have the right to temporarily disconnect or restrict the Generating Facilities.

(f) Reconnection

The Parties shall cooperate with each other to restore the Generating Facilities, the Interconnection Facilities, and the Network to their normal operating state as soon as reasonably practicable following a temporary disconnection or reduction, however caused.

4 Article 4. Cost Responsibility for Interconnection Facilities and Distribution Upgrades

4.1 Interconnection Facilities

(a) Subject to article 4.1(c), the Interconnection Customer shall pay for the cost of the Interconnection Facilities identified in Attachment 2 of this Agreement. The Interconnecting Transmission Owner shall provide a best estimate cost, including overheads, for the purchase and construction of its Interconnection Facilities and provide a detailed itemization of such costs.

(b) Subject to article 4.1(c), the Interconnection Customer shall be responsible for all [reasonable] expenses, including overheads, associated with (1) owning, operating, maintaining, repairing, and replacing its own Interconnection Facilities, and (2) operating, maintaining, repairing, and replacing the Interconnecting Transmission Owner's Interconnection Facilities. The Interconnecting Transmission Owner shall provide a detailed itemization of costs incurred by it in relation to the operation, maintenance, repair, and replacement of the Interconnecting Transmission Owner's Interconnection Facilities.

(c) Costs associated with the Interconnection Facilities may be shared with other entities that may benefit from such facilities by agreement with the Interconnection Customer,

such other entities, and the Interconnecting Transmission Owner and with final approval from the Electricity Regulatory Authority.

4.2 Distribution Upgrade

The Interconnecting Transmission Owner shall design, procure, construct, install, and own the Distribution Upgrades described in Attachment 6 of this Agreement. If the Interconnecting Transmission Owner and the Interconnection Customer agree, the Interconnection Customer may construct Distribution Upgrades that are located on land owned by the Interconnection Customer. The actual cost of the Distribution Upgrades, including overheads, shall be directly assigned to the Interconnection Customer. The Interconnection Customer shall be responsible for its share of all reasonable expenses, associated with operating, maintaining, repairing, and replacing such Distribution Upgrades, except to the extent that a retail tariff of, or an agreement with, the Interconnecting Transmission Owner or its distribution company affiliate, if appropriate, provides otherwise.

5 Article 5. Cost Responsibility for Transmission Upgrades

5.1 Applicability

No portion of this Article 5 shall apply unless the interconnection of the Generating Facilities requires Transmission Upgrades.

5.2 Transmission Upgrades

(a) The Interconnecting Transmission Owner shall design, procure, construct, install, and own the Transmission Upgrades described in Attachment 6 of this Agreement. If the Interconnecting Transmission Owner and the Interconnection Customer agree, the Interconnecting Transmission Owner may construct Transmission Upgrades that are located on land owned by the Interconnection Customer. Unless the Interconnecting Transmission Owner elects to pay for part or all of Transmission Upgrades, the actual cost of the Transmission Upgrades, including overheads, shall be borne by the Interconnection Customer.

(b) Cost Allocation. Cost allocation of Transmission Upgrades shall be agreed to by the Interconnecting Transmission Owner and Interconnection Customer.

5.3 Rights Under Other Agreements

Notwithstanding any other provision of this Agreement, nothing herein shall be construed as relinquishing or foreclosing any rights, including but not limited to firm transmission rights, capacity rights, transmission congestion rights, or transmission credits, that the Interconnection Customer shall be entitled to, now or in the future, under any other agreement or tariff as a result of, or otherwise associated with, the transmission capacity, if any, created by the Transmission Upgrades.

6 Article. 6. Billing, Payment, Milestones, and Performance Assurance

6.1 Billing and Payment Procedures and Final Accounting

(a) The Interconnecting Transmission Owner shall invoice the Interconnection Customer for the design, engineering, construction, procurement, operation, repair and replacement costs of the Interconnecting Transmission Owner's Interconnection Facilities and Upgrades contemplated by this Agreement on a monthly basis, or as otherwise agreed by the Parties. The Interconnection Customer shall pay each bill within **60 Calendar Days** of receipt, or as otherwise agreed to by the Parties.

(b) Within **three months** of completing the construction and installation of the Interconnecting Transmission Owner's Interconnection Facilities and/or Upgrades described in the Attachments to this Agreement, the Interconnecting Transmission Owner shall provide the Interconnection Customer with a final accounting report of any difference between (1) the Interconnection Customer's cost responsibility for the actual cost of such facilities or Upgrades, and (2) the Interconnection Customer's previous aggregate payments to the Interconnecting Transmission Owner for such facilities or Upgrades. If the Interconnection Customer's cost responsibility exceeds its previous aggregate payments, the Interconnecting Transmission Owner shall invoice the Interconnection Customer for the amount due and the Interconnection Customer shall make payment to the Interconnecting Transmission Owner within 30 calendar days. If the Interconnection Customer's previous aggregate payments exceed its cost responsibility under this Agreement, the Interconnecting Transmission Owner shall refund to the Interconnection Customer an amount equal to the difference within 30 calendar days of the final accounting report.

6.2 Milestones

The Parties shall agree on milestones for which each Party is responsible and list them in Attachment 4 of this Agreement. A Party's obligations under this provision may be extended by agreement. If a Party anticipates that it will be unable to meet a milestone for any reason other than a Force Majeure Event, it shall immediately notify the other Party of the reason(s) for not meeting the milestone and (1) propose the earliest reasonable alternate date by which it can attain this and future milestones, and (2) request appropriate amendments to Attachment 4. The Party affected by the failure to meet a milestone shall not unreasonably withhold agreement to such an amendment unless (1) it will suffer significant uncompensated economic or operational harm from the delay, (2) attainment of the same milestone has previously been delayed, or (3) it has reason to believe that the delay in meeting the milestone is intentional or unwarranted notwithstanding the circumstances explained by the Party proposing the amendment.

6.3 Performance Assurance

The Interconnection Customer shall deliver to the Interconnecting Transmission Owner, Performance Assurance in the amount of 100% of a reasonable cost estimate provided by the Interconnecting Transmission Owner in a form and from a financial institution reasonably acceptable to the Interconnecting Transmission Owner. In the event the Interconnection Customer shall fail to provide such Performance Assurance or other credit assurance acceptable

to Interconnecting Transmission Owner within thirty (30) Days of the [Effective Date], then until such Default is cured by the Interconnection Customer, the Interconnecting Transmission Owner shall not be required to perform or resume performance of its obligations under articles 4, 5 and 6.2.

6.4 Grant of Security Interest/Remedies.

To secure its obligations under this Agreement, the Interconnection Customer hereby grants to the Interconnecting Transmission Owner a present and continuing security interest in, and lien on (and right of setoff against), and assignment of, all cash collateral and cash equivalent collateral and any and all proceeds resulting from the Performance Assurance or the liquidation thereof, whether now or hereafter held by, on behalf of, or for the benefit of, such Interconnecting Transmission Owner, and Interconnection Customer agrees to take such action as the Interconnecting Transmission Owner reasonably requires in order to perfect the Interconnecting Transmission Owner's security interest in, and lien on (and right of setoff against), such collateral and any and all proceeds resulting there from or from the liquidation thereof. Upon or any time after the occurrence or deemed occurrence and during the continuation of a Default, the Interconnecting Transmission Owner may do any one or more of the following:

(a) exercise any of the rights and remedies of the Interconnecting Transmission Owner with respect to the Performance Assurance, including any such rights and remedies under law then in effect;

(b) exercise its rights of setoff against any and all property of the Interconnection Customer in the possession of the Interconnecting Transmission Owner or its agent;

(c) liquidate the Performance Assurance held by or for the benefit of the Interconnecting Transmission Owner free from any claim or right of any nature whatsoever of the Interconnection Customer, including any equity or right of purchase or redemption by the Defaulting Party.

The Interconnecting Transmission Owner shall apply the proceeds of the Performance Assurance realized upon the exercise of any such rights or remedies to reduce the Interconnection Customer's obligations under the Agreement (the Interconnection Customer remaining liable for any amounts owing to the Non-Defaulting Party after such application), subject to the Interconnecting Transmission Owner's obligation to return any surplus proceeds remaining after such obligations are satisfied in full.

7 Article. 7. Assignment, Liability, Indemnity, Consequential Damages, and Default

Notwithstanding any other provision of this Agreement, the liability, indemnification and insurance provisions of the Interconnecting Transmission Owner's applicable Operating Agreements shall apply to the relationship between the Interconnecting Transmission Owner and the Interconnection Customer.

7.1 Assignment

(a) Neither Party shall assign this Agreement or its rights hereunder without the prior written consent of the other Party, which consent may not be withheld or conditioned if:

(i) the assignee agrees in writing to be bound by the terms and conditions of this Agreement;

(ii) the assignee holds all requisite regulatory approvals or permits to authorise it to perform this Agreement;

(iii) in the case of an assignment by the Interconnection Customer, the assignee's creditworthiness is equal to or higher than that of the Interconnection Customer;

(iv) the assigning Party demonstrates, to the reasonable satisfaction of the other Party, that the assignee possesses the requisite technical competence and experience to perform its obligations to this Agreement;

provided, however, either Party may, without the consent of the other Party, transfer, sell, pledge, encumber or assign this Agreement or the accounts, revenues or proceeds hereof in connection with any financing or other financial arrangements.

(b) Any attempted assignment that violates this article is void and ineffective. Assignment shall not relieve a Party of its obligations, nor shall a Party's obligations be enlarged, in whole or in part, by reason thereof.

7.2 Limitation of Liability

Except as set forth herein, there is no warranty of merchantability or fitness for a particular purpose, and any and all implied warranties are disclaimed. The Parties confirm that the express remedies and measures of damages provided in this Agreement satisfy the essential purposes hereof. For breach of any provision for which an express remedy or measure of damages is provided, such express remedy or measure of damages shall be the sole and exclusive remedy, the obligor's liability shall be limited as set forth in such provision and all other remedies or damages at law or in equity are waived. If no remedy or measure of damages is expressly provided herein, the obligor's liability shall be limited to direct actual damages only, such direct actual damages shall be the sole and exclusive remedy and all other remedies or damages at law or in equity are waived. Neither Party shall be liable for consequential, incidental, punitive, exemplary or indirect damages, lost profits or other business interruption damages, by statute, in tort or contract, under any indemnity provision or otherwise. It is the intent of the Parties that the limitations herein imposed on remedies and the measure of damages be without regard to the cause or causes related thereto, including the negligence of any Party, whether such negligence be sole, joint or concurrent, or active or passive. To the extent any damages required to be paid hereunder are liquidated, the Parties acknowledge that the damages are difficult or impossible to determine, or otherwise obtaining an adequate remedy is inconvenient

and the damages calculated hereunder constitute a reasonable approximation of the harm or loss.

7.3 Default

(a) No Default shall exist where such failure to discharge an obligation (other than the payment of money) is the result of a Force Majeure Event, Electric System Emergency, a Curtailment or the result of an act or omission of the other Party.

(b) Upon a Default, the non-defaulting Party shall give written notice of such Default to the defaulting Party.

(c) In the case of a Default by the Interconnecting Transmission Owner, the Interconnection Customer's sole remedies will be as determined in accordance with the T&D Code and the Electricity Regulatory Authority Law.

(d) In the case of a Default by the Interconnection Customer, the Interconnection Customer:

(i) in the case of a failure to pay any monetary amount due under this agreement, shall have 30 calendar days from receipt of the Default notice to pay such amount and, if paid in full within such time, the Default shall cease to exist; or

(ii) in the case of any other Default, shall have 30 calendar days from receipt of the Default notice within which to cure such Default; provided however, if such Default is not capable of cure within 30 calendar days, the Interconnection Customer shall commence such cure within 10 calendar days after notice and continuously and diligently complete such cure within three months from receipt of the Default notice; and, if cured within such time, the Default specified in such notice shall cease to exist.

(e) Subject to article 6.3 and 6.4, if a Default by the Interconnection Customer is not cured as provided in this article, or if a Default by the Interconnection Customer is not capable of being cured within the period provided for herein, the Interconnecting Transmission Owner shall have the right to disconnect the Generating Facilities from the Network, and the Interconnecting Transmission Owner will be relieved of any further obligation hereunder [and under the Power Purchase Agreement] until such Default is cured by the Interconnection Customer.

8 **Article. 8. Insurance Requirements**

8.1 Insurance

The Interconnection Customer shall take out and maintain in full force and effect policies of insurance as specified in the Power Purchase Agreement.

8.2 Insurance Requirements and Endorsements

All required insurance shall be carried by reputable insurers qualified to underwrite insurance where the interconnection is located having a Best Rating of "A-". In addition, all insurance shall, (a) include Interconnecting Transmission Owner as additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Interconnecting Transmission Owner shall not incur liability to the insurance carrier for payment of premium for such insurance; and (d) provide for thirty (30) calendar days' written notice to Interconnecting Transmission Owner prior to cancellation, termination, or material change of such insurance; provided that to the extent the Interconnection Customer is satisfying the requirements of subpart (d) of this paragraph by means of a presently existing insurance policy, the Interconnection Customer shall only be required to make good faith efforts to satisfy that requirement and will assume the responsibility for notifying the Interconnecting Transmission Owner as required above.

If the requirement of clause (a) in the paragraph above prevents Interconnection Customer from obtaining the insurance required without added cost or due to written refusal by the insurance carrier, then upon Interconnection Customer's written notice to Interconnecting Transmission Owner, the requirements of clause (a) shall be waived.

8.3 Evidence of Insurance

Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnection Customer.

The Interconnection Customer is responsible for providing the Interconnecting Transmission Owner with evidence of insurance in compliance with this Agreement on an annual basis.

Prior to the Interconnecting Transmission Owner commencing work on its Interconnection Facilities, any Transmission Upgrades and any Distribution Upgrades, the Interconnection Customer shall have its insurer furnish to the Interconnecting Transmission Owner a certificate of insurance evidencing the insurance coverage required above. The Interconnection Customer shall notify and send to the Interconnecting Transmission Owner a certificate of insurance for any policy written on a "claims-made" basis. The Interconnecting Transmission Owner may at its discretion require the Interconnection Customer to maintain full coverage for three years on all policies written on a "claims-made" basis.

8.4 Self Insurance

If Interconnection Customer is a company with a self-insurance program established in accordance with commercially acceptable risk management practices, Interconnection Customer may comply with the following in lieu of the above requirements as reasonably approved by the Interconnecting Transmission Owner:

(a) Interconnection Customer shall provide to Interconnecting Transmission Owner, at least thirty (30) calendar days prior to the Commercial Operation Date, evidence of such program to self-insure to a level of coverage equivalent to that required.

(b) If Interconnection Customer ceases to self-insure to the standards required hereunder, or if Interconnection Customer is unable to provide continuing evidence of Interconnection Customer's financial ability to self-insure, Interconnection Customer agrees to promptly obtain the coverage required under article 8.1.

8.5 The Interconnecting Transmission Owner agrees to maintain general liability insurance or self-insurance consistent with the Interconnecting Transmission Owner's commercial practice. Such insurance or self-insurance shall not exclude coverage for the Interconnecting Transmission Owner's liabilities undertaken pursuant to this Agreement.

9 Article 9. Confidentiality

9.1 Confidential Information shall include without limitation, all information governed by the Interconnecting Transmission Owner's Information Policy, all information obtained from third parties under confidentiality agreements, and any confidential and/or proprietary information provided by a Party to another Party that is clearly marked or otherwise designated "Confidential." For purposes of this Agreement all design, operating specifications, and metering data provided by the Interconnection Customer shall be deemed Confidential Information regardless of whether it is clearly marked or otherwise designated as such.

9.2 Confidential Information does not include information previously in the public domain, required to be publicly submitted or divulged by Governmental Authorities (after notice to the other Party and after exhausting any opportunity to oppose such publication or release), or necessary to be divulged in an action to enforce this Agreement. Each Party receiving Confidential Information shall hold such information in confidence and shall not disclose it to any third party nor to the public without the prior written authorization from the Party providing that information, except to fulfill obligations under this Agreement, or to fulfill legal or regulatory requirements.

Upon termination of this interconnection agreement for any reason, each Party shall, within ten (10) Calendar Days of receipt of a written request from the other Party(ies), use Reasonable Efforts to destroy, erase, or delete (with such destruction, erasure, and deletion certified in writing to the other Party(ies)) or return to the other Party(ies), without retaining copies thereof, any and all written or electronic Confidential Information received from the other Party(ies).

9.3 Each Party shall employ at least the same standard of care to protect Confidential Information obtained from the other Party as it employs to protect its own Confidential Information.

9.4 Each Party is entitled to equitable relief, by injunction or otherwise, to enforce its rights under this provision to prevent the release of Confidential Information without bond or proof of damages, and may seek other remedies available at law or in equity for breach of this provision.

10 Article 10. Disputes

10.1 Dispute.

Subject to article 10.8, any Dispute must be resolved by reference to the dispute mechanism set out in this article and a Party must not start arbitration or court proceedings (except proceedings seeking urgent interlocutory relief) in respect of the Dispute unless it has complied with this article.

10.2 When a Dispute arises

A Dispute will be deemed to arise when one Party serves on the other Party a notice (a "Dispute Notice"):

(a) stating the nature of the Dispute;

(b) providing brief particulars of the facts and circumstances relied upon by the Party serving the Dispute Notice; and

(c) nominating an authorised representative to settle the Dispute on its behalf (as the case may be).

Within five (5) Business Days after the service of a Dispute Notice, the other Party must nominate in writing an authorised representative to settle the Dispute on its behalf.

10.3 Negotiation in good faith.

Following the service of the Dispute Notice, the authorised representatives of each Party must meet and negotiate in good faith to resolve the Dispute.

10.4 Alternative Dispute Resolution.

If:

(a) the Dispute is not resolved by the Parties using the process referred to in article 10.3; or

(b) agreement is not reached using an alternative dispute resolution process (for example mediation or independent expert determination) to resolve the Dispute,

within [45] Business Days after the service of the Dispute Notice, the Parties must refer the Dispute to be determined by an independent expert in accordance with article 10.5.

10.5 Appointment of Expert

The independent expert must be chosen

(a) by agreement between the Parties within 50 Business Days after the service of the Dispute Notice.

The independent expert must act as an expert and not as an arbitrator and must determine the rules for the conduct of the process.

10.6 Payment for independent expert.

The costs and expenses of any determination by the independent expert must be borne by either Party or both of the Parties to the Dispute in such proportion as the expert making the determination may decide.

10.7 Continuance of obligations

The Parties agree that, until the Dispute is resolved in accordance with this article or by a court of competent jurisdiction in the Cayman Islands, they will be bound to perform their respective obligations arising under this Agreement, despite the existence of the Dispute.

10.8 Alternative relief.

Nothing in this article shall prevent either Party from:

(a) pursuing any alternative remedy available to it under this Agreement; or

(b) seeking urgent interlocutory or declaratory relief from a court of competent jurisdiction where, in that Party's reasonable opinion, that action is necessary to protect that Party's rights.

10.9 Determination of dispute by independent expert

Subject to article 10.1, a determination made by an expert under this article shall not be final upon the Parties, who shall be free to seek relief in arbitral proceedings conducted by the Regulatory Authority or by another body, or from a court of competent jurisdiction in relation to the Dispute.

11 **Article 11. Taxes**

11.1 The Parties agree to follow all applicable tax laws and regulations, consistent with the Cayman Islands.

12 **Article 12. Miscellaneous**

12.1 Governing Law, Regulatory Authority, and Rules

The validity, interpretation and enforcement of this Agreement and each of its provisions shall be governed by the laws of the Cayman Islands, without regard to its conflicts of law principles. This Agreement is subject to all Applicable Laws and Regulations. Each Party expressly reserves the right to seek changes in, appeal, or otherwise contest any laws, orders, or regulations of a Governmental Authority.

12.2 Amendment

The Parties may amend this Agreement by a written instrument duly executed by the Parties.

12.3 No Third-Party Beneficiaries

This Agreement is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the Parties, and the obligations herein assumed are solely for the use and benefit of the Parties, their successors in interest and where permitted, their assigns.

12.4 Waiver

(a) The failure of a Party to this Agreement to insist, on any occasion, upon strict performance of any provision of this Agreement will not be considered a waiver of any obligation, right, or duty of, or imposed upon, such Party.

(b) Any waiver at any time by a Party of its rights with respect to this Agreement shall not be deemed a continuing waiver or a waiver with respect to any other failure to comply with any other obligation, right, duty of this Agreement. Termination or default of this Agreement for any reason by Interconnection Customer shall not constitute a waiver of the Interconnection Customer's legal rights to obtain an interconnection from the Interconnecting Transmission Owner. Any waiver of this Agreement shall, if requested, be provided in writing.

12.5 Entire Agreement

This Agreement, including all Attachments, constitutes the entire agreement between the Parties with reference to the subject matter hereof.

12.6 Multiple Counterparts

This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

12.7 No Partnership

This Agreement shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership between the Parties or to impose any partnership obligation

or partnership liability upon any Party. No Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Parties.

12.8 Severability

If any provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction or other Governmental Authority, (1) such portion or provision shall be deemed separate and independent, (2) the Parties shall negotiate in good faith to restore insofar as practicable the benefits to each Party that were affected by such ruling, and (3) the remainder of this Agreement shall remain in full force and effect.

12.9 Security Arrangements

Infrastructure security of the Interconnecting Transmission Owner's Network equipment and operations and control hardware and software is essential to ensure day-to-day reliability and operational security. The Electricity Regulatory Authority expects the Interconnecting Transmission Owner and Interconnection Customers interconnected to the Interconnecting Transmission Owner's Network to comply with Operating Documents and utility best practices.

12.10 Environmental Releases

Each Party shall notify the other Party as well as the Electricity Regulatory Authority and the appropriate Governmental Authorities, first orally and then in writing, of the release of any hazardous substances, any asbestos or lead abatement activities, or any type of remediation activities related to the Generating Facilities or the Interconnection Facilities, each of which may reasonably be expected to affect the other Party. The notifying Party shall (1) provide the notice as soon as practicable, provided such Party makes a good faith effort to provide the notice no later than 24 hours after such Party becomes aware of the occurrence, and (2) promptly furnish to the other Party copies of any publicly available reports filed with any Governmental Authorities addressing such events.

12.11 Subcontractors

Nothing in this Agreement shall prevent a Party from utilizing the services of any subcontractor as it deems appropriate to perform its obligations under this Agreement; provided, however, that each Party shall require its subcontractors to comply with all applicable terms and conditions of this Agreement in providing such services and each Party shall remain primarily liable to the other Party for the performance of such subcontractor.

(a) The creation of any subcontract relationship shall not relieve the hiring Party of any of its obligations under this Agreement. The hiring Party shall be fully responsible to the other Party for the acts or omissions of any subcontractor the hiring Party hires as if no subcontract had been made; provided, however, that in no event shall the Interconnecting Transmission Owner be liable for the actions or inactions of the

Interconnection Customer or its subcontractors with respect to obligations of the Interconnection Customer under this Agreement. Any applicable obligation imposed by this Agreement upon the hiring Party shall be equally binding upon, and shall be construed as having application to, any subcontractor of such Party.

(b) The obligations under this article will not be limited in any way by any limitation of subcontractor's insurance.

13 Article 13. Notices

13.1 General

Unless otherwise provided in this Agreement, any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given if delivered in person, delivered by recognized national currier service, or sent by first class mail, postage prepaid, to the person specified below:

If to the Interconnection Customer:

Interconnection Customer: _____
Attention: _____
Position: _____
Address: _____
City: _____ Country and /or State:_____
Zip:_____
Phone: _____ Fax: _____

If to the Interconnecting Transmission Owner:

Interconnecting Transmission Owner: _____
Attention: _____
Position: _____
Address: _____
City: _____ Country:_____ Zip:_____
Phone: _____ Fax: _____

Billings and payments shall be sent to the addresses set out below:

Interconnection Customer: _____
Attention: _____
Position: _____
Address: _____
City: _____
Country and /or State:_____ Zip:_____

Interconnecting Transmission Owner: _____
Attention: _____
Position: _____
Address: _____
City: _____ Country:_____ Zip:_____

13.2 Alternative Forms of Notice

Any notice or request required or permitted to be given by a Party to the other Party and not required by this Agreement to be given in writing may be so given by telephone, facsimile or e-mail to the telephone numbers and e-mail addresses set out below:

If to the Interconnection Customer:

Interconnection Customer: _____
Attention: _____
Address: _____
City: _____ Country and /or State:_____
Zip:_____
Phone: _____ Fax: _____
E-mail: _____

If to the Interconnecting Transmission Owner:
Interconnecting Transmission Owner: _____
Attention: _____
Address: _____
City: _____ Country:_____ Zip:_____
Phone: _____ Fax: _____
E-mail: _____

13.3 Designated Operating Representative

The Parties may also designate operating representatives to conduct the communications which may be necessary or convenient for the administration of this Agreement. This person will also serve as the point of contact with respect to operations and maintenance of the Party's facilities.

Interconnection Customer's Operating Representative:

Interconnection Customer: _____
Attention: _____
Address: _____
City: _____ Country and/or State:_____
Zip:_____
Phone: _____ Fax: _____

E-mail: _____

Interconnecting Transmission Owner's Operating Representative:

Interconnecting Transmission Owner: _____
Attention: _____
Address: _____
City: _____ Country:_____ Zip:_____
Phone: _____ Fax: _____
E-mail: _____

13.4 Changes to the Notice Information

A Party may change this information by giving five Business Days written notice to the other Parties prior to the effective date of the change.

14 Article 14. Signatures

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their respective duly authorized representatives.

Caribbean Utilities Company, Ltd.

By:_____	By:_____
Name:_____	Name:_____
Title:_____	Title: _____

_____.

By:_____	By:_____
Name:_____	Name:_____
Title:_____	Title: _____

ATTACHMENTS TO Agreement

Attachment 1 - Glossary of Terms

Attachment 2 - Description and Costs of the Generating Facilities, Interconnection Facilities, and Metering Equipment

Attachment 3 - One-line Diagram Depicting the Generating Facilities, Interconnection Facilities, Metering Equipment and Upgrades

Attachment 4 - Milestones

Attachment 5 - Additional Operating Procedures for Network Needed to Support the Interconnection Customer's Needs

Attachment 6 - Interconnecting Transmission Owner's Description of its Upgrades, and Best Estimates of Upgrade Costs

Attachment 1 - Glossary of Terms

Affiliate – With respect to any person, any other person (other than an individual) that, directly or indirectly, through one or more intermediaries, controls, or is controlled by, or is under common control with, such person. For this purpose, "control" means the direct or indirect ownership of fifty percent (50%) or more of the outstanding shares or other equity interests having ordinary voting power.

Applicable Laws and Regulations – All duly promulgated applicable laws of the Cayman Island including any local laws, regulations, rules, ordinances, codes, decrees, judgments, directives, or judicial or administrative orders, permits and other duly authorized actions of any Governmental Authority.

Business Day - Any day except a Saturday, Sunday, or a bank holiday in the Cayman Islands. A Business Day shall commence at 8:00 a.m. and end at 5:00 p.m. local time in the Cayman Islands.

Claiming Party - The Party that is prevented by Force Majeure or, in the case of the Interconnecting Transmission Owner, an Electric System Emergency, from carrying out, in whole or part, its obligations under this Agreement.

Commercial Operation Date - The next day after the acceptance tests of the Generating Facilities have been satisfactorily completed in accordance with the Power Purchase Agreement and the Interconnection Works have been constructed and commissioned in accordance with this Agreement.

Curtailment - A disconnection or reduction of the Generating Facilities and/or the Interconnection Facilities in accordance with article 3.5(d).

Default – The failure of a breaching Party to cure its breach under the Transmission Connected Generator Interconnection Agreement.

Delivery Point – the physical point at which high voltage electrical interconnection is made between the Interconnecting Transmission Owner's Network and its Interconnection Facilities, as depicted in Attachment 2.

Dispute - Any dispute or difference of any kind between the Parties in connection with or arising out of this Agreement, whether during the term of this agreement or after its expiry or early termination.

Distribution System –The Interconnecting Transmission Owner's facilities and equipment used to transmit electricity to ultimate usage points such as homes and industries directly from nearby generators or from interchanges with higher voltage transmission networks which transport bulk power over longer distances. The voltage levels at which Distribution Systems operate differ among areas.

Distribution Upgrades – The additions, modifications, and upgrades to the Interconnecting Transmission Owner's Distribution System at or beyond the Delivery Point to facilitate interconnection of the Generating Facilities and render the transmission service necessary to effect the

Interconnection Customer's wholesale sale of electricity. Distribution Upgrades do not include the Interconnection Facilities.

Electric System Emergency - The existence of a physical or operational condition, including transmission or distribution contingencies, or the occurrence of an event on the Buyer's electric system that is reasonably likely to endanger life or property or to impair the Buyer's ability to provide safe, sufficient and reliable electric service to its customers.

Force Majeure - An event or circumstance which prevents one Party from performing its obligations under this Agreement, which event or circumstance was not anticipated as of the date hereof, which is not within the reasonable control of, or the result of the negligence of, the Claiming Party, and which, by the exercise of due diligence and adherence to Prudent Operating Practices, the Claiming Party is unable to overcome or avoid or cause to be avoided. Events of Force Majeure may include, but are not limited to, acts of God; fire; flood; earthquake; war; riots; acts of terrorism; strikes, walkouts, lockouts and other labour disputes; requirements, actions or failure to act on the part of governmental authorities; adoption or change in any law, regulation, statute, rule or regulation imposed by governmental bodies, including, without limitation, a change in the interpretation thereof; or any lawful order by any court or administrative agency (so long as the Claiming Party has not applied for or assisted in the application for such court or governmental action and the cause, event, condition or circumstance has not arisen as a result of the Claiming Party's breach of law or breach of a regulatory licence or approval). A cause, event, condition or circumstance that (i) affects the cost of generating energy at the electric Generating Facilities or the cost of transmitting such energy to the Delivery Point, (ii) merely causes an economic hardship to either Party, (iii) is, or results from, a failure of a third party supplier to supply goods or services to the Seller, or (iv) where the Claiming Party is the Seller, is, or results from, a design defect of the Generating Facilities, shall be deemed not to be a Force Majeure.

Generating Facilities – each Generating unit and any plant or facility of the Licensee from time to time used for Generation identified in Schedule 1 of the Interconnecting Transmission Owner's 2008 Generation Licence, and includes any structures, equipment or other things used for that purpose.

Governmental Authority – The Cayman Islands Electricity Regulatory Authority (or any successor) or any governmental regulatory or administrative agency, court, department, board, or other governmental subdivision, legislature, rulemaking board, tribunal, or other governmental authority having jurisdiction over the Parties, their respective facilities, or the respective services they provide, and exercising or entitled to exercise any administrative, executive, police, or taxing authority or power; provided, however, that such term does not include the Interconnection Customer, the Interconnection Transmission Owner, or any Affiliate thereof.

Interconnecting Transmission Owner – The Party identified as such at the beginning of this Agreement.

Interconnection Customer – The Party identified as such at the beginning of this Agreement.

Interconnection Facilities – The facilities necessary to connect the Generating Facilities to the Network at the Delivery Point, including circuit breakers, bus work, transmission line(s), relays and

associated equipment installed by the Interconnecting Transmission Owner or Interconnection Customer for the direct purpose of interconnecting the Generating Facilities (including without limitation any system upgrades), along with any easements, rights of way, surface use agreements and other interests in real estate reasonably necessary for the construction, operation and maintenance of such facilities. The Interconnection Facilities are sole use facilities and shall not include the Distribution Upgrades or Transmission Upgrades.

Interconnection Request – A request by the Interconnection Customer to: (i) interconnect the Generating Facilities to the Network (ii) increase the energy capability or capacity capability of the Generating Facilities; (iii) make a modification to the operating characteristics of the Generating Facilities, including its Interconnection Facilities, that is interconnected to the Network.

Network - The interconnected Transmission System and Distribution System.

Operating Documents – The Power Purchase Agreement and the T&D Code.

Operating Procedures – The operating procedures referred to in Section 3.5.5 of the T&D Code and outlined in Attachment 5 of this Agreement.

Party – The Interconnecting Transmission Owner or the Interconnection Customer and Parties means both of them.

Performance Assurance - collateral in the forms of cash, letter of credit, guaranty or other security acceptable to the requesting Party as provided for in accordance with article 6.3.

Power Purchase Agreement - The "Firm Generation Power Purchase Agreement" between the Interconnection Customer and the Interconnecting Transmission Owner.

Prudent Operating Practice – practices followed from time to time by the power industry, and in respect of any person, acting in good faith to perform its contractual obligations and, in so doing and in the general conduct of its undertaking, exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator complying with applicable laws and mandatory regulatory requirements, engaged in the same or a similar type of undertaking, in the same or similar circumstances and conditions.

Reasonable Efforts –With respect to an action required to be attempted or taken by a Party under the Transmission Connected Generator Interconnection Agreement, efforts that are timely and consistent with Prudent Operating Practice and are otherwise substantially equivalent to those a Party would use to protect its own interests.

T&D Code - The code referred to as the "T&D code" in the *Electricity Regulatory Authority Law (2010 Revised)* of the Cayman Islands.

Transmission System – The Interconnecting Transmission Owner's facilities and equipment used to transmit electricity at a voltage of [ ].

Transmission Upgrades –Additions, modifications, and upgrades to the Transmission System required at or beyond the point at which the Generating Facilities interconnects with the Transmission System to accommodate the interconnection of the Generating Facilities in accordance with the T&D Code.

Attachment 2

Description and Costs of the Generating Facilities, Interconnection Facilities, and Metering Equipment , including the Generating Facilities, Interconnection Facilities, and metering equipment shall be itemized and identified as being owned by the Interconnection Customer or the Interconnecting Transmission Owner. The Interconnecting Transmission Owner will provide a best estimate itemized cost, including overheads, of its Interconnection Facilities and metering equipment, and a best estimate itemized cost of the annual operation and maintenance expenses associated with its Interconnection Facilities and metering equipment.

1. DESCRIPTION OF MAJOR COMPONENTS

   A. Generating Facilities

      (1) Description of Generating Facilities.

      [insert]

      (2) Detailed Description of Generating Facilities and Generator Step-Up Transformer, if applicable:

Generator Data	
Number of Generators	
Manufacturer	
Model	
Designation of Generator(s)	
Excitation System Manufactuer	
Excitation System Model	
Voltage Regulator Manufactuer	
Voltage Regulator Model	

Generator Ratings	
Greatest Unit Gross and Net MW Output at Ambient Temperature at or above 90 Degrees F	
Greatest Unit Gross and Net MW Output at Ambient Temperature at or above 50 Degrees F	
Greatest Unit Gross and Net MW Output at Ambient Temperature at or above 20 Degrees F	
Greatest Unit Gross and Net MW Output at Ambient Temperature at or above zero Degrees F	
Station Service Load For Each Unit	
Overexcited Reactive Power at Rated MVA and Rated Power Factor	
Underexcited Reactive Power at Rated MVA and Rated Power Factor	

Generator Short Circuit Data	
Generator MVA rating	
Subtransient Resistance	
Subtransient Reactance (saturated)	
Transient Resistance	
Transient Reactance (saturated)	
Negative sequence resistance	
Negative sequence reactance	
Transformer Data	
Number of units	
Self Cooled	
Maximum Rating	
Winding Connection (LV/LV/HV)	
Fixed Taps	
Z1 primary to secondary at self cooled rating	
Z1 primary to tertiary at self cooled rating	
Z1 secondary to tertiary at self cooled rating	
Positive Sequence X/R ratio primary to secondary	
Z0 primary to secondary at self cooled rating	
Z0 primary to tertiary at self cooled rating	
Z0 secondary to tertiary at self cooled rating	
Zero Sequence X/R ratio primary to tertiary	

B. Interconnection Facilities

[insert]

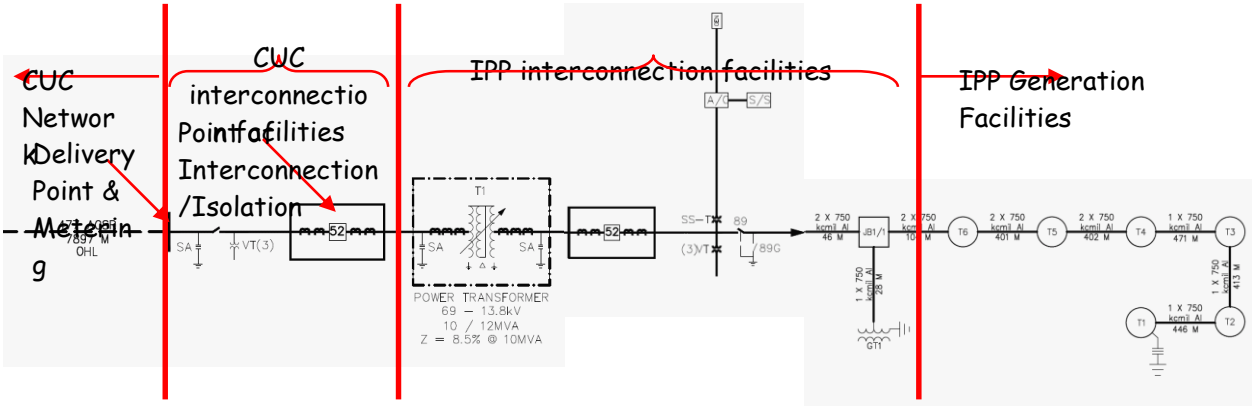
C. Metering Equipment

[insert]

D. Other Components

[insert]

2. INTERCONNECTION EQUIPMENT OWNERSHIP, OPERATION AND MAINTENANCE



Ownership Maintenance Expense Repair

CUC Interconnection facilities	CUC	CUC	IPP
CLP Interconnection facilities	IPP	IPP	IPP
Network	CUC	CUC	IPP*

IPP* denotes that IPPwould pay for the initial line construction costs. Ongoing maintenance costs would be based on a percentage of dedicated usage (ie depending the number of customers using the T-line).

3. PRICING ESTIMATES

A. Interconnection Facilities

[insert]

B. Metering Equipment

[insert]

C. Operation and Maintenance

[insert]

Attachment 3

One-line Diagram Depicting the Generating Facilities, Interconnection Facilities, Metering Equipment, and Upgrades

[insert]

Attachment 4

Milestones

1. Milestones for all Transmission Connected Generating Facilities: The description and entries listed in the following table establish the required Milestones in accordance with the provisions of the Agreement.

Item No.	Milestone Description	Responsible Party	Date
1	Siting approval for the Generating Facility and Interconnection Facilities	Interconnection Customer	As agreed to by the Parties
2	Engineering of Interconnection Facilities approved by Interconnecting Transmission Owner	Interconnection Customer	As agreed to by the Parties
3	Ordering of long lead time material for Interconnection Facilities and system upgrades	Interconnection Customer	As agreed to by the Parties
8	Initial Synchronization Date		Same as Interconnection Request unless subsequently modified
9	Commercial Operation Date		Same as Interconnection Request unless subsequently modified
10	In-Service Date	Interconnection Customer	Same as Interconnection Request unless subsequently modified

Agreed to by:

For the Interconnecting Transmission Owner:_____

Date:_____

For the Interconnection Customer:_____

Date:_____

Attachment 5

[Operating Procedures for the Network Needed to Support the Interconnection Customer's Needs

The Interconnecting Transmission Owner shall also provide requirements that must be met by the Interconnection Customer prior to initiating parallel operation with the Network.]

I. OPERATING PROCEDURES

[Insert]

Attachment 6

Interconnecting Transmission Owner's Description of its Upgrades and Best Estimate of Upgrade Costs. The Interconnecting Transmission Owner shall describe Upgrades and provide an itemized best estimate of the cost, including overheads, of the Upgrades and annual operation and maintenance expenses associated with such Upgrades. The Interconnecting Transmission Owner shall functionalize Upgrade Costs and annual expenses as either transmission network or distribution related.

I. DESCRIPTION OF UPGRADES

A. Distribution Upgrades

[Insert]

B. Transmission Upgrades

[Insert]

(1) Stand-Alone Transmission Upgrades

(2) Other Transmission Upgrades

C. Contingency Upgrades

(1) [Long Lead Facility-Related Upgrades. If the Interconnection Customer's Generating Facilities is associated with a Long Lead Facility, in accordance with Article 3.2.3 of the LGIP. Pursuant to Article 4.1 of the LGIP, the Interconnection Customer shall be responsible for the following upgrades in the event that the Long Lead Facility achieves commercial operation and obtains a Capacity Supply Obligation in accordance with Article III.13.1 of the Tariff:]

[insert list of upgrades]

If the Interconnection Customer fails to cause these upgrades to be in-service prior to the commencement of the Long Lead Facility's Capacity Commitment Period, the Interconnection Customer shall be deemed to be in Default of this Agreement.

(2) Other Contingency Upgrades. [e.g., list of upgrades associated with higher queued Interconnection Requests with Agreements prior to this Agreement and any other contingency upgrades that the Parties may deem necessary for the interconnection of the Generating Facilities.]

Appendix D
CORE Credit Agreement
Revised August 30, 2012

1. Consumer-Owned Renewable Energy ("CORE") Credit Agreement Information

1.1 CORE Customer Information

Name: _____

PO Box _____, Grand Cayman KY1- _____

Street Address: _____

District: _____

Telephone: Work: _____ Mobile: _____

Home: _____ Other: _____

CUC Account #: _____

1.2 CORE Generator Information

Name Plate Rating of the CORE Generating System (kW AC): _____

_____

Total Installed Gross Generation (kW AC): _____

Type: Wind Turbine ☐ Photovoltaic (Solar) ☐ Biomass ☐

Other (please specify): _____

_____

Inverter utilized: Yes ☐ No ☐

Make and Model of Inverter: _____

Battery storage installed: Yes ☐ No ☐

Name Plate Rating of Storage (when fully charged) _____ kWh AC _____ kW AC

Make and Model of Storage: _____

Is the System capable of generating firm power for the premises: Yes ☐ No ☐
System to be installed by (name of Electrical Contractor): _____

_____

Contact Person's Name: _____

PO Box _____, Grand Cayman KY1- _____

Telephone: Work: _____ Mobile: _____

Other: _____

Is there any existing Electric Generating Equipment at this location? Yes ☐ No ☐

If "Yes", please provide details (e.g., is this backup diesel generation; what is its size; when was it installed; how often has it been used):

_____

_____

_____

_____

_____

_____

_____

_____

1.3 Additional Information

CUC reserves the right to require additional information, if considered necessary, to adequately serve the CORE generator.

This CORE Credit Agreement, with the approval of the ERA, may be subject to changes from time to time.

2. CORE Tariff

2.1 Applicability

This tariff provides for the sale and exchange of electric energy between Caribbean Utilities Company, Ltd. ("CUC") and a residential or commercial customer with a Consumer-Owned Renewable Energy ("CORE") generator on their premises for the purposes of serving a portion of their own electricity requirements while helping to reduce their electric utility cost and, subject to the limitations herein, providing any available net excess energy to the CUC T&D System.

For any CUC customer interested in self-generating electrical energy to fully supply his or her own premises utilizing a renewable or alternative energy generator, Section 7(6) in the General Regulatory Principles of the *Electricity Regulatory Authority Law (2010 Revision)* will apply which allows generation for self-supply by consumers without licensing by the Authority.[1] A consumer who self-generates electrical energy to fully meet his or her own demand will be doing so outside the terms and conditions of the CUC CORE Program.

2.2 Limitations

Residential customers on this tariff will be allowed to install a renewable or alternative energy generator no greater than CUC's estimate of the customer's peak load or 20 kilowatts alternating current ("kW AC") capacity, whichever is less. Commercial customers on this tariff will be allowed to install a renewable or alternative energy generator of up to CUC's estimate of the customer's peak load or 100 kW AC capacity, whichever is less. CUC will use industry best practices to estimate the CORE Customer's peak load and justify its estimate to the CORE Customer and the ERA.

A maximum aggregate of 2 megawatts ("MW") capacity of renewable and/or alternative energy generation will be allowed to connect to the CUC T&D System. CUC and the ERA will review this aggregate capacity limit annually or when the CORE portfolio is fully subscribed, whichever comes first.

The CORE Customer must be capable of receiving all of his or her electric load requirements from the CUC T&D System. The CORE Customer will be required to make application for such service and comply with CUC's technical and interconnection guidelines. If the proposed CORE generator is greater than the capacity limits allowed by this agreement, the CORE Customer will be required to downsize his or her CORE generator prior to submittal and approval.

2.3 Monthly Consumer Charges and Credits

Monthly Charges to the CORE Customer will incorporate all components of the existing CUC retail rate (see https://www.cuc-cayman.com/billing-rates). The current monthly retail rate to the CORE Customer includes a basic facilities charge, an energy charge, a fuel charge and a charge for Licence and Regulatory Fees.

The monthly charges and credits to the CORE Customer will consist of the following:

- Charges are derived from the CUC retail rate and established by the CORE Customer's Monthly Energy Consumption (as if no CORE generator existed). Subtracted from this amount will be the CORE Credit, as defined below;

- The CORE Credit is determined by the Monthly Generation Output from the CORE generator, as defined on the attached *CORE Interconnection Specification* sheet. It consists of Monthly Generation Output from the CORE generator times the current CORE rate of CI$0.385 per kWh for residential customers and CI$0.375 per kWh for commercial customers;

[1] A customer who self-supplies may require back-up electricity supply from the T&D Licensee at times when they are temporarily unable to satisfy their system demand with the generation resources normally available to them. Section 61 of the *Electricity Regulatory Authority Law (2010 Revision)* outlines the terms for back-up connection to the CUC T&D System for the self-supplying customer.

- In the event that the CORE Credit from Monthly Generation Output exceeds Monthly Charges, the difference will be shown as a credit on the CORE Customer's account and CUC will refund any credit balance remaining at the end of each calendar quarter;

Regardless of the *CORE Interconnection Specification* sheet, the intent of the CUC CORE Program is for the CORE Customer to be paid a CORE Credit for 100 percent of his or her Monthly Generation Output.

2.4 Determination of the CORE Customer's Monthly Generation Output

CUC will install a meter on all AC energy outputs (in kWh) for the CORE Customer as illustrated in the attached diagram titled: *CORE Interconnection Specification* sheet. CUC will have the right to secure the meters and to inspect the interconnection(s) at any time. These meters will be read by CUC either visually or remotely on the normal meter reading schedule. The total kWh output reading on the meter attached to the CORE generator will constitute the Monthly Generation Output.

2.5 Determination of the CORE Customer's Monthly Energy Consumption

Monthly Energy Consumption (in kWh) for a Type A Connection[2] is determined as follows:

> *"Net energy into the CORE Customer's premises through the CUC main meter plus the output reading on the meter attached to the CORE generator."*

Monthly Energy Consumption (in kWh) for a Type B Connection[3] is determined as follows:

> *"Net energy into the CORE Customer's premises through the CUC main meter."*

3. General Terms and Conditions

3.1 Compliance

The parties to this CORE Credit Agreement shall ensure that the generating and interconnection systems are compliant with the practices, methods and equipment, as set out in this Agreement, and as may be changed from time to time subject to ERA approval, to ensure the safe and dependable operation of the electrical equipment, and that such systems comply with the *Electricity Law (2008 Revision), Electricity Regulations (2005 Revision)*, the National Electric Code ("NEC"), IEEE Standard 1547, UL Standard 1741.

3.2 Term of the CORE Credit Agreement

The term of the CORE Credit Agreement is 20 years. Residential customers approved under this tariff will receive CI$0.385 for every kWh of CORE generator output. Commercial customers approved under this tariff will receive CI$0.375 for each kWh of CORE generator output. If the CORE rate increases or decreases from the current level, the CORE Customer will receive the new CORE rate for each kWh of CORE generator output until either (i) the next CORE rate change or (ii) the completion of the CORE Credit Agreement. Future changes to the CORE rate can either increase or decrease, at the determination of CUC and the ERA, but cannot decrease below the 2011 CORE rate of CI$0.37 per kWh for residential customers and CI$0.37 per kWh for commercial customers. CORE Customers signed up prior to August 20, 2012 will also receive the new residential and commercial CORE rates.

3.3 Installation of the Disconnect

The design, installation, operation and maintenance of the CORE generator shall comply with CUC approved control and protection equipment and a manual load-break disconnect device lockable in the open position and accessible by CUC as a means of electrically isolating the CORE generator from the CUC T&D System, and to establish working clearance for maintenance and repair work in accordance with accepted electrical practice.

[2] See the *CORE Interconnection Specification* sheet.

[3] See the *CORE Interconnection Specification* sheet.

The load-break disconnect device shall be furnished and installed by the CORE Customer and is to be connected between the CORE generator and the CUC T&D System. The disconnect device shall be located in the immediate vicinity of the electric meter at the main service entrance or, with prior approval by CUC, may be located at an alternate location which is accessible by CUC personnel on a 24-hour basis. The disconnect device shall be clearly labeled "CORE System Disconnect". With reasonable notice given to the CORE Customer, CUC shall have the right to inspect the CORE generator.

3.4 Notice

The CORE Customer shall provide CUC with at least thirty (30) days advance written notice for the following:

- Any proposed changes to the CORE generator that may materially affect its interaction with the CUC T&D System;
- Any change in ownership of the premises; or
- Any increase in the total capacity of the CORE generator.

3.5 Permits and Licences

The CORE Customer shall obtain, at his or her expense, any and all authorizations, permits and licences which may be required for the construction and operation of the CORE generator.

3.6 Metering

CUC shall supply, own, maintain and read all necessary meters utilized for monthly charges and credits. The CORE Customer shall supply, at no expense to CUC, a suitable location for meters.

The CORE Program requires two meters in one of two suggested configurations (see the *CORE Interconnection Specification* sheet and accompanying notes). For ease of understanding, these two configurations are referred to as "Customer Tie" and "Grid Tie".

"Customer Tie" (Type A Connection) – Under this configuration, the output of the CORE generator is metered and connected to the CORE Customer's premises at some point "downstream" of his or her main meter. Therefore, the main meter reading is net of the CORE generator output. For billing purposes, the usage is calculated by adding both the electricity supplied from the CUC T&D System and the electricity supplied from the CORE generating system while subtracting the electricity exported to the CUC T&D System. Because the renewable or alternative generator is tied directly into the CORE Customer's premises, the potential advantage of this arrangement is the use of the CORE generator to supply the premises during system outages.

"Grid Tie" (Type B Connection) – Under this configuration, the output from the CORE generator is metered and fed directly into the CUC T&D System "upstream" of the main meter serving the CORE Customer. The CORE Customer's main meter measures the gross consumption of his or her premises while the CORE meter measures the output of the CORE generator. This is the simpler approach and reflects the basic concept of a "feed-in" to the CUC T&D System.

3.7 Indemnification

Each party shall hold harmless and indemnify the other party and the directors, officers, authorized agents, and employees of the other party against and from any and all loss and liability for injuries to persons including employees and authorized agents of either party, and damages, including property of either party, resulting from or arising out of (i) the engineering, design, construction, maintenance, or operation of, or (ii) the making of replacements, additions, or betterments to the facilities which are required for the interconnection and parallel operation of the CORE generator with the CUC T&D System. Neither party shall be indemnified for liability or loss resulting from its sole negligence or willful misconduct.

3.8 Continuity of Service

Although CUC will use industry best practices to provide continuous service, there may be occasions requiring the interruption of service to the CORE Customer. Continuity of service may be interrupted under the following conditions:

1. Notification will be given whenever CUC requires the CORE Customer to temporarily curtail, interrupt or reduce deliveries of electrical energy when necessary in order for CUC to construct, install, maintain, repair, replace, remove, investigate or inspect any of CUC's equipment or any part of its T&D System affected by the planned undertakings. CUC will plan work at a time, if at all practical, which will cause the least inconvenience to those customers who may be affected, and;

2. No notification will be given in those instances in which CUC determines that such curtailment, interruption or reduction is necessary because of system emergencies, forced outage, or compliance with standard electrical practice. The CORE Customer shall not be entitled to any priority for restoration of service after a power outage.

3.9 Additional Equipment

CUC is not required to install any additional distribution equipment for the CORE Customer that would not normally be afforded to other customers in a similar rate class and at a similar location. If the CORE Customer requests any such additional distribution equipment to be installed, the full cost of these additions shall be at the expense of the CORE Customer, which will be billed by CUC to the CORE Customer at cost.

3.10 Safety

If at any time CUC determines that the continued operation of the CORE generator may endanger any person or property or the CUC T&D System, or have an adverse effect on the safety or power quality of other CUC customers, CUC shall have the right to disconnect the CORE generator from the CUC T&D System and the CORE Customer will be promptly informed in writing of the action taken and the reasons for such action. The CORE generator shall remain disconnected until such time as CUC and the Government Electrical Inspector are satisfied that the endangering or power quality conditions have been corrected and CUC shall not be obligated to accept any electrical energy from the CORE Customer during such period. CUC shall not be liable directly or indirectly for the acts or omissions of the CORE Customer that result in loss or injury, including death, to any third party. It is the responsibility of the CORE Customer to protect his or her generator from voltage imbalances from the CUC T&D System or reclosing operations after a power interruption.

3.11 Power Factor

The CORE generator will be designed to operate at a power factor of at least 0.90 lagging. The CORE Customer is encouraged to consult with CUC during the design stage to ensure his or her generator will operate at the required power factor.

a. Termination of Agreement

The CORE Customer may terminate this CORE Credit Agreement at any time by giving a minimum five (5) business days' written notice to both CUC and the ERA. The written notice must specify the date of termination and reasons for termination. CUC, subject to ERA approval, may at any time give the CORE Customer five (5) business days' written notice of termination of this CORE Credit Agreement if the CORE Customer violates the *Electricity Law (2008 Revision), Electricity Regulations (2005 Revision)*, the National Electric Code ("NEC"), IEEE Standard 1547, UL Standard 1741, the terms of this CORE Credit Agreement or fails to correct any violation from Section 3.10 within the time period of five (5) business days of receiving written notification from CUC. The CORE Customer acknowledges that upon termination of the CORE Credit Agreement it would be a violation of the *Electricity Regulatory Authority Law (2010 Revision)* to operate the CORE generator while being interconnected to the CUC T&D System and any such operation shall be considered an unauthorized connection of service and CUC will seek to apply appropriate fines or other prescribed penalties. This does not apply to stand-alone systems[4] which are not interconnected to the CUC T&D System.

[4] Electric power systems independent of the CUC T&D System.

CUC may also terminate this CORE Credit Agreement if the CORE Customer fails to execute any of the following:

A. Receive Central Planning Authority approval for the premises that will contain the CORE generator within four (4) months of this CORE Credit Agreement being approved;

B. Start construction on the premises that will contain the CORE generator within four (4) months following receipt of the Central Planning Authority approval referred to in item (a);

C. Receive a Certificate of Occupancy within twelve (12) months following the start of construction for residences and eighteen (18) months for commercial buildings.

The CORE Customer may apply to CUC and the ERA for an extension to any of the above, which must be accompanied by proof of progress. CUC and the ERA will review each application for extension on a case-by-case basis and will approve applications that demonstrate reasonable progress.

*A copy of this agreement will be supplied to the ERA immediately upon signature and submittal by the CORE Customer to CUC.

IN WITNESS WHEREOF the parties have executed this Agreement:

CORE Customer:

By: _____ Date: _____

Print Name: _____

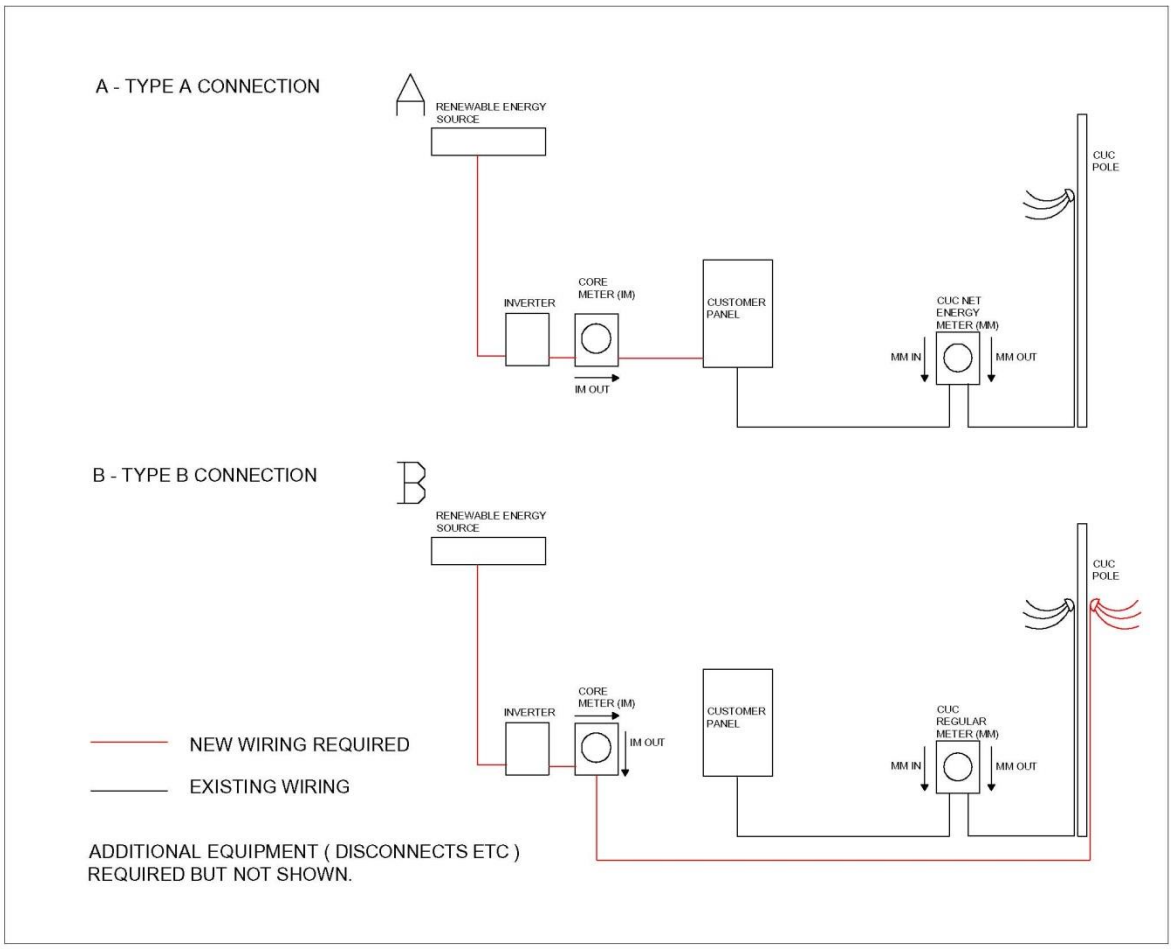
Caribbean Utilities Company, Ltd.:

By: _____ Date: _____

Sacha Tibbetts
Manager Engineering & Customer Service
Caribbean Utilities Company, Ltd.

*Final signed agreement to be supplied by CUC to ERA within 5 days of signature.

CORE Interconnection Specification *



Calculations used in Monthly Billing:

Monthly Energy Consumption

Consumption for Type A Connection = MM in – MM out + IM1 out
Consumption for Type B Connection = MM in – MM out

Monthly CORE Generation

CORE Generation for Type A Connection = IM1 out
CORE Generation for Type B Connection = IM1 out

Note, the calculation for CORE Generation may be different if battery storage is included.

Note: CUC recognizes that there are several ways of configuring CORE generation systems. These are simplified diagrams and are not intended to represent the requirements for all possible situations. The customer should meet with a CUC representative if their system design varies from the above diagram to agree on any additional system requirements.

Appendix E

Application for Operation of IPP Generation Greater Than 100 kVA in Parallel with the CUC Radial Distribution System

Caribbean Utilities Company Connection Impact Assessment (CIA) Application

General Application Information

This Application Form is for Generators with a project size of greater than 100 kilowatts (kW) who are applying for a Connection Impact Assessment ("CIA"), including:

- New Generators applying for Connection Impact Assessment ("CIA")
- New Generators applying for revision(s) to their original CIA
- Existing Generators to verify information related to current connection to the CUC system. It is part of the overall Distribution Connection Agreement.

For a guide to technical requirements of CUC's projects, refer to the

- CUC Transmission and Distribution Code
- Distributed Generation Technical Interconnection Requirements

Please return the completed form, fees and other required documents by mail to:

Caribbean Utilities Company, Ltd.
457 North Sound Road
P.O Box 38
Grand Cayman KY1-1101
CAYMAN ISLANDS

Important Notes

- Applicants are cautioned NOT to incur major expenses until CUC approves to connect the proposed generation facility.
- All technical submissions (Form B, single line diagrams, etc.) must be signed and sealed by a licensed Professional Engineer (PE or P.Eng.) or Chartered Engineer (C.Eng).
- **All fields below are mandatory, except where noted. Incomplete applications will be returned by CUC.**

Section A – Administrative Information

Date: ____/____/_____ *(dd / mm / yyyy)*

Application Type: ☐ New CIA Application **OR** ☐ CIA Revision/Rework *(list revisions in the box below)*

If this is a CIA revision application, list only the fields that have changed from your previous CIA below:
Example: "Original CIA Project ID#, Contract Number and Type of Connection"

_____

_____

_____

_____

1. **Original CIA Project ID# (if applicable):** _____
   Project Name: _____
2. **Contract Number:** _____
3. **Proposed In- Service Date**: ____/____/_____ *(dd / mm / yyyy)*

Section B – Project Information

4. **Type of connection:** ☐ Single phase **OR** ☐ Three phase

5. **Project Size:** Total requested DG output capacity (maximum DG power output): _____ kW
*(**Note:** The project size must be in agreement with your IPP contract)*

6. **Equipment Capacity:** Nameplate capacity (equipment rating as per manufacturer's stamp): _____kW
*(**Note: See** section 2.1.2 of Interconnection Requirements)*

7. **Project Location:**

Address _____

Lot Number(s) _____

8. **Project Contact Information:**

The Single Point of Contact for the project will be the (choose ONE): ☐ Owner ☐ Consultant

	Generator *(Mandatory)*	**Owner** *(Mandatory)*	**Consultant** *(Optional)*
Company/ Person			
Contact Person			
Mailing Address (Street #)			
Mailing Address (Suite, Unit #)			
Work Tel. #			
Cell			
Fax			
E-mail			

Preferred method of communication with CUC (check ONE): ☐ E-mail ☐ Telephone ☐ Mail ☐ Fax

9. **Customer Status:**

Is there an existing CUC customer account at the project location? ☐ Yes ☐ No

If yes, what is the CUC account number of the property: _____

Customer name registered on existing Account: _____

Are you the existing account owner? ☐ Yes ☐ No

Nearest pole number serving project location: _____

10. **Fuel / Renewable Energy Type:**

☐ Biomass ☐ Solar (PV) ☐ Gas Turbine

☐ Wind ☐ Diesel Engine ☐ Other (please specify) _____

☐ Water (for water projects please answer (a) and (b) below):

a) Is water your primary energy source? ☐ Yes ☐ No

b) Is your generation facility located on Government property? ☐ Yes ☐ No

Section C – Project Connection Information

In the following section:

- "**Point of Connection**" or "**POC**" means the point where the new Generator's connection assets or new line expansion assets will be connected to the existing CUC distribution system.
- "**Point of Common Coupling**" or "**PCC**" or "**Point of Supply"** means the point where the Generation facility is to connect to CUC's distribution system.
- The **POC** and the **PCC** may be the same, especially if the Generation facility lies along the existing CUC distribution system; or the **PCC** may be located somewhere between the **POC** and the Generation facility if the new line will be owned by CUC. For illustration of the **POC** and the **PCC**, refer to Appendix A (pg. 7) attached.

11. Generation Facility and New Line Map:

On a cut-out from the CUC map, provide the location of the generation facility with proposed line routings for connection to CUC's distribution system. It should identify the Point of Connection, the PCC and the location of new lines between the generation facility and the Point of Connection (i.e. on private property or public road right-of-ways).

Drawing / Sketch No. _____ Rev. _____

12. Connection to CUC Distribution System:

a. Proposed or existing connection voltage to CUC's distribution system (if this is a CIA revision application, list the kV as stated in your original CIA study agreement): _____ kV

b. Station Name: _____

c. Feeder: _____

d. GPS coordinates of the following: *(GPS Format:* ***Latitude, Longitude - Degree Decimal*** *e.g. 49.392, -75.570)*

POC:_____

PCC:_____

Generation Facility:_____

e. Please select ONE applicable connection figure from Appendix A: ☐ A1 ☐ A2 ☐ A3

f. Length of line distance from the POC to the PCC: _____ feet

g. Length of line distance from the PCC to the Generation Facility (refer to Appendix A): _____ft

Conductor type/size: _____/_____

h. Fault contribution from the Generator's Facilities, with the fault location at the PCC:

☐ Three-phase generators: 3-phase short circuit _____

☐ Single-phase generators: 1-phase short circuit _____

NOTES:

- If this project requires line expansion work between the **POC** and **PCC**, CUC will provide a cost estimate to construct any line located on public road right-of-way. The cost estimate will include a breakdown of **Uncontestable** work (i.e. overbuild to existing line) that can only be performed by CUC, as well as **Contestable** work (i.e. new construction/green-field) that can be performed by the Generator/their contractor **or** CUC. (Both **Uncontestable** work and **Contestable** work requires the design to CUC specifications). CUC will become the owner of the line expansion.

- For Generator-owned line, the Generator may choose to apply for installation of the line on existing CUC-owned poles. This is known as an application for **Joint Use (JU**) of poles. If the application is accepted, CUC will provide the Generator with information on initial connection costs, annual pole-space rental and emergency service (ES) fees, and required JU & ES Agreements.

13. Single Line Diagram ("SLD"):

Provide an SLD of the Generator's facilities including the PCC, transformer and connecting station, feeder and supply voltage. SLD Drawing No. _____, Rev. _____

Section D – Generation Characteristics

14. Generation Characteristics

a. **Existing Generation:** Are there any existing generators at the PCC? ☐ Yes ☐ No

b. **Characteristics of Proposed Generation**

NOTE for facilities with multiple generators: *Provide the manufacturer's technical data (electrical) for the generator or inverter. If your generators have different characteristics, please provide the characteristics for each generator on an additional sheet(s).*

Number of generating unit(s): _____
Manufacturer / Type or Model No: _____ / _____
Rated capacity of each unit: _____ kW _____ kVA
Generator Output Voltage _____ kV

Generator Type: ☐ Rotating
☐ Static (PV, fuel cell, battery)

Generator phasing: ☐ single phase
☐ single phase connecting to three phase system
☐ three phase

Power conversion technologies: ☐ Synchronous ☐ Induction ☐ Full inverter interfaced
☐ Other (Please Specify) _____

(If the machine type is "Other", please provide values equivalent to a Synchronous or Induction type Generator)

Limits of range of reactive power at the machine output:
i. Lagging (over-excited): _____ kVAR power factor _____
ii. Leading (under-excited) _____ kVAR power factor _____

Limits of range of reactive power at the PCC:
iii. Lagging (over-excited): _____ kVAR power factor _____
iv. Leading (under-excited) _____ kVAR power factor _____

Maximum Starting inrush current: _____ pu (multiple of full load current)

Generator winding connection: ☐ delta ☐ star

Neutral grounding method of star connected generator:
☐ Solid ☐ Ungrounded ☐ Impedance: R: _____ ohms X: _____ ohms

For Synchronous Units:

a) Nominal machine voltage: _____ kV (LL)
b) Unsaturated reactances on: _____ kVA base _____ kV base
Direct axis subtransient reactance, Xd" _____ pu
Direct axis transient reactance, Xd' _____ pu
Direct axis synchronous reactance, Xd _____ pu
Subtransient time, Td" _____ ms
Transient time, Td' _____ ms
Zero sequence reactance, X0 _____ pu

For Induction Units:

a) Nominal machine voltage: _____ kV
b) Unsaturated reactances on: _____ kVA base _____ kV base

Direct axis subtransient reactance, Xd'' _____ pu

15. Interface Step-Up Transformer Characteristics:

a. Transformer ownership: ☐ Customer / ☐ CUC
If transformer CUC owned, provide the CUC Account No. _____ **OR** complete (b) to (h) below:
b. Transformer rating: _____ kVA
c. Nominal voltage of high voltage winding: _____ kV
d. Nominal voltage of low voltage winding: _____ kV
e. Transformer type: ☐ single phase ☐ three phase
f. Impedances on: _____ kVA base _____ kV base
R: _____ pu, X: _____ pu
g. High voltage winding connection: ☐ delta ☐ star
Grounding method of star connected high voltage winding neutral:
☐ Solid ☐ Ungrounded ☐ Impedance: R: _____ ohms X: _____ ohms

h. Low voltage winding connection: ☐ delta ☐ star
Grounding method of star connected low voltage winding neutral:
☐ Solid ☐ Ungrounded ☐ Impedance: R: _____ ohms X: _____ ohms

NOTES:

- The term 'High Voltage' refers to the connection voltage to CUC's distribution system and 'Low Voltage' refers to the generation or any other intermediate voltage.

16. Intermediate Transformer Characteristics (if applicable):

a. Transformer rating: _____ kVA
b. Nominal voltage of high voltage winding: _____ kV
c. Nominal voltage of low voltage winding: _____ kV
d. Transformer type: ☐ single phase ☐ three phase
e. Impedances on: _____ kVA base _____ kV base
R _____ pu X _____ pu
f. High voltage winding connection: ☐ delta ☐ star
Grounding method of star connected high voltage winding neutral:
☐ Solid ☐ Ungrounded ☐ Impedance: R _____ ohms X _____ ohms

g. Low voltage winding connection: ☐ delta ☐ star
Grounding method of star connected low voltage winding neutral:
☐ Solid ☐ Ungrounded ☐ Impedance: R _____ ohms X _____ ohms

NOTE: The term 'High Voltage' refers to the intermediate voltage that is input to the interface step-up transformer and the 'Low Voltage' refers to the generation voltage.

17. High-Voltage Grounding Transformer Characteristics (if applicable):

Type: ☐ Zig-zag ☐ star-delta
Zig-zag Grounding Transformer zero sequence impedance (Z0): R_____ ohms X _____ ohms
Star-delta Grounding Transformer zero sequence impedance (Z0): R _____ ohms X _____ ohms

18. Load information:

a. Maximum load of DG facility: _____ kVA _____ kW
b. Maximum load current (referred to the nominal voltage at the connection point to CUC system): _____ A
c. Maximum inrush current to loads (referred to the nominal voltage

at the connection point to CUC system): _____ A

Attached Documents:

Item No.	Description	Document No.	No. of Pages
1			
2			
3			

Attached Drawings:

Item No.	Description	Document No.	No. of Pages
1			
2			
3			

Section E – Checklist

Please ensure the following items are completed prior to submission. The application will be returned if CUC determines it is incomplete:

- ☐ Completed Form B stamped by a Professional Engineer
- ☐ Payment in full.
- ☐ Signed Study Agreement (original signature is required)
- ☐ Single Line Diagram (SLD) of the Generator's facilities, must be stamped by a Professional Engineer
- ☐ Map with generator location and PCC marked on map

Appendix A: Illustrations of PCC and Point of Connection

Figure A-1: CUC Owns Entire Tap Line

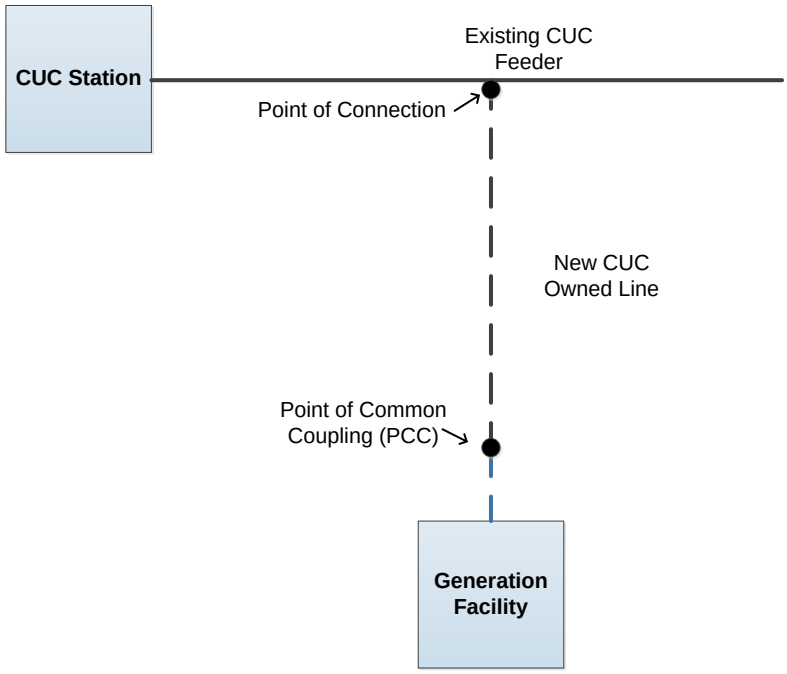


Figure A-2: Generator Owns Entire Tap Line

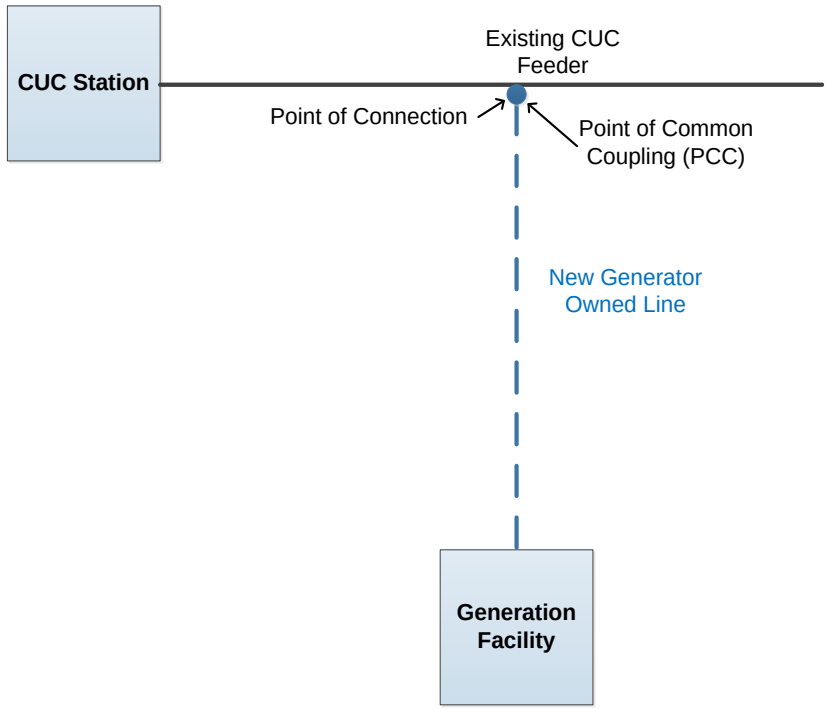
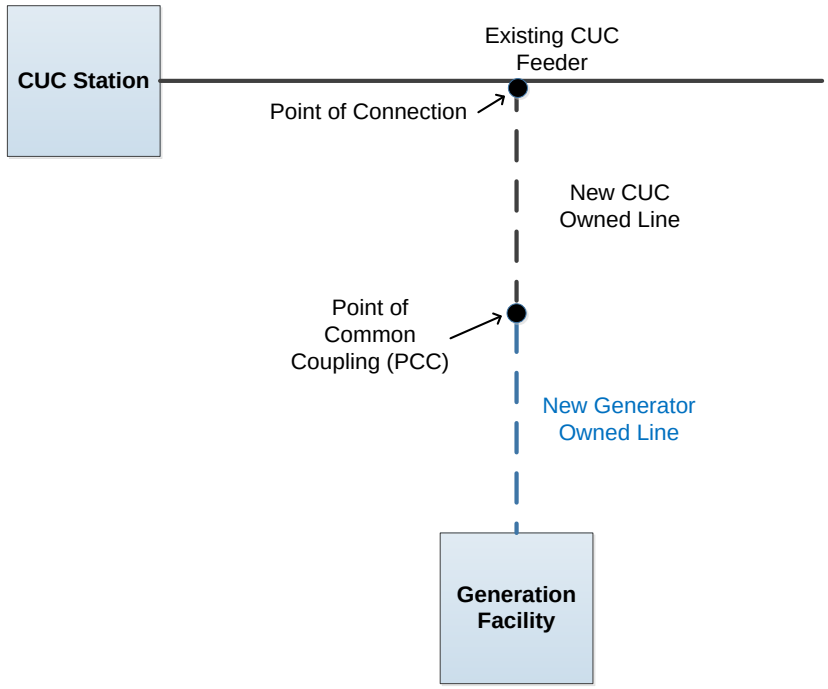
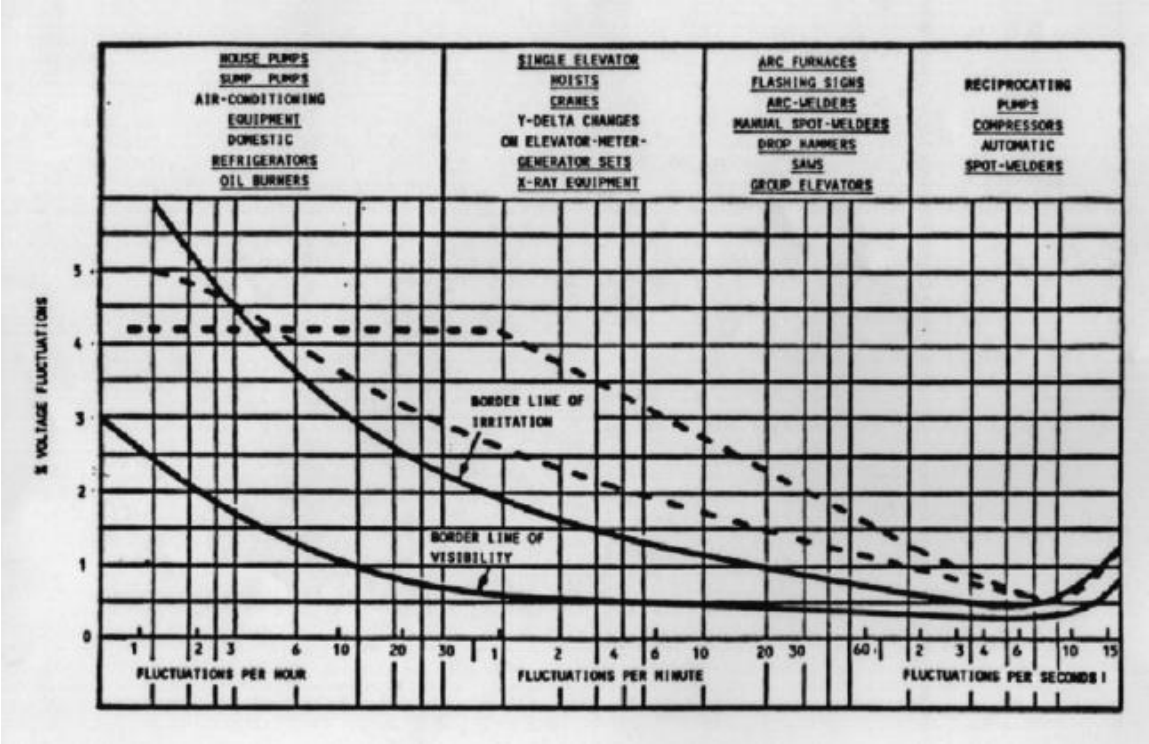


Figure A-3: CUC Owns a Portion and Generator Owns a Portion of Tap Line



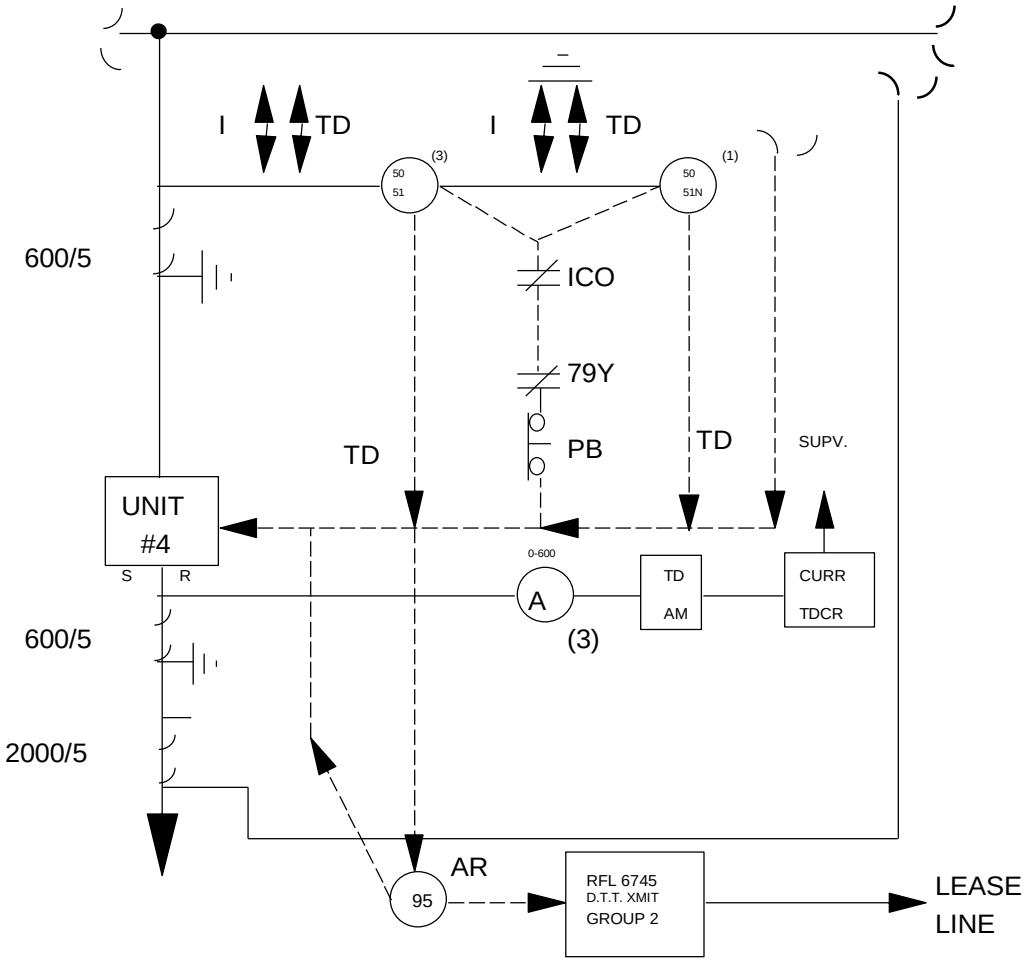
Appendix F

Voltage Flicker Curves



Appendix G

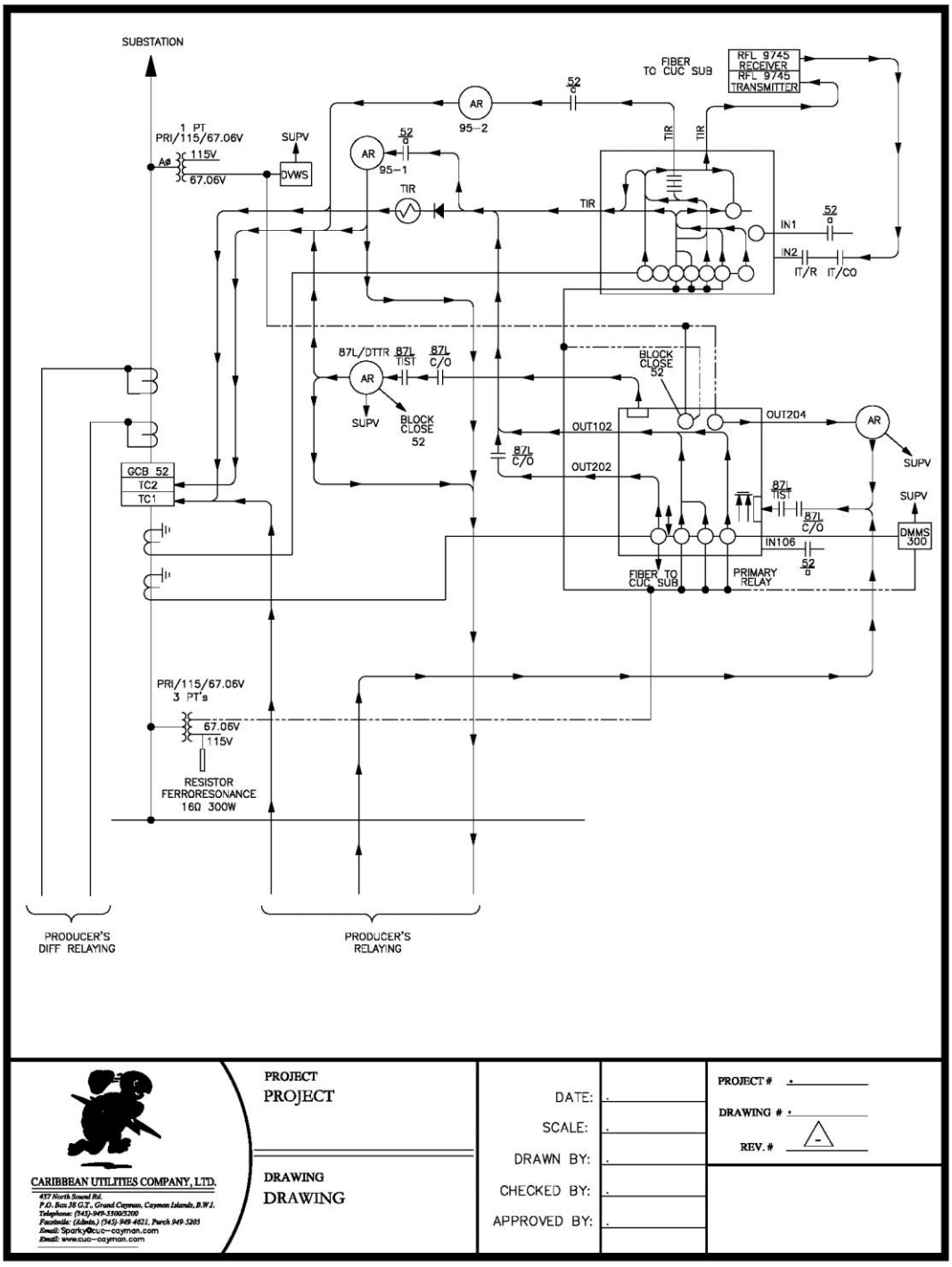
Relaying Functional Example



NOTE: This is a sample of an acceptable Relaying Functional Diagram, and shall only be used for reference purposes.

Appendix G1

Relaying Functional Example 69 kV



Appendix H

Billing Tariff Rates

Effective Date:		To May 31, 2014	From June 1, 2014
Residential: Rate R			
Monthly Facilities Charge		$5.25 per account	$5.17 per account
Plus:	All kWh per month	$0.1065 per kWh	$0.1031 per kWh
General Commercial: Rate C			
Monthly Facilities Charge		$26.24 per account	$28.60 per account
Plus:	All kWh per month	$0.1065 per kWh	$0.1153 per kWh
Large Commercial: Rate L			
Monthly Facilities Charge		$141.72 per account	$150.00 per account
Plus:	First 30,000 kWh per month	$0.1065 per kWh	$0.1153 per kWh
	Over 30,000 kWh per month	$0.0934 per kWh (see Note 2)	$0.0952 per kWh

Notes:

1. The above does not include the following:
   a) Charges for Fuel cost paid by CUC.
   b) Charges for optional services such as the Security Lighting (Dusk to Dawn Lighting). These shall be added to billings as applicable.
2. Customers consuming over 38,800 kWh per month for three (3) consecutive months will be considered Large Commercial Customers. For customers consuming between 30,000 kWh and 38,800 kWh, it is beneficial for the customer to be considered General Commercial Customers and be charged the lower Monthly Customer Charge; therefore they will be classified accordingly as General Commercial Customers.

Consumer-Owned Renewable Energy (CORE) Rates

Effective Date:	To August 29, 2012	From August 30, 2012
Residential: FIT Rate	$0.37 per kWh	$0.385 per kWh
Commercial: FIT Rate	$0.37 per kWh	$0.375 per kWh

Note:

1. The above rate is a Feed-in-Tariff Rate Structure (FIT Rate) as approved by the Electricity Regulatory Authority (ERA)

Appendix I

Application for Electrical Service

Caribbean Utilities Company, Ltd.
Customer Service Department
P.O. Box 38, Grand Cayman KY1-1101
Tel: (345) 949-4300, Fax: (345) 945-1218

Note:
When applying for electrical service, please provide a copy of the lease or ownership papers and a copy of your driver's licence, passport or voter's identification card.

Date service required:
If you are a previous or existing customer, please state Customer Account Number[s]:

Individual Section		
Name:		
Mailing Address:		
Telephone [Home]:	[Work]:	[Cell]:
Telephone number of contact person:		Owner occupied: Yes No
Occupation:		Employed by:
Passport Type and Number:		
Driver's Licence Number:		E-mail:

Corporate Section	
Sole Proprietorship Partnership Company Strata Corporation	
Name of Business:	
Billing Address:	
Telephone[s]:	
Trade & Business Licence No.:	Date of Registration:

Name of Officers/Directors [or attach list with contract]:	Positions held:
1.	1.
2.	2.
3.	3.

Please Note: Only a duly authorised Officer of the above company has the authority to apply for electrical service.

Service Requirements	
Exact street address where service is required: Building/House No.:	Apartment No.:
Street Name:	District:
Telephone number at address requiring electricity service:	
Address where service is required [only if exact street address has not been issued by Government Planning Department]: Registration section: Block: Parcel:	
Please indicate: Permanent supply Temporary supply	
Has electricity been provided previously at this address? Yes No	
Number of bedrooms:	
Do you own the property where service is required? Yes No	
If you are a tenant, state landlords name and telephone number:	
Please tick to indicate if you would like to receive information on any of the following: Security lighting Customer Share Purchase Plan	

Declaration & Agreement

The undersigned declares that the information provided on this application is true and accurate and understands that any false declarations may result in reassessment of deposit and/or disconnection of service. In case of a corporate application, the undersigned confirms that: "I am a duly authorised officer of the company and have the authority to apply for electricity service."

Having agreed to pay/transfer a deposit to Caribbean Utilities Company, Ltd. [CUC], the undersigned hereby applies for service in accordance with the current Schedule of Rates, the Transmission & Distribution Code which includes the Customer Service Code (terms of service) and other terms and conditions of supply that may come into effect from time to time regulating the use and supply of electricity which are on file with CUC, or any effective superseding schedule governing this class of service. The undersigned understands and agrees to the terms herein and acknowledges and agrees to the right of CUC to require security deposits or advance payments where these are deemed appropriate or necessary by CUC. In the case that CUC requests such a deposit, the undersigned agrees to pay the same to CUC forthwith upon demand.

It is further agreed that should CUC or the undersigned terminate this service, the undersigned will be liable for all unpaid amounts and authorise CUC to transfer any outstanding amounts to any of the undersigned's active CUC accounts.

Name: _____ Signature: _____

Position: _____ Date: _____

Acceptance by CUC

Name: _____ Signature: _____

Position: _____ Date: _____

Please Note: Tenants are required to notify CUC upon termination of tenancy.

Appendix J

Schedule of Fees / Equipment Costs

(Effective January 1, 2015)

Deposits:

For residential properties, CUC will assess the monthly usage based on electrical equipment installed and will charge a deposit based on 45 days of estimated usage.

For commercial properties, CUC will assess the monthly usage based on electrical equipment installed and will charge a deposit based on 6 weeks estimated usage.

Metering Equipment:

To be determined based upon current market prices.

Metering Testing:

Meter testing in accordance with section 10.6	$250.00

Disconnect / Reconnect – on Customer's Request:

At the meter	$ 50.00
At the point of connection (i.e. pole, transformer, etc)	$100.00

Disconnect / Reconnect - Non-Payment:

At the meter or metering installation point	$ 60.00

Return Payment fee:

Non Sufficient Funds (NSF) cheque returns	$30.00
NSF for Direct Debit	$30.00

Temp Service Connection:

Usually $270.00, where $120.00 is a customer deposit which is refundable once permanent connection is made and the remaining $150.00 is for the cost of installation. Final charges are determined by CUC's Planning Dept.

Meter/Service Tampering fee:

Tampering fee per occurrence	$500.00

CUC reserves its rights to prosecute offenders in accordance with the law

Energy Audits:

Residential – to be determined on a case by case basis

General Commercial - to be determined on a case by case basis
Large Commercial - to be determined on a case by case basis

Tree Trimming:
To be determined on a case by case basis

Customer References:
Customer Reference Letter $ 25.00

Finance Charges:
A Finance charge at Cayman Islands banks 'published prime lending rate plus 3% p.a. will be assessed on overdue customer accounts beyond 60 days. This rate will change from time to time based on the local bank rates. The minimum finance charge is CI$15.00 per month.

Lighting Rates

	Description				
Rate Code	Lamps	Poles	Service	Acct	Monthly Rate
D1	100W HPS	ExDist	OH	G	$2.74
D1	100W HPS	ExDist	OH	P	3.74
D6	100W HPS	35 ft WD	OH	P	9.93
D4	250W HPS	ExDist	OH	G	2.87
D4	250W HPS	ExDist	OH	P	3.87
D5	400W HPS	ExDist	OH	G	3.23
D5	400W HPS	ExDist	OH	P	4.23
D8	1000W HPS	ExDist	OH	G	5.68
DA	100W HPS	35 ft AL1	UG	G	64.68
DA	100W HPS	35 ft AL1	UG	P	65.68
DB	250W HPS	35 ft AL1	UG	G	64.81
DB	250W HPS	35 ft AL1	UG	P	65.81
DC	400W HPS	35 ft AL1	UG	P	66.17
DJ	250W HPS	35 ft AL1	UG	G	33.84
DK	400W HPS	50 ft AL4	UG	G	23.45
DF	1000W SEC LIGHT	50 ft WD	UG	P	67.32
DH	100W HPS	20 ft AL	UG	G	62.18

[1] The above does not include the charges for fuel costs paid by CUC. Fuel cost rates for Lighting are subject to change on a quarterly basis

Charge out Rates:
Normal Working Hours
Supervisor $54.00 / hr

Journeyman Technician (i.e. Lineman)	$46.00 / hr
Apprentice	$32.00 / hr

Charges for time outside Normal Working hours will be at 1.5 times the normal rates except for Sundays and Public Holidays which will be at 2.0 times the normal rates. The above rates are subject to change annually.

Equipment Rates	
Bucket Truck	$45.00/hr
Pole Planting Truck	$50.00/hr
Pick up Truck	$15.00/hr

Appendix K

Damage Claim Procedure

Date Issued: February 15th, 2010
Date Revised: November 16, 2011

Approved by: [Signed] Manager, Customer Service
[Signed] VP Transmission & Distribution

PURPOSE:
To provide guidelines that will enable customers to formally submit claims to the CUC and receive a response in a timely and consistent manner.

SCOPE:
Payment of customer damage claims will normally be considered only when there is reasonable evidence to indicate that the damage resulted from negligence on the part of the Company or its employees, or from a situation that could have been corrected by the Company, but was not done for reasons other than negligence.

The co-ordination and handling of the customer claim rests with the Customer Service Department. Final approval for payment rest with the Manager, Customer Service, VP of Transmission & Distribution (VP T&D) or designate.

PROCEDURE:
Customer claims should be in the form of a written letter and include any invoices paid or estimates for repair or replacement of damaged equipment. The completed claims report must be forwarded to the Supervisor of Customer Service within 30 days of the damage occurring.

Customers should, where possible, wait for a decision on their claim before paying for equipment repairs or replacements. For claims that CUC agrees to settle, if it is determined that the equipment cannot be repaired, the Company will pay to have the damaged equipment replaced with equipment that is similar in type and value.

CUC will investigate the claim to identify the equipment damaged, the time and cause of damage and will prepare a written response within 10 days of receipt of the claim which will be issued to the Customer by the Supervisor of Customer Service. In the case where a payment is to be made, the Customer will be asked to sign a Damage Claim Release Letter prior to CUC issuing the check. If CUC determines that it is not responsible for the damages and will not make payment on the claim the results of the investigation and the reason(s) that the claim was denied will be communicated in writing to the Customer.

Nothing in the procedure set out in this appendix will operate to exclude or deny any remedies that Customers may be entitled to under any Cayman Islands Law, Rule or Regulation.

Appendix L

Dispute Resolution Procedure for Customers

Date Issued: February 15th, 2010
Date Revised: November 16, 2011

Approved by: Dana Smith, Manager, Customer Service; Andrew E. Small, VP Transmission & Distribution

PURPOSE:

The purpose of this policy is to outline a process for the orderly resolution of complaints or disputes raised by customers that involve or relate to electric bills issued to customers by Caribbean Utilities Company, Ltd (CUC).

SCOPE:

This procedure covers the request for information, the filing of a complaint and the methodology for resolving any dispute that may arise.

In the event of electricity bill disputes, customers are advised to pay all their electric bills during the Dispute Resolution Process. Late payment charges will continue to accrue until the disputed bills are paid in full unless the bills are found to be incorrect, in which case, all the charges associated with the dispute will be reimbursed or credited to the customer's account.

PROCEDURE:

Request for Information

Customers may request an explanation of their bill from the Customer Service department at any time by the following methods:
By calling the Call-Center at (345) 949-5300
By visiting CUC offices – 457 North Sound Way or
By e-mail to service@cuc.ky

Customers that are not satisfied with the bill explanation, may request a formal review of their charges. Customer disputes must be submitted in writing to CUC's Manager, Customer Service in order to begin the formal review process.

Filing of a Written Complaint – to Manager, Customer Service

All customers have the right to file a formal dispute of their electric bill with CUC. Disputes must be submitted in writing within three months of the date of the bill in question.

CUC will provide a response within 10 business days of receipt of a written complaint. All complaints must be sent to:

Customer Complaint
Attn: Manager, Customer Service
Caribbean Utilities Company, Ltd.
PO Box 38 GT
Cayman Islands KY1-1101

The following information must be included in the complaint letter:

- Identification of service location (street address or block and parcel number)

- The charge in dispute and the date of bill
- Statement of reason(s) why you believe the charge is incorrect
- Any supporting documentation

Filing of an Initial Appeal – to the Vice President of Transmission and Distribution (VP of T&D)
If you are not satisfied with the decision of the Manager, Customer Service you have the right to appeal. CUC must receive your appeal, in writing, no later than 10 business days from the date of the response letter. If you need an extension, you must file a petition before the appeal due date.

To appeal, you must send a written statement to the VP of T&D. This statement must include your block and parcel, your account number, and an explanation as to why you think the charges are incorrect.

The initial appeal must be addressed to:
Initial Appeal
Attn: Vice President of Transmission & Distribution
Caribbean Utilities Company Ltd.
P.O. Box 38 GT
Grand Cayman
Cayman Islands, KY1-1101

Please indicate in the subject line of your letter "INITIAL APPEAL." The following must be included in the Initial Appeal letter:

- Identification of the property (block and parcel number or street address)
- The charge in dispute and the date of the bill
- Statement of reason(s) why you believe the charge is incorrect
- Any supporting documentation

The VP of T&D will then render a decision, in writing, on your appeal within 30 days of receipt.

If the VP of T&D decides the charges are correct, payment must be made in full immediately to avoid disconnection of service. If the charges are determined to be incorrect by the VP of T&D the customer's account will be corrected immediately.

If the decision of the VP of T&D is not satisfactory, Customers may file a complaint with the Electricity Regulatory Authority (ERA). Please refer to the ERA's website (www.caymanera.ky) for a description of the ERA's complaints procedure.

Appendix M

CUSTOMER SERVICE PERFORMANCE STANDARDS

CUC to submit proposed Customer Service Performance Standards to ERA for approval within 60 days of Approval of the T&D Code. Said Standards to be included as a separate appendix in Customer Service Code "Appendix G."