

**GRENADA ELECTRICITY SECTOR
GRID CODE**



GENERATION CODE

October 2019

ARRANGEMENT OF REGULATIONS

GC 1	INTRODUCTION TO THE GENERATION CODE	9
GC 1.1	INTRODUCTION	9
GC 1.2	PURPOSE	9
GC 1.3	STRUCTURE OF THE GENERATION CODE	9
GC 1.4	OBLIGATIONS OF COMBINED NETWORK AND GENERATION LICENSEE	9
GC 1.4.1	NETWORK LICENSEE ROLES UNDER GENERATION CODE	9
GC 1.4.2	GENERATOR ROLES UNDER GENERATION CODE	10
GC 2	INTERCONNECTION CONDITIONS	11
GC 2.1	INTERCONNECTION CONDITIONS AND METHODS	11
GC 2.2	INTERCONNECTION AGREEMENTS	11
GC 2.3	INTERCONNECTION POINT AND RESPONSIBILITIES	11
GC 2.3.1	BOUNDARY OF RESPONSIBILITY	11
GC 2.3.2	INTERCONNECTION POINT	11
GC 2.3.3	GENERATOR AND NETWORK LICENSEE RESPONSIBILITIES CONCERNING INTERCONNECTION ..	12
GC 2.4	GENERATOR SUPPLY VOLTAGE	13
GC 2.4.1	VOLTAGE LEVEL	13
GC 2.4.2	VOLTAGE AT INTERCONNECTION POINT	13
GC 2.4.3	SMALL RENEWABLE ENERGY SELF-GENERATORS	13
GC 2.4.4	NETWORK LICENSEE DETERMINATION	13
GC 2.5	CONFIGURATION OF SUBSTATIONS	13
GC 2.5.1	GENERATION SUBSTATION REQUIREMENTS	13
GC 2.5.2	GENERATION SUBSTATION EQUIPMENT	13
GC 2.6	GENERATOR PERFORMANCE STANDARDS AND TECHNICAL CRITERIA STANDARDS	14
GC 2.7	PERFORMANCE STANDARDS	14
GC 2.8	STATION CAPABILITIES	14
GC 2.8.1	SYNCHRONIZING FACILITIES	14
GC 2.8.2	AUXILIARY SUPPLY	14
GC 2.8.3	AUTOMATIC FREQUENCY RESPONSE AND AUTOMATIC VOLTAGE REGULATION	15
GC 2.8.4	CYCLING CAPABILITY	15
GC 2.8.5	GOVERNOR RESPONSE CAPABILITY	16

GC 2.8.6	CAPABILITY	16
GC 2.8.7	FUEL SUPPLY CAPABILITY (THERMAL PLANTS ONLY).....	17
GC 2.9	PROTECTION REQUIREMENTS (REFERENCE IS MADE TO ANSI/IEEE GUIDELINES OR EQUIVALENT). 17	
GC 2.9.1	PROTECTIVE SYSTEM TECHNICAL STANDARDS	18
GC 2.9.2	PROTECTIVE RELAYING EQUIPMENT STANDARDS	18
GC 2.9.3	SPECIFIC INCIDENCE PROTECTIONS	18
GC 2.9.4	TRANSFORMERS	18
GC 2.9.5	INTERCONNECTION	19
GC 2.10	RENEWABLE ENERGY GENERATING UNITS	19
GC 2.10.1	RENEWABLE ENERGY GENERATING UNIT GRID IMPACTS	19
GC 2.10.2	REQUIREMENTS FOR GENERATOR LICENSEES	20
GC 2.10.3	RESPONSIBILITY FOR INVERTER EQUIPMENT AND SETTINGS	22
GC 2.10.4	REQUIREMENTS FOR SMALL RENEWABLE ENERGY SELF- GENERATORS WITH PERMITS.....	22
GC 2.11	EMERGENCY GENERATORS.....	24
GC 2.11.1	PORTABLE EMERGENCY GENERATORS	24
GC 2.11.2	EMERGENCY GENERATOR INSTALLATION STANARDS	24
GC 2.11.3	UNINTERRUPTIBLE POWER SUPPLY	24
GC 2.11.4	EMERGENCY GENERATOR RISKS	24
GC 2.12	GRID PERFORMANCE AND TECHNICAL STANDARDS	25
GC 2.12.1	GRID FREQUENCY.....	25
GC 2.12.2	GRID SYSTEM VOLTAGES.....	25
GC 2.13	SHORT CIRCUIT LEVELS	25
GC 2.14	OTHER NETWORK LICENSEE RIGHTS.....	25
GC 2.14.1	INSPECTION OF GENERATING FACILITIES BY NETWORK LICENSEE.....	26
GC 2.15	DISCONNECTION OF GENERATOR BY THE NETWORK LICENSEE NETWORK LICENSEE	26
GC 2.15.1	DISCONNECTION WITHOUT NOTICE	26
GC 2.15.2	NETWORK LICENSEE DISCONNECTION AUTHORITY	27
GC 2.16	TECHNICAL CRITERIA APPLICABLE TO LICENSE AND PERMIT-EXEMPT SELF-GENERATORS.....	27
GC 3	GENERATION OPERATIONAL METERING.....	27
GC 3.1	GENERATOR OBLIGATIONS	27
GC 3.1.1	METERING SYSTEMS	27
GC 3.1.2	COSTS OF INTERCONNECTION	28
GC 3.2	NETWORK LICENSEE OBLIGATIONS CONCERNING GENERATION METERING CODE OF PRACTICE ...	28
GC 3.2.1	CODE OF PRACTICE FOR GENERATION METERING	28

GC 3.2.2	CODE CONTENTS.....	28
GC 3.3	LOCATION OF METERS.....	29
GC 3.3.1	METER LOCATION	29
GC 3.3.2	OTHER EQUIPMENT	29
GC 3.3.3	INTERCONNECTION AGREEMENT/PPA.....	29
GC 3.4	TECHNICAL STANDARDS FOR OPERATIONAL METERING.....	29
GC 3.4.1	GENERATION METERING STANDARDS.....	29
GC 3.4.2	CURRENT TRANSFORMER SUPPLY OF GENERATION METERING EQUIPMENT.....	29
GC 3.4.3	POTENTIAL TRANSFORMER SUPPLY OF NON-METERING EQUIPMENT.....	29
GC 3.4.4	METER ACCURACY	29
GC 3.4.5	INVENTORY OF METERS FOR GENERATION AND FOR SUPPLY	29
GC 3.5	GENERATION METER SYSTEMS SEALING, FIELD TESTING, INSPECTION	30
GC 3.5.1	GENERATION METER SYSTEM SEALING	30
GC 3.5.2	GENERATION METER SYSTEM FIELD TESTING.....	30
GC 3.5.3	GENERATION METER SYSTEM INSPECTION EQUIPMENT.....	30
GC 3.5.4	GENERATION METER SYSTEM WIRING	30
GC 3.5.5	GENERATION METER INSPECTION PROTOCOLS.....	31
GC 3.6	METER DATA READING PROCEDURES.....	31
GC 3.7	FREQUENCY OF READING	32
GC 3.7.1	DEMAND INTERVAL.....	32
GC 3.7.2	TIME OF NETWORK LICENSEE METER READING.....	32
GC 3.7.3	CLOCK DRIFT.....	32
GC 3.7.4	OTHER REQUIREMENTS	32
GC 3.8	CONTROL PROCEDURES.....	33
GC 3.8.1	CUSTOMER NOTICE OF METER READING.....	33
GC 3.8.2	RECORDS.....	33
GC 3.9	METER READING RECONCILIATION PROCEDURES.....	33
GC 3.9.1	USE OF BACKUP METERING SYSTEM	33
GC 3.9.2	PRIMARY METERING SYSTEM FAILURE PROCEDURES.....	33
GC 3.10	RESOLUTION OF DISPUTES OVER RECORDED METERING DATA.....	34
GC 3.10.1	METERING DISPUTE RECONCILIATION.....	34
GC 3.10.2	SMALL RENEWABLE ENERGY SELF-GENERATOR RECONCILIATION.....	34
GC 4	GENERATION SCHEDULING (UNIT COMMITMENT) AND DISPATCH	34
GC 4.1	CRITERIA FOR SCHEDULING AND DISPATCH	34

GC 4.2	MERIT ORDER SCHEDULING.....	34
GC 4.2.1	MERIT ORDER RANKING ESTABLISHMENT	34
GC 4.2.2	MERIT ORDER METHODOLOGY.....	34
GC 4.3	ECONOMIC DISPATCH OF GENERATORS.....	36
GC 4.4	REVIEW OF MERIT ORDER.....	36
GC 4.4.1	FOSSIL FUEL GENERATORS.....	36
GC 4.4.2	RENEWABLE GENERATORS	37
GC 4.5	SYSTEM SECURITY STANDARDS	37
GC 4.5.1	SPINNING RESERVE	37
GC 4.5.2	OPERATING RESERVE	37
GC 4.5.3	SYSTEM EMERGENCY	38
GC 4.6	UNIT COMMITMENT SCHEDULING AND SYSTEM OPERATION	38
GC 4.6.1	NETWORK LICENSEE OBLIGATION	38
GC 4.6.2	DECLARATION OF PLANT AVAILABILITY AND CAPACITY	38
GC 4.6.3	WEEKLY UNIT COMMITMENT SCHEDULE.....	38
GC 4.6.4	DAILY UNIT COMMITMENT SCHEDULE	38
GC 4.7	PREPARATION OF UNIT COMMITMENT SCHEDULE.....	38
GC 4.7.1	FACTORS CONTROLLING UNIT COMMITMENT SCHEDULE.....	38
GC 4.7.2	DAILY REPORTING DEADLINES	39
GC 4.7.3	UPDATES	39
GC 4.7.4	NOTIFICATION OF COMMITMENT	39
GC 4.8	DISPATCH INSTRUCTIONS TO DISPATCHABLE UNITS.....	39
GC 4.8.1	REAL POWER (KW)	39
GC 4.8.2	REACTIVE POWER (KVAR).....	40
GC 4.8.3	ANCILLARY SERVICE.....	40
GC 4.9	INSTRUCTION TO SYNCHRONIZE / DESYNCHRONIZE.....	40
GC 4.10	FREQUENCY AND VOLTAGE CONTROL.....	40
GC 4.10.1	DISPATCH INSTRUCTIONS	40
GC 4.10.2	AUTOMATIC GENERATION CONTROL	40
GC 4.10.3	NETWORK LICENSEE RESPONSIBILITY IN SYSTEM CONTROL.....	41
GC 4.10.4	GENERATOR RESPONSIBILITY	41
GC 4.10.5	CHANGES TO GENERATION CONDITIONS	42
GC 4.11	NETWORK LICENSEE SWITCHING PROCEDURE AND INSTRUCTIONS.....	42
GC 4.12	NON-DISPATCHABLE GENERATING UNITS.....	42

GC 4.12.1	OPERATIONS	42
GC 4.12.2	COMMUNICATIONS	42
GC 5	COMMUNICATION AND REPORTING	42
GC 5.1	DESIGNATED COMMUNICATIONS CONTACT	43
GC 5.1.1	NETWORK LICENSEE RESPONSIBILITIES	43
GC 5.1.2	GENERATOR RESPONSIBILITIES.....	43
GC 5.2	NETWORK LICENSEE RECORD OF DISPATCH.....	43
GC 5.3	GENERATOR OPERATIONS LOG	44
GC 5.4	FUEL SUPPLY PLAN	45
GC 5.5	FUEL SUPPLY AGREEMENT.....	45
GC 5.5.1	FUEL SUPPLY AGREEMENT	45
GC 5.5.2	GENERATOR RESPONSIBILITIES.....	45
GC 6	GENERATOR SCHEDULING & DISPATCHING TOOLS	46
GC 6.1	NETWORK LICENSEE TOOLS.....	46
GC 6.1.1	NETWORK LICENSEE OBLIGATION	46
GC 6.1.2	DECISION MAKING MECHANISMS	46
GC 6.1.3	SYSTEM DISPATCH AND OPERATIONS UPDATE.....	46
GC 6.1.4	COMMUNICATION OF PROCEDURES	46
GC 6.1.5	DISPATCH TOOL	46
GC 6.2	TRANSPARENCY AND FAIRNESS.....	46
GC 7	LOAD SHEDDING AND POWER RESTORATION.....	47
GC 7.1	LOAD SHEDDING PROCEDURES	47
GC 7.1.1	UNDER FREQUENCY (AUTOMATIC) LOAD SHEDDING	47
GC 7.2	LOW FREQUENCY ALARMS	47
GC 7.2.1	GENERATION ALARMS	47
GC 7.2.2	NETWORK LICENSEE ALARMS	47
GC 7.3	ACTION AT LOW FREQUENCY ALARMS.....	47
GC 7.3.1	GENERATOR ACTION.....	48
GC 7.3.2	CONSULTATION REQUIRED.....	48
GC 7.3.3	GENERATOR RESPONSE TO LOSS OF GENERATING UNIT	48
GC 7.4	ACTION BELOW 49.5 HZ.....	48
GC 7.4.1	GENERATOR ACTION.....	48
GC 7.4.2	NETWORK LICENSEE LOAD SHEDDING.....	48
GC 7.5	ACTION BELOW 48.5 HZ AND FALLING	48

GC 7.5.1	GENERATOR OBLIGATION	48
GC 7.5.2	SYSTEM RESTORATION	48
GC 7.6	MANUAL LOAD SHEDDING	49
GC 7.6.1	NETWORK LICENSEE RESPONSIBILITY	49
GC 7.6.2	BLOCK IMPLEMENTATION	49
GC 7.6.3	MANUAL LOAD SHEDDING PROCEDURE	49
GC 7.6.4	SCHEDULE COMPLIANCE	49
GC 7.6.5	CRITICAL LOAD	49
GC 7.6.6	PRIOR NOTICE FOR CRITICAL LOAD	49
GC 7.6.7	MINIMIZING IMPACTS.....	49
GC 7.6.8	FREQUENCY TARGET VARIATION	50
GC 7.6.9	SUBSTATIONS WITH AUTOMATIC ON-LOAD TAP CHANGERS	50
GC 7.6.10	REPORTING ADVERSE EFFECTS ON GENERATING UNITS	50
GC 7.7	CONTINGENCY PLANS FOR POWER RESTORATION	50
GC 7.7.1	PROCEDURES FOR RESTORATION OF POWER FOLLOWING WIDESPREAD BLACKOUT.....	50
GC 7.8	PERIODIC REVIEW OF RESTORATION PLAN	51
GC 7.8.1	RESTORATION PLAN UPDATES	51
GC 7.8.2	AUDIT OF IMPLEMENTATION CAPACITY	51
GC 8	GENERATOR MAINTENANCE PLANNING.....	51
GC 8.1	LONG TERM MAINTENANCE	51
GC 8.2	PLANNING HORIZON	51
GC 8.3	ANNUAL COMMITMENT OF MAINTENANCE PROGRAM	52
GC 8.4	CHANGES TO THE COMMITTED MAINTENANCE SCHEDULES	52
GC 8.5	SHORT TERM OUTAGE PROGRAM	53
GC 9	TESTING AND MONITORING PROCEDURES.....	53
GC 9.1	GENERATOR TEST TIMETABLE	53
GC 9.2	STANDARD TESTS.....	53
GC 9.3	TESTS TO BE COMPLETED PRIOR TO FIRST SYNCHRONIZATION OF A GENERATING UNIT	53
GC 9.3.1	PRE-SYNCHRONIZATION OF GENERATION UNIT	53
GC 9.3.2	MANDATORY FACTORY TESTS.....	53
GC 9.3.3	ADDITIONAL TESTING	54
GC 9.3.4	NOTICE OF TEST PROGRAM.....	54
GC 9.3.5	INDIVIDUAL TEST RESULTS.....	54
GC 9.3.6	ALL TEST RESULTS	54

GC 9.4	TESTS TO BE COMPLETED AT THE SITE OF NEW GENERATING FACILITY	54
GC 9.4.1	MANDATORY SITE TESTS	54
GC 9.4.2	INDIVIDUAL TEST RESULTS	55
GC 9.4.3	ADDITIONAL TESTING	55
GC 9.4.4	NOTICE OF TEST PROGRAM	55
GC 9.5	TESTS TO BE COMPLETED AFTER FIRST SYNCHRONIZATION	55
GC 9.5.1	ADDITIONAL PRE-COMMISSIONING TESTING	55
GC 9.6	TESTS TO BE COMPLETED BY CO-GENERATORS AND NON- DISPATCHABLE GENERATORS.....	57
GC 9.7	TESTING OF METERING SYSTEM	57
GC 9.8	MONITORING	57
GC 10	GENERAL PROVISIONS	57
GC 10.1	UNFORESEEN CIRCUMSTANCES AND SYSTEM EMERGENCIES UNFORESEEN CIRCUMSTANCES...	57
GC 10.1.1	CONSULTATION AND DECISION RESPONSIBILITY.....	57
GC 10.1.2	REFERRAL TO GRID CODE REVIEW COMMITTEE	58
GC 10.2	FORCE MAJEURE	58
GC 10.3	NON-COMPLIANCE	58
APPENDIX A	59
APPENDIX B	60
APPENDIX C	61
APPENDIX D	62

GC 1 INTRODUCTION TO THE GENERATION CODE

GC 1.1 INTRODUCTION

The Generation Code (the "Generation Code") is the section of the Grid Code that governs the guiding principles, operating procedures and Technical Standards governing operation of the Grid of Grenada and all interconnected Generating Facilities.

GC 1.2 PURPOSE

The Code seeks to facilitate the economic, safe and reliable operation of the Grenada Power System and to avoid any undue discrimination by the Network Licensee among Generators. The provisions of the Code are enforceable under the Electricity Act No. 19 of 2016, as amended by the Electricity Supply (Amendment) Act No. 33, 2017 (the "Act").

GC 1.3 STRUCTURE OF THE GENERATION CODE

The Generation Code consists of ten sections and four Appendices as follows:

Section 1	Introduction to the Generation Code
Section 2	Interconnection Conditions
Section 3	Generation Operational Metering
Section 4	Generation Scheduling (Unit Commitment) and Dispatch
Section 5	Communication and Reporting
Section 6	Generation Scheduling and Dispatching Tools
Section 7	Load Shedding and Power Restoration
Section 8	Generator Maintenance Planning
Section 9	Testing and Monitoring Provisions
Section 10	General Provisions
Appendices	Appendix A Required Communication Equipment Appendix B Key Documents Appendix C Low Voltage/High Voltage Ride-through Appendix D Spinning Reserve Margin Policy

GC 1.4 OBLIGATIONS OF COMBINED NETWORK AND GENERATION LICENSEE

GC 1.4.1 NETWORK LICENSEE ROLES UNDER GENERATION CODE

An entity which holds both a Network License and a Generation License has responsibilities under this Code in two distinct capacities:

GC 1.4.1.1

In its Network Licensee capacity, the entity is responsible for prudent and efficient management of the electricity system of Grenada and, in that capacity, for dealing with all Generators in a consistent and non-discriminatory manner. The Code uses the term

"Network Licensee" whenever referring to the Network Licensee in this capacity; and

GC 1.4.1.2

In its Generation Licensee capacity, an entity is also subject to the rights and obligations in this Code as it applies to Generating Facilities.

GC 1.4.2 GENERATOR ROLES UNDER GENERATION CODE

GC 1.4.2.1

The Generation Code establishes the interconnection requirements and minimum technical and operational criteria for Generators. The Generation Code addresses the three different categories of Generators under the Act:

- (a) A Generation Licensee under Section 14 of the Act, including Independent Power Producers (IPPs) and the Network Licensee's Generating Facilities;
- (b) A Self-Generator, including Small Renewable Energy Self-Generators, who holds a Permit under Section 25 of the Act; and
- (c) A Self-Generator without any interconnection to the Grid who is authorized to operate with a license or permit under Sections 13(2) and (3) and Section 25 of the Act.

GC 1.4.2.2

It is anticipated that the Commission will establish a Self-Generator Program under Section 4(h) of the Act that will establish maximum cumulative generating capacity to be installed by Self-Generators, maximum generating capacity in respect of each Self-Generator, and the criteria for issuance of Self-Generator Permits under Section 25 of the Act. This Generation Code makes two assumptions in anticipation of this Self-Generator Program:

- (a) The Self-Generator Program will continue the current Small Renewable Energy Self-Generator Program currently in effect to the extent that the program provides for simplified and streamlined interconnection requirements and simplified technical design criteria for Self-Generators with renewable energy systems with a rated capacity below 30 kW AC;
- (b) It is unlikely that the Self-Generator Program will include larger renewable energy systems, but even if such Generating Facilities were to be included, those Generating Facilities should be subject to the same interconnection requirements as Generation Licensees from a technical perspective under the Code.

GC 1.4.2.3

A Self-Generator without a License under Section 14 of the Act, or a Permit under Section 25 of the Act, is prohibited from connecting to the Grid. The Generation Code establishes the technical criteria necessary to enable the Network Licensee to monitor and protect the Grid from any unauthorized interconnections or impacts on the Grid from such Self-Generators.

GC 2 INTERCONNECTION CONDITIONS

This Section describes the normal method of connection and the minimum technical, design and operational criteria which must be complied with by all current or prospective Generation Licensees under Section 14 of the Act, and all current or prospective Self-Generator Permit Holders under Section 25 of the Act.

This Section also describes the technical, design and operational criteria for a Self-Generator who is not connected to the Grid and is authorized to operate without a license or permit under Section 13 of the Act.

For the purposes of this Section 2, except as expressly provided, the terms “Generator” and “Self-Generator Permit Holder” do not include Small Renewable Energy Self-Generators. Small Renewable Energy Self-Generators are instead covered by the simplified procedures of the Code of Practice on Small Renewable Energy Self-Generation under Generation Code Section 2.10.4 “Requirements for Small Renewable Energy Self-Generators with Permits” and Supply Code Section 4, “Self-Generators.” As noted in Section 1.4.2.2 above, although it is not anticipated that the Self Generator Program will be expanded to include Self-Generators other than Small Renewable Energy Self-Generators with Renewable Energy Generation systems less than 30kW, or that Permits under Section 25 of the Act would be issued to a broader class of Self-Generators, this Code provides that any such broader class of Self-Generator Permit Holders will be treated in the same manner as a Generation Licensee for purposes of this Section 2.

GC 2.1 INTERCONNECTION CONDITIONS AND METHODS

The TDC 5.3 “Method of Interconnection” sets out in detail the normal method of connection and the minimum technical, design and operational criteria which must be complied with by any Generation Licensee or Self-Generator Permit Holder, as well as the Network Licensee.

GC 2.2 INTERCONNECTION AGREEMENTS

TDC 5.3.1 “Determination of Interconnection Method” describes the method of determining the optimum interconnection method and the development of the Interconnection Agreement, and in some cases a Power Purchase Agreement (PPA), between the Network Licensee and a System User.

GC 2.3 INTERCONNECTION POINT AND RESPONSIBILITIES

GC 2.3.1 BOUNDARY OF RESPONSIBILITY

Unless otherwise negotiated and defined in the Interconnection Agreement, the Interconnection Point will demarcate the boundary of responsibility between the Generation Licensee or Self-Generator Permit Holder and the Network Licensee.

GC 2.3.2 INTERCONNECTION POINT

The Generating Unit(s) shall be interconnected to the Grid via a circuit breaker if the facility's output voltage matches that of the system at the Interconnection Point, or via a Substation. If via a Substation, the Interconnection Point shall normally be on the High Voltage side (Grid side) of the Generating Unit(s) transformer.

GC 2.3.3 GENERATOR AND NETWORK LICENSEE RESPONSIBILITIES CONCERNING INTERCONNECTION

GC 2.3.3.1

The Network Licensee is responsible for assuring that the interconnection requirements of the TDC 5, “Transmission and Distribution Interconnection” and of the Generation Code have been fulfilled, and incorporated as needed into the Interconnection Agreement and/or PPA with the Generator, consistent with the requirements of the Act and this Code. The Network Licensee shall establish the technical design and maintenance requirements for all Interconnection Point Apparatus.

GC 2.3.3.2

A Generation Licensee and a Self-Generator Permit Holder are responsible for the installation of all auxiliary and interconnecting equipment, and all associated costs, on the Generator's side of the Interconnection Point. This shall include the communications equipment required of the Generator by the Generation Code or the Network Licensee listed in GC Appendix A, “Required Communications Equipment.” This requirement also applies to Small Renewable Energy Self-Generator Permit Holders.

GC 2.3.3.3

A Generation Licensee and a Self-Generator Permit Holder are responsible for any injuries to persons or damages to equipment that is attributable to the failure of the Generator's Generating Facility to operate in compliance with this Code. This requirement also applies to Small Renewable Energy Self-Generator Permit Holders.

GC 2.3.3.4

A Generation Licensee and a Self-Generator Permit Holder are responsible to cooperate with the Network Licensee to finalize the number of connection points and the works required to facilitate an interconnection, consistent with the relevant System Analysis Studies set forth in the Transmission and Distribution Section 3, “Transmission and Distribution Planning” (including, but not limited to, Distribution System Impact Studies, Distribution Facilities Detailed Study, Generation Interconnection Feasibility and Generation Interconnection Facilities) at the time of interconnection to the System.

GC 2.3.3.5

A Generation Licensee and a Self-Generator Permit Holder are responsible for all financial costs and all construction associated with the Interconnection Point Apparatus, consistent with the provision of TDC 5.1, “Transmission and Distribution Interconnection,” as modified by any controlling provisions of an Interconnection Agreement and/or PPA, except the costs of interconnection meters, which shall be assessed between the Generator and the Network Licensee consistent with the provisions of GC 3, “Operational Metering” and TDC 17, “Transmission and Distribution Metering.”

GC 2.3.3.6

A Small Renewable Energy Self-Generator who holds a Permit under Section 25 of the Act shall be responsible for the financial costs and all construction associated with the Interconnection Point Apparatus and other Interconnection requirements as set forth in SC 4.2, “Small Renewable Energy Self-Generator Interconnection” and SC 4.2.3 “Small Renewable Energy Generation Code of Practice,” and the related provisions of

GC 2.10.4, “Requirements for Small Renewable Energy Self-Generators With Permits,” and TDC 5, “Transmission and Distribution System Interconnection.”

GC 2.4 GENERATOR SUPPLY VOLTAGE

GC 2.4.1 VOLTAGE LEVEL

The voltage level at which the Generating Unit(s) are interconnected to the Grid will be dependent on, but not limited to, the size, technology and number of units and the other factors that determine the interconnection requirements and the Interconnection Point as defined by the Network Licensee and included in the Interconnection Agreement between the Network Licensee and the Generator.

GC 2.4.2 VOLTAGE AT INTERCONNECTION POINT

Subject to other technical considerations, a Generation Licensee and a Self-Generator Permit Holder shall be interconnected to the Transmission or Distribution System at 33kV, 11kV or 400/230V, as is appropriate for the mutually agreed Interconnection Point.

GC 2.4.3 SMALL RENEWABLE ENERGY SELF-GENERATORS

Small Renewable Energy Self-Generator Permit Holders shall comply with the Generator Supply Voltage requirements referenced in GC 2.3.3.6 concerning interconnection requirements.

GC 2.4.4 NETWORK LICENSEE DETERMINATION

The Network Licensee shall determine the method of interconnection, consistent with the provisions of the Act and this Code.

GC 2.5 CONFIGURATION OF SUBSTATIONS

GC 2.5.1 GENERATION SUBSTATION REQUIREMENTS

As provided in TDC 7.4.7, “Configuration of Substations,” all Generation Substations shall have the capability to disconnect or separate, from the Grid, any transmission line and/or Generating Unit which is interconnected to the Substation. The configuration of the substations shall be determined based upon capacity.

GC 2.5.2 GENERATION SUBSTATION EQUIPMENT

For reasons of ensuring safety and reliability of operation, Generation Substations with more than three transmission lines or Generating Units interconnected to them shall be of a breaker and a half” or “double bus double breaker” configuration. The size of the Generating Units shall be considered for applicability of the breaker and a half requirement. The Substation shall be equipped with all requisite protection measures necessary to meet the Network Licensee’s System performance and protection standards as set out in GC 2.6 “Generation Performance Standards and Technical Criteria Standards” and GC 2.8, “Station Capabilities” below.

GC 2.6 GENERATOR PERFORMANCE STANDARDS AND TECHNICAL CRITERIA STANDARDS

All components of the Generator Substation shall be constructed, installed and tested in accordance with the current edition at the time of construction of the Codes and standards, or their international equivalents as set forth in TDC 7.2, “Substation Plant and Apparatus,” as well as Prudent Utility Practice:

GC 2.7 PERFORMANCE STANDARDS

Each Generating Unit within the Generating Facility of a Generation Licensee or a Self-Generator Permit Holder shall be required, as a minimum, to meet the following performance standards:

- (i.) Sustained operation at any Load within the loading limits within the System frequency range 49.25 Hz to 50.25 Hz during normal operations;
- (ii.) Emergency operation at any Load within the loading limits within the System frequency range 48.5 Hz to 51.5 Hz during exceptional frequency excursion circumstances;
- (iii.) Maintain normal rated output at the Grid voltages specified in GC Appendix C, “Low and High Voltage Ride-Through” and the Interconnection Agreement and/or PPA;
- (iv.) Sustained operation at the rated Power Factor range set out in the Interconnection Agreement and/or PPA; and
- (v.) Compliance with the other Code provisions applicable to the Generating Unit.

GC 2.8 STATION CAPABILITIES

GC 2.8.1 SYNCHRONIZING FACILITIES

Each Generating Unit within the Generating Facility of a Generation Licensee or a Self-Generator Permit Holder shall be equipped with synchronizing facilities to ensure synchronization with the Grid. The synchronization facilities shall include a synchronism check relay to support synchronization under the following range of conditions:

- (i.) A nominal Grid frequency of 50 Hz within a nominal operation band of +/- 0.5%. And
- (ii.) Grid voltages within the limits + 5% - 5% of nominal value voltages on all Generator buses¹, as provided in TDC 3.4.1, “Transmission and Distribution System Security Standards.”

GC 2.8.2 AUXILIARY SUPPLY

Each Generation Licensee or Self-Generator Permit Holder shall have the capacity to service its Auxiliary Supply during the full range of operational conditions, as described

¹ Limitations set in the Electricity Supply Act, 2016 does not allow for such conformity: Set at $\pm 3\%$

below, and shall not be dependent upon the Network Licensee to service its Auxiliary Supply.

GC 2.8.2.1

These Generators shall have the capacity to service its Auxiliary Supply during normal operations and during the abnormal frequency or voltage excursions described in GC Appendix C, “Low Voltage and High Voltage Ride-Through”.

GC 2.8.2.2

These Generators must have the capacity to service its own Auxiliary Supply needs during periods of disconnection from the Grid. The minimum period of time shall be established in the Interconnection Agreement and/or PPA, guided by the principle that the critical electrical systems and the Generating Facility must be available for the Generator to participate in the System Restoration Procedures set forth in TDC 12.5, “System Restoration Procedures.”

GC 2.8.2.3

These Generators must transition into islanding mode following disconnection of the Generating Facility from the Grid, in accordance with the protection provisions in the Interconnection Agreement and/or PPA. The Generator must demonstrate this function of transition to auxiliary load as part of standard commission testing.

GC 2.8.2.4

These Generators must have the capacity to respond as anticipated during Grid restoration, consistent with the requirements of the Grid Restoration Strategy and Procedures set forth in the TDCs 12.4, “System Restoration Strategy” and 12.5, “System Restoration Procedures.”

GC 2.8.2.5

These Generators must have the ability to balance sudden load connections, and the Interconnection Agreement and/or PPA shall address the specifications for the maximum load connection demand and the time between load connection demands.

GC 2.8.3 AUTOMATIC FREQUENCY RESPONSE AND AUTOMATIC VOLTAGE REGULATION

It is required that Dispatch Generating Units have continuously fast acting response automatic governor and excitation control systems to control the Generating Unit's power output and voltage levels without instability of operation within the operating range of the unit.

GC 2.8.4 CYCLING CAPABILITY

The Network Licensee shall assign a dispatch priority to the Generating Units of Generator Licensees. These Generating Units will perform cycling roles determined by the dispatch priority ranking and the demand to be served. Generating Units utilized in a cycling mode by the Network Licensee should be so designed to possess the capability of withstanding the stresses associated with the expected repeated startup and shutdown in its normal operating mode, accommodating at a minimum 350 starts per year. The criteria guiding Generation dispatch priority shall be established based upon the size, efficiency, availability, reserve requirements, maintenance requirements, and load share

requirements of the Units.

GC 2.8.5 GOVERNOR RESPONSE CAPABILITY

The droop characteristics from no load to full load for Generating Units shall be adjustable in the range of 0-5%.

GC 2.8.6 CAPABILITY

GC 2.8.6.1

The Network Licensee shall designate certain Generating Units from any Generation Licensee as having Black Start Capability, primarily considering their type and location on the system. This shall enable Generators to: restart their facilities without incoming supply from the Grid; connect to a Dead Bus; and supply load as necessary. Once on line, Generators are required to be in frequency sensitive mode so as to vary with load changes. In the event of the Generator “black starting” the Grid, the Generator may act, temporarily upon the provision of instructions from the Network Licensee.

GC 2.8.6.2

The specification of the Black Start Generating Unit will be a subject of the Interconnection Agreement and/or PPA between the Network Licensee and the Generation Licensee. Where a Generation Licensee has a Generating Facility interconnected to the Network Licensee’s Transmission System (excluding intermittent Renewable Energy systems with a high and rapid variability), at least two Generating Units shall be designated as Black Start units. Generation Facilities interconnected to the Network Licensee’s Distribution System (excluding intermittent Renewable Energy systems with high and rapid variability) may be designated as a Black Start Generating Facility. As noted in TDC 5.3.8.3, “Interconnection of Generation Licensees and Self-Generators,” the Network Licensee normally will not identify a Self-Generator as a Black Start Generating Facility.

GC 2.8.6.3

At least two Generating Units at every designated Black Start Generating Facility must be designated as first options for black-starting at that station. The Black Start facilities of these Generating Units shall be routinely tested at least once per week by the Generator to ensure satisfactory operation. The Network Licensee shall have the right to require the Generator to demonstrate the performance of the Black Start Capability.

GC 2.8.6.4

The Generator is required to provide a formal report to the Network Licensee detailing the results of each Black Start Generator test.

GC 2.8.6.5

A failed event shall automatically and immediately trigger the reporting of that black start test event by the relevant Generator to the Network Licensee. Any abnormalities or defects must be entered in a Requisition for Maintenance Form, also entered in the Operations Diary and the information passed on to any incoming shift personnel. A follow up report is also to be immediately submitted by the Generator to the Network Licensee upon subsequent successful maintenance and operation of said Black Start Generator.

GC 2.8.7 FUEL SUPPLY CAPABILITY (THERMAL PLANTS ONLY)

GC 2.8.7.1

For those Generator Licensees who are required to supply the Network Licensee with electricity pursuant to a PPA from a Generating Facility that uses gaseous or liquid fuels, (excluding Renewable Energy Systems with on-site fuel production), the Generator shall ensure firm arrangements to maintain at least thirty (30) days of fuel requirement at normal rated output, or any greater minimum requirement provided in the PPA. The arrangement, detailed in GC 5.5 “Fuel Supply Agreement,” may include any of the following:

- (i.) Wholly owned and maintained storage facility;
- (ii.) Supplier owned storage with contractual arrangements guaranteeing the required storage; or
- (iii.) A combination of the above.

GC 2.8.7.2

Prior to a natural disaster, these Generators shall coordinate with and cooperate fully with the Network Operator and emergency management agencies to assure adequate storage for both the Generator’s operations, and for any potential contingent emergency use of the fuels by the disaster management authority to respond to the disaster, subject to appropriate compensation of the Generator. By way of example, the disaster management authorities might instruct the Generator to fully fuel all tanks due to high likelihood of extended disruption of fuel supply deliveries.

GC 2.9 PROTECTION REQUIREMENTS (REFERENCE IS MADE TO ANSI/IEEE GUIDELINES OR EQUIVALENT)

Generation Licensees and Self-Generator Permit Holders are responsible for ensuring that adequate protections are included in the Generating Facility to ensure that Grid operations, including, but not limited to, switching operations, voltage fluctuations, and automatic reclosing, do not cause damage to the Generating Facility. These Generators are responsible for the design, adjustment, and operation of these protection devices, given that these safety devices are primarily designed for the protection of the Generator. In addition, the Generation Licensee and Self-Generator Permit Holder must install all protection devices necessary to assure compliance with the minimum technical standards set forth in this section. In addition, the Network Licensee may require the Generators to provide other protective measures to minimize the risk and/or impact of disturbances on the System with the approval of the Commission. The Interconnection Agreement and/or PPA between the Network Licensee and Generator shall address any necessary safety devices beyond the standards set forth below, consistent with GC 2.13 “Short Circuit Levels” and TD Section 3.7, “Fault Levels.”

The protection measures for the Transmission and Distribution System shall be designed, coordinated, and tested to achieve the desired level of speed, sensitivity, and discrimination to isolate the affected sections of the System while ensuring that the isolated section is narrowly defined to exclude non-affected sections of the System, to the extent feasible, using Prudent Utility Practices.

GC 2.9.1 PROTECTIVE SYSTEM TECHNICAL STANDARDS

Protective systems shall be provided in accordance with the ANSI/IEEE Technical Standards C37.90, C37.90.1, and C37.90.2, and with Prudent Utility Practice.

GC 2.9.2 PROTECTIVE RELAYING EQUIPMENT STANDARDS

All protective relaying equipment shall comply with the appropriate ANSI/IEEE Technical Standards.

GC 2.9.3 SPECIFIC INCIDENT PROTECTIONS

Generating Units shall at a minimum have protection against the following incidences:

- (a) Loss of excitation;
- (b) Under excitation;
- (c) Unbalanced load operation;
- (d) Stator phase faults and earth faults;
- (e) Generating unit differential protection;
- (f) Reverse power protection;
- (g) Main transformer phase and earth faults, HV and LV;
- (h) Station service transformer phase and earth faults, HV and LV;
- (i) Transformer tank sudden pressure and transformer differential;
- (j) Backup protection in the event that external phase and earth faults are not Cleared by remote protection system;
- (k) Backup protection in the event of circuit breaker failure to operate;
- (l) Over and under frequency;
- (m) Over speed;
- (n) Stator over temperature;
- (o) Rotor over temperature;
- (p) Restricted earth faults; and
- (q) Undervoltage and Overvoltage.

GC 2.9.4 TRANSFORMERS

- (a) Differential current protection for generator step-up transformers;
- (b) HV/LV phase and ground overcurrent protection (for station service/unit auxiliary transformers);
- (c) Buchholz and/or Sudden pressure (gas relay);
- (d) Over excitation protection (for generator step-up transformers);

- (e) Backup protection in the event of circuit breaker failure to operate for generator step-up transformers;
- (f) Over-temperature protection (winding and oil); and
- (g) Low oil level.

GC 2.9.5 INTERCONNECTION

- (a) Differential (line current high-impedance) for Phase and earth faults;
- (b) Backup interconnection protection in the event that external phase and earth faults are not cleared by remote protection system;
- (c) Backup protection in the event of circuit breaker failure to operate;
- (d) The protection requirements for the HV interconnection with Grid will depend on the connection voltage and the Substation configuration. The detailed arrangements for each Generating Facility are set out in the respective Interconnection Agreement. In all cases it should be ensured that each Generating Unit can be separated from the Grid as rapidly as possible in the event of a sustained electrical fault on either side of the Interconnection Point;
- (e) The protective relaying systems shall provide the levels of sensitivity, speed and reliability as required by the Network Licensee. The operation of all protection schemes shall be coordinated with the operation of the Network Licensee's equipment; and
- (f) The Generator shall submit the following design data for approval by the Network Licensee:
 - i. Tele-metering single line diagrams;
 - ii. Protection and Metering single line diagrams;
 - iii. Tripping logic diagrams;
 - iv. AC and DC schematic diagrams for the interconnection and Generating Unit protection schemes;
 - v. Setting calculations and setting lists for the interconnection and Generating Unit protection schemes including closing time for major circuit breakers;
 - vi. Rating and transfer function data as required for computer simulation of the Generating Unit(s). This shall include data on the Generating Unit(s), transformer(s), automatic voltage regulator(s) and prime mover governor; and
 - vii. Substation single line diagram.

GC 2.10 RENEWABLE ENERGY GENERATING UNITS

GC 2.10.1 RENEWABLE ENERGY GENERATING UNIT GRID IMPACTS

The intermittent nature of the power supplied to the Grid by many Renewable Energy Generating Units presents significant technical challenges for the Network Licensee in maintaining a reliable and secure source of Supply to all Consumers. This section addresses the additional controls required for Renewable Energy Generating Units to address those technical challenges. These control requirements, together with the planning and analysis requirements of the Transmission and Distribution Code, are designed to maximize the potential for integration of Renewable Energy Generation sources to supply the Grid. The intent is to establish adequate controls to protect the Grid, that are proportionate to the size of the Generator and that do not impose unnecessary or excessive costs on small Generators.

GC 2.10.2 REQUIREMENTS FOR GENERATOR LICENSEES

Generation Licensees and Self-Generator Permit Holders with Renewable Energy Generating Units must be capable of controlling operations consistent with the following requirements on voltage control, system connected transformer configuration, voltage flicker, harmonic distortion, low and high voltage ride-through, and on reconnection of the Generating Facility to Grid after disturbances:

GC 2.10.2.1 Automatic Voltage Regulation (AVR) & Fast Voltage Control:

These Generators must be capable of operating in a voltage control mode that maintains the voltage at the Interconnection Point at a set point provided by the Network Licensee to the Generator. The voltage setting requirement shall be consistent with the controlling Interconnection Agreement and/or PPA, or absent such provisions, shall be within the normal operating range of the System (plus 5% and minus 5% of nominal voltage² on Generator buses under normal conditions), as set forth in TDC 3.4.1, “Normal Conditions” and plus 8% and minus 10% of nominal values³ on 33 kV buses, as set forth in TDC 3.4.2, “Contingency Conditions”, with the deadband not exceeding 0.5%. These Generators must respond to a sudden voltage decrease/increase with the corresponding fast positive sequence fundamental frequency reactive current output controllers. To assure fulfillment of these requirements at the Interconnection Point, the Network Licensee shall assure that the appropriate system studies have been conducted, with expenses apportioned as set forth under the TDC 3.11, “System Planning Procedures.” The Network Licensee and Generator may include more detailed AVR and Fast Voltage Control protections in the Interconnection Agreement and/or PPA in order to address study results.

GC 2.10.2.2 Generator System Connected Transformer Configuration.

These Generating Facilities may be required to provide a System-connected power transformer with on-load tap- changing facilities. The transformer configuration and tap changing steps shall be proposed by Generator and pre-approved by the Network Licensee prior to interconnection, and related requirements may be included in the Interconnection Agreement and/or PPA.

GC 2.10.2.3 Voltage Flicker.

Generators are not allowed to introduce significant Voltage Flicker on the Transmission Network as measured at the Interconnection Point. The Generating Facility must not create objectionable Voltage Flicker for other Customers on the Network Licensee’s

² The Electricity Supply Act stipulates plus 3% and minus 3%

³ The Electricity Supply Act stipulates plus 3% and minus 3% for normal conditions – 33kV buses were not stipulated

Grid. The voltage dip at the Interconnection Point should not cause the voltage to exceed the range authorized in GC 2.10.2.1, “AVR and Fast Voltage Control,” and should remain within 10% of nominal voltage when the entire Generating Facility trips. The Generator shall take steps to make sure that Voltage Flicker requirements are met, and may need to add additional equipment to assure compliance, including, but not limited to, loss of synchronism protection and stagger generator energization. To assure fulfillment of these requirements at the Interconnection Point, the Network Licensee shall assure that the appropriate system studies have been conducted, with expenses apportioned as set forth under the TDC 3.11, “System Planning Process” prior to interconnection. The Network Licensee and Generator may include more detailed Voltage Flicker limits in the Interconnection Agreement and/or PPA in order to address study results.

GC 2.10.2.4 Generator Harmonic Distortion.

The electrical output of these Generating Facilities shall not contain Harmonics which may cause disturbances (unacceptable voltage distortion) on or damage to the Grid, or to other Customer’s systems, such as, but not limited to, computer, telephone, communication and other sensitive electronic or control systems. The Generating Facility shall follow the requirements of internationally accepted standards such as the ANSI and the IEEE. To assure fulfillment of these requirements at the Interconnection Point, the Network Licensee shall assure that the appropriate system studies have been conducted, with expenses apportioned as set forth under the TDC 3.11, “System Planning Process” prior to interconnection. The Network Licensee and Generator may include more detailed harmonic distortion control requirements in the Interconnection Agreement and/or PPA in order to address study results.

GC 2.10.2.5 Low and High Voltage Ride-Through.

These Generating Facilities must remain interconnected to the Grid during occasions of temporary abnormal Grid conditions to assist in maintaining an acceptable level of Grid reliability and stability. The Generator’s Generating Facility will be required to disconnect from the Grid if the voltage or frequency are outside the established ranges, or if the duration raises concerns for the safety of persons or any connected equipment, including the Generating Facility itself. To assure fulfillment of these requirements at the Interconnection Point, the Network Licensee shall assure that the appropriate system studies have been conducted, with expenses apportioned as set forth under the TDC 3.11, “System Planning Process” prior to interconnection. The Network Licensee and Generator may include more detailed low and high voltage ride through control requirements in the Interconnection Agreement and/or PPA in order to address study results.

GC 2.10.2.6

The required Generating Facility response to Grid voltage and frequency excursions are specified in the two tables set forth in GC Appendix C, “Low Voltage and High Voltage Ride-Through.” Reconnection to the Grid after Disturbances. After any System disturbance, Generation Licensees and Self-Generator Permit Holders may not reconnect to the Grid until the Grid’s voltage range is within the normal operation voltage range set forth in the table in GC Appendix C, “Low and High Voltage Ride Through” above.

After the System disturbance, a Generating Facility shall delay reconnection to the Grid until after the steady state voltage and frequency of the Grid are restored to normal

operation values set forth in the table in GC Appendix C, “Low and High Voltage Ride Through” above, assuring at least a fixed delay of five (5) minutes, or an adjustable delay of three (3) to five (5) minutes prior to reconnection.

These reconnection requirements are subject to revision periodically by the Network Licensee, after consultation with the Grid Code Review Committee, and publication to all these Generators, allowing adequate time for operational adjustments.

Small Renewable Energy Self-Generators shall comply with the applicable Code of Practice requirements concerning reconnection established under GC 2.10.4, “Requirements for Renewable Energy Self-Generators with Permits.”

GC 2.10.3 RESPONSIBILITY FOR INVERTER EQUIPMENT AND SETTINGS

All Generators, including Small Renewable Energy Self-Generators with Permits, are responsible to ensure that the inverter equipment installed in its Generating Facility is capable of assuring that the Generating Facility remains in compliance with the technical requirements of the Code and any applicable Interconnection Agreement and/or PPA. The Generator must assure that the manufacturer specifications, the installation methods, and the inverter tolerance settings for the inverter equipment will enable proper inverter operation to meet this standard. The Generator shall obtain a certification from the inverter installer describing the inverter settings and configuration, and shall share same with the Network Licensee upon request.

In the event of any revision to the Grid Code, the Interconnection Agreement and/or PPA, these Generators shall assure that the inverter settings and configuration are updated and adjusted to meet the revised requirements. In the event that the Generator can demonstrate that the new requirements would require replacement of existing inverter hardware or software at an unreasonable cost, the Generator may submit a Request for Relief under the Derogation provisions of Introduction Code Section 12 to the Commission. Any such Request for Relief must include a demonstration by the Generator that the inverter can still be operated safely and with full protection for the Generating Facility and the Grid. The costs associated with a required hardware or software upgrade required to enable a Generating Facility to meet revised requirements shall be determined by the controlling provisions of the Interconnection Agreement and/or PPA, or in the absence of any such provisions, by the Commission at the time of the revision approval decision.

GC 2.10.4 REQUIREMENTS FOR SMALL RENEWABLE ENERGY SELF- GENERATORS WITH PERMITS

GC 2.10.4.1

Small Renewable Energy Self-Generators who hold a Permit under Section 25 of the Act must be capable of controlling operations consistent with the requirements of the Commission-approved Code of Practice for Small Renewable Energy Generation Facilities.

GC 2.10.4.2

Small Renewable Energy Generation Facilities Code of Practice. Upon request of the Commission, the Network Licensee shall propose a Code of Practice for Small Renewable Energy Generation Facilities for Commission review and approval. The

Code of Practice shall comply with all regulations adopted by the Minister pertaining to Self-Generators who hold Permits under Section 25 of the Act and shall provide technical requirements for interconnection. The Network Licensee shall submit the proposed Code of Practice and related Consumer Checklists of Small Renewable Energy Generation Facilities for approval by the Commission on a time schedule to be established by the Commission.

GC 2.10.4.3 Contents of Small Renewable Energy Generation Facilities Code of Practice.

The Code of Practice for Small Renewable Energy Generation Facilities shall address the following topics, at a minimum:

- (a) Classifications and technical requirements for interconnection, including, but not limited to, generation plant and interconnection equipment standards, maximum plant output, power factor and voltage levels, frequency, and voltage ride-through thresholds;
- (b) Application process and forms of applications with detailed guidance to potential applicants concerning completion of the application;
- (c) Detailed description of when the Network Licensee will require a Distribution Facilities Impact Study as part of the application process, and the steps for the Licensee and applicant to reach agreement on the scope, cost and content of such study;
- (d) Detailed guidance on number and types of meters required to measure energy flows to and from the Grid;
- (e) Detailed guidance on billing and payment for Service by Consumer, and for Consumer's sale of energy to the Network Licensee, as established by Commission-approved tariffs and interconnection fees;
- (f) Model small-scale renewable energy generation interconnection service agreements, tailored as appropriate to the classifications and technical requirements for various Consumer renewable energy plants and interconnection; and
- (g) Network Licensee right of inspection of the Generating Facility.

GC 2.10.4.4 Responsibility of Network Licensee.

The Network Licensee shall have an obligation to enable interconnection of Small Renewable Energy Self-Generators with permits who have fulfilled the requirements of this section for interconnection and who have executed an interconnection agreement with Network Licensee, unless the Network Licensee, after consultation with the Electrical Inspectorate Unit, reasonably determines that the interconnection will compromise the safety and protection of the System.

GC 2.10.4.5 Transition.

The Network Licensee's current Renewable Energy Interconnection Policy and Programme,⁴ attached as Appendix B, as amended from time to time by the Network Licensee, may be considered a Commission-approved Code of Practice for Small

⁴ Might be referenced by a different name

Renewable Energy Generation Facilities under this Code pending the Commission adoption of a Self-Generator Program and Commission approval of a new Code of Practice for Small Renewable Energy Generation Facilities.

GC 2.10.4.6 Publication.

The Network Licensee shall publish the approved Commission policy and agreements and shall make them available in its customer service locations and on its website.

GC 2.10.4.7 Prohibition Against and Penalties for Prohibited Interconnection.

Improper and unauthorised connection of an electricity generator or any other source of electric power with the Network Licensee's Facilities may energise its lines and endanger the lives of its employees, agents or representatives working on the Network Licensee Facilities, and may otherwise adversely affect operations of the Distribution Network. Therefore, it is a matter of the highest public safety priority to assure that all interconnections for any purpose with the Network Licensee's Facilities fully comply with all requirements of this Code regarding establishing and maintaining such Interconnection.

GC 2.11 EMERGENCY GENERATORS

GC 2.11.1 PORTABLE EMERGENCY GENERATORS

The Generator Interconnection process and requirements contained in GC 2.10, "Renewable Energy Generating Unit" are not applicable to portable emergency generators.

GC 2.11.2 EMERGENCY GENERATOR INSTALLATION STANDARDS

Portable or stationary emergency generators must be installed in accordance with the IEE 16th Edition Electrical Regulations and Article 700 of the National Electrical Code publication. Guidelines in these publications require that adequate measures will be taken to ensure that the generator cannot be operated in parallel with the Network Licensee's Distribution System.

GC 2.11.3 UNINTERRUPTIBLE POWER SUPPLY

Consistent with SC 6.1.8 "Electricity Generators in Consumer Installations" and SC 6.1.9 "Uninterruptible Power Supply" the owner of an emergency generator under Section 25 of the Act for any grid-connected generator, regardless of the time of use, given the potential serious safety hazard to the System and the workers.

GC 2.11.4 EMERGENCY GENERATOR RISKS

Attempting to interconnect an emergency generator of this type with the Distribution System, except as specified in the National Electrical Code or equivalent and the publication referenced above, as well as specified in the Permit issued under Section 25 of the Act, poses a significant risk of injury or death to personnel, and can potentially cause damage to the Company's Distribution System and significant damage to the Customer's generator and premises, and is specifically prohibited.

GC 2.12 GRID PERFORMANCE AND TECHNICAL STANDARDS

GC 2.12.1 GRID FREQUENCY

The normal operation frequency of the Grid shall be 50.0 Hertz (Hz) (cycles per second), varying within a range of 49.25 to 50.25 Hz. For limited periods, in response to abnormal and transient Grid conditions (such as disconnection of large Generating Units or Load), the frequency may deviate outside of this range.

Generating Units shall be designed for sustained operation within the frequency limits as specified and for time required during both normal operations and abnormal frequency excursion limits as set forth in the table in GC Appendix C, “Low Voltage and High Voltage Ride-Through.”

GC 2.12.2 GRID SYSTEM VOLTAGES

GC 2.12.2.1

The Nominal Operating Voltages on the Grid shall be:

- (a) 33 kV or higher on the Transmission System; and
- (b) 11 kV on the Distribution System
- (c) 400/230V on the Supply System

GC 2.12.2.2

The Normal Operating voltages shall be within:⁵

- (a) + 3 % to -3% on the Transmission System;
- (b) -3% to -3% Distribution System; and
- (c) +3% to -3% on the Supply System.

GC 2.12.2.3

For limited periods, in response to abnormal and transient Grid conditions (such as disconnection of large Generating Units, Load or System faults), the voltage may deviate outside of this range.

GC 2.12.2.4

For the avoidance of doubt, Generating Units shall be designed for sustained operation within the voltage limits as specified and for restricted time based operation within the emergency voltage limits as specified in the table in GC Appendix C, “Low and High Voltage and Frequency Ride-Through” and the Interconnection Agreement and/or PPA.

GC 2.13 SHORT CIRCUIT LEVELS

The System shall be designed to withstand a three phase symmetrical short circuit at the Generating Unit Substation for fault levels as specified in TDC 3.7, “Fault Levels.”

GC 2.14 OTHER NETWORK LICENSEE RIGHTS

⁵ The Electricity Supply Act stipulates plus 3% and minus 3%

GC 2.14.1 INSPECTION OF GENERATING FACILITIES BY NETWORK LICENSEE

GC 2.14.1.1

The Network Licensee may be allowed to inspect any aspect of any Generation Licensee or Self-Generator Permit Holder's Generating Facility, or the Generating Units located therein, insofar as that Facility is pertinent to the provision of capacity and/or energy to the Grid, or to the safe and secure operation of the Grid, in order to verify the correct operation of all equipment including controls, circuit breakers, relays (and relay settings), metering and tele-metering. The inspection shall be conducted in collaboration with the electrical inspectorate and the commission. Prior to inspection of the Generator's Facility and Metering System under normal operating conditions, the Network Licensee must give five (5) business days' notice and provide adequate reason for the inspection. Nothing in this section shall contravene the Network Licensee's right to enter the Generating Facility to inspect, maintain, or remove Network Licensee Facilities, as provided under the Act or implementing regulations, or under the Interconnection Agreement or PPA with the Generator.

GC 2.14.1.2

The Government Chief Electrical Inspector may authorize any qualified person under Sections 44 and 47 of the Act, including, but not limited to personnel of the Government Electrical Inspection Unit, to enter and inspect the Generating Facility and all related Generating Units and equipment for compliance with this Code and controlling law, upon 24 hours written notice to the Licensee (including any Generator holding a License or a Permit), and may direct any such Licensee not to supply electricity.

GC 2.14.1.3

Any Generator or Licensee who believes that any facility of the Network Licensee or of a Generating Facility are unsafe or fail to comply with the Act, this Code, or other applicable regulations, may request that the Government Electrical Inspection Unit inspect or test such Facilities. The Government Chief Electrical Inspector shall ensure that the inspection and testing is completed within three (3) days of such request, as required by Section 44(5) of the Act.

GC 2.14.1.4

The Generator shall keep records to provide verification of tests and maintenance in accordance with agreements between the Network Licensee and Generator.

GC 2.15 DISCONNECTION OF GENERATOR BY THE NETWORK LICENSEE

GC 2.15.1 DISCONNECTION WITHOUT NOTICE

The Network Licensee retains the right, at its sole discretion to disconnect any Generating Facility of a Generation Licensee, or any type of Self-Generator Permit Holder (including Small Renewable Energy Self-Generators) from the Grid thereby isolating equipment, without prior notice under the following circumstances:

- (a) In cases of System Emergency or exceptional circumstances;
- (b) During system restoration following partial or complete loss of power;
- (c) If at any time the Generating Facility is being operated outside acceptable

operating parameters in a manner which violates the interconnection conditions set out in the Generation or Transmission and Distribution Code, or which is likely to cause any of the following:

- i. A safety risk to personnel;
- ii. A risk to the stability or security of the Grid or Other Generating Units;
- iii. Any behavior causing sustained operation outside the normal Grid operating frequency and voltages as stated under GC 2.7, "Performance Standards;"
- iv. Any other material breach of the GC2, "Interconnection Conditions," Interconnection Agreement and/or PPA which prevents the Network Licensee from meeting its license obligations; and
- v. Any other breach of any Interconnection Agreement and/or PPA provision which stipulates that this action may be taken.

In instances where disconnections occurs for any of the above reasons, a full report must be submitted to the Commission within forty-eight (48) hours.

GC 2.15.2 NETWORK LICENSEE DISCONNECTION AUTHORITY

Notwithstanding the foregoing, in the event of any material breach of these GC 2, "Interconnection Conditions" which prevents the Network Licensee from meeting its License obligations, the Network Licensee may disconnect the Generator after using best commercial efforts to give notice to the Generator.

GC 2.16 TECHNICAL CRITERIA APPLICABLE TO LICENSE AND PERMIT-EXEMPT SELF-GENERATORS

A Self-Generator who is exempt from license and permit requirements under Section 13 of the Act must comply with all applicable Building and Electrical Code requirements and must file a notice with the registry maintained by the Commission of non-license and permit-holding Self-Generators. These Self-Generators must provide information upon reasonable request of the Commission to affirm that they remain unconnected to the Grid. The Government Chief Electrical Inspector and his designated personnel within the Government Electrical Inspection Unit, and Network Licensee are authorized to inspect these units annually, or in response to specific information indicating that the Self-Generator may have interconnected to the Grid without proper authority.

GC 3 GENERATION OPERATIONAL METERING

GC 3.1 GENERATOR OBLIGATIONS

GC 3.1.1 METERING SYSTEMS

All Generation Licensees and Self-Generating Permit Holders must install adequate Metering Systems consistent with the technical specifications of this Code and any other applicable Commission rules or orders. Small Renewable Energy Self-Generators

are excluded from this Section, and are covered instead by the provisions of the Code of Practice for Small Renewable Energy Self-Generators.

GC 3.1.2 COSTS OF INTERCONNECTION

The ownership and costs of interconnection meters shall be allocated between the Generator and the Network Licensee consistent with the provisions of GC 3, “Operational Metering” and TDC 17, “Transmission and Distribution Metering”.

GC 3.2 NETWORK LICENSEE OBLIGATIONS CONCERNING GENERATION METERING CODE OF PRACTICE

GC 3.2.1 CODE OF PRACTICE FOR GENERATION METERING

The Network Licensee shall submit for Commission review and approval a proposed Code of Practice for Generation Metering that addresses metering requirements applicable to all Generators with a License or a Permit who are interconnected to the Grid consistent with applicable Commission rules and orders. The Network Licensee may opt to combine this Code of Practice for Generation Metering with the Code of Practice of Metering required by SC 8.2, “Code of Practice for Metering.” The Code of Practice for Generation Metering shall address, at a minimum, all topics listed in SC 8.2, to the extent applicable to Generator Interconnections.

GC 3.2.2 CODE CONTENTS

The Code of Practice for Generation Metering shall include, at a minimum, two categories of metering requirements for Generators, as well as any additional categories required by applicable Commission rules or orders:

GC 3.2.2.1

For Small Renewable Energy Self-Generators, the metering requirements shall be based on the Generating Facility rated capacity and interconnection, and may include a either a standard distribution class meter with two registers, or a smart meter having additional capabilities of mass memory, remote reading and power quality monitoring to support more advanced Network Licensee Supply and Demand Side programs designed to lower the cost of electricity or to promote energy conservation.

GC 3.2.2.2

For all other Generators, metering requirements shall be based on the Generation Facility rated capacity and interconnection and should include a smart meter having additional capabilities of mass memory, remote reading and power quality monitoring to support Network Licensee Supply and Demand Side programs designed to lower the cost of electricity or to promote energy conservation. Specification of the meter shall be outlined in the Interconnection Agreement and/or the PPA between the Network Licensee and the Generator. The Metering System shall comprise a Primary and Backup Metering System. The Primary Metering System shall be designed, owned, installed and maintained by the Network Licensee. All associated costs of the design and installation shall be borne by the Generator. The Backup Metering System shall be designed, installed, owned and operated by the Generator and approved by the Network Licensee as part of the Interconnection Agreement and/or PPA.

GC 3.3 LOCATION OF METERS

GC 3.3.1 METER LOCATION

Both Primary and Backup Metering Systems shall be installed to accumulate the outputs and/or inputs at the High Voltage side bushing of the Generating Unit step-up transformer, or as otherwise agreed to by the Network Licensee and the Generator.

GC 3.3.2 OTHER EQUIPMENT

Each meter shall have its own current transformer (CT) and potential transformers (PT) and necessary independent systems to function effectively.

GC 3.3.3 INTERCONNECTION AGREEMENT/PPA

The location of the meter shall be addressed in the Interconnection Agreement and/or PPA.

GC 3.4 TECHNICAL STANDARDS FOR OPERATIONAL METERING

GC 3.4.1 GENERATION METERING STANDARDS

All generation metering equipment, including self-contained meters and instrument transformers shall conform to ANSI Standards C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers and shall have sufficient capacity to handle the attached equipment.

GC 3.4.2 CURRENT TRANSFORMER SUPPLY OF GENERATION METERING EQUIPMENT

The current transformers secondary winding used for generation metering purposes shall supply only the metering equipment and associated systems. Notwithstanding the foregoing each current transformer may have other secondary windings that may be used for purposes other than metering.

GC 3.4.3 POTENTIAL TRANSFORMER SUPPLY OF NON-METERING EQUIPMENT

Potential transformers' secondary windings may be used for generation metering and other purposes provided that the total loading does not exceed one half the rating of the transformer.

GC 3.4.4 METER ACCURACY

Any generation metering and accumulating equipment shall have sufficient accuracy to comply with the ANSI standards referenced in GC 3.4.1 above.

GC 3.4.5 INVENTORY OF METERS FOR GENERATION AND FOR SUPPLY

The Network Licensee and the Generator shall address all metering to be used by the Generator for either metering of generation and sale of electricity to the Network Licensee, or for Generator purchase of Electricity from Network Licensee. The Supply Code Section 8, "Metering and Billing" requirements will apply to the meters used to

track any Network Licensee sale of electricity to Generator.

GC 3.5 GENERATION METER SYSTEMS SEALING, FIELD TESTING, INSPECTION

GC 3.5.1 GENERATION METER SYSTEM SEALING

Meters and associated instrument transformer boxes or enclosures shall be sealed by and at the expense of the Generators at the respective meters. The type of seal shall be determined by the Network Licensee consistent with Prudent Utility Practice and best industry practice.

GC 3.5.2 GENERATION METER SYSTEM FIELD TESTING

Generation meters shall be inspected and tested in accordance with the Code of Practice for Generation Metering approved by the Commission. This is to ensure that all meters maintain the required accuracy and meet the standards required to assure they are correctly registering the consumptions or delivery of electricity by a Generator. Inspection and testing of meters shall also be accommodated at the request of the Generator or the Network Licensee where they have concerns about meter accuracy. The Generation meter owner shall be responsible for the cost of annual testing of the Generation meter, and any additional testing shall be paid for by the requesting party, except where the multiple results of such testing indicates the meter to be in error as defined in the meter accuracy standards, in which case the meter owner shall pay those additional test costs.

The Government Electrical Inspection Unit shall be informed of all meter testing schedules and shall upon request have the opportunity to witness such testing.

GC 3.5.3 GENERATION METER SYSTEM INSPECTION EQUIPMENT

The Network Licensee shall maintain in proper condition such apparatus as may be approved by the Government Electrical Inspection Unit for examining, testing and regulating meters used or intended to be used in connection with the Supply of electricity by the Network Licensee, including sealed and certified standard meters.

GC 3.5.4 GENERATION METER SYSTEM WIRING

GC 3.5.4.1

For wiring used only for metering purposes, only conduits which comply with ANSI/IEEE or equivalent standards shall be used to enclose the wiring connecting the instrument transformers and the related accumulating and metering equipment. Any boxes or enclosures or other devices used to join two or more sections of conduit shall be securely covered, fastened and sealed with seals approved by the Government Electrical Inspection Unit.

GC 3.5.4.2

If the wiring used for metering must pass through a panel, panel board or switchgear structure, it shall be fastened together and cabled as a unit separate and apart from the rest of the wiring.

GC 3.5.4.3

At its own expense, the Generator shall provide any terminal blocks that may be used along the length of the metering conductors within a panel, panel board or switchgear with covers or strips that limit access to the respective connections and said covers or strips shall be affixed with a seal approved by the Network Licensee.

GC 3.5.5 GENERATION METER INSPECTION PROTOCOLS

Seals shall not be broken by anyone except the Generation Meter owner or Government Electrical Inspection Unit personnel when the meters are to be inspected, tested or adjusted. The Network Licensee shall notify the Generator and Government Electrical Inspection Unit in advance of such inspection, testing or adjustment, and the Generator and the Government Electrical Inspection Unit shall have the right to have a representative present.

GC 3.5.5.1

Before the commissioning of any Generating Unit, the Network Licensee shall test the Metering System for correct wiring and accuracy, using equipment whose accuracy is equal to or better than that of the individual meters. Individual meter components found to be inaccurate before commissioning shall be identified to the Generator for replacement. Malfunctioning identified after full acceptance of the Metering System shall be the responsibility of the individual meter owners.

GC 3.5.5.2

The Network Licensee shall test the Metering System within ten (10) days after:

- (a) The detection of a difference larger than the Allowable Error established by the ANSI standards referenced in GC 3.4.1 above in the readings of the meters;
- (b) The repair of all or part of a meter caused by the failure of one or more parts to operate in accordance with the specifications; and/or
- (c) On the schedule established for testing for that category of Generator meter in the Code of Practice for Generation Metering. If any errors in the readings of the meters are discovered by such testing, the Party owning those meters shall repair, recalibrate or replace those meters and shall give the other Party reasonable advance notice so that the Party receiving notice may have a representative present during any such corrective activity.

GC 3.6 METER DATA READING PROCEDURES

The Code of Practice for Generation Metering shall address the metering data to be collected by all Generation Meters and the procedures for reading the meters. The Network Licensee shall be responsible for selection and approval of generation meters that are capable of providing the required data, and appropriate recording of the Net Energy Output of the Generating Unit(s). The Network Licensee shall specify both the type and data to be supplied by the Primary and any Back-Up Meters, consistent with the Code of Practice for Generation Metering, and the Generator shall be responsible for the metering costs, consistent with GC 3.1.2, "Costs of Interconnection" above.

The parameters to be metered shall be addressed in the Code of Practice for Generation Metering approved by the Commission and in the Interconnection Agreement and/or PPA between the Generator and the Network Licensee, and may, at a minimum, consist of any or all of the following parameters:

- (a) Active energy (MWh) OUT;
- (b) Active energy (MWh) IN;
- (c) Reactive energy (MVarh) First Quadrant;
- (d) Reactive energy (MVarh) Fourth Quadrant;
- (e) Active Power Demand (MW) OUT;
- (f) Active Power Demand (MW) IN;
- (g) Apparent Power Demand (MVA) OUT;
- (h) Apparent Power Demand (MVA) IN;
- (i) Reactive Power Demand (MVar) First Quadrant; and
- (j) Reactive Power Demand (MVar) Fourth Quadrant.

GC 3.7 FREQUENCY OF READING

GC 3.7.1 DEMAND INTERVAL

The Demand Interval shall be fifteen (15) minutes and shall be set to start at the beginning of the hour. Demand shall be calculated by averaging the respective parameters over the stated Demand Interval.

GC 3.7.2 TIME OF NETWORK LICENSEE METER READING

The Network Licensee shall read the appropriate meters and the Demand register shall be reset, within five (5) minutes of midnight of the last day of each Month or two Month period as agreed upon by the Parties. If readings are obtained remotely, copies of the printout produced by the device which initiates the reading protocol shall be made and provided to the Generator.

GC 3.7.3 CLOCK DRIFT

The Network Licensee shall use Prudent Utility Practices to address the potential for clock drift in software and other operating systems, including either frequent recalibration to resynchronize the clocks, or the use of devices to enable direct time reading from remote time servers. The Interconnection Agreement and/or PPA between the Generator and the Network Licensee shall address the clock drift issue, and shall assure that data copies are retained and provided upon request to the Generator to enable comprehensive Generator review of the process.

GC 3.7.4 OTHER REQUIREMENTS

The meters shall be read by the Network Licensee consistent with the Code of Practice for Generation Metering, and any Interconnection Agreement and/or PPA between the

Generator and the Network Licensee.

GC 3.8 CONTROL PROCEDURES

GC 3.8.1 CUSTOMER NOTICE OF METER READING

The Network Licensee shall inform a Generator Licensee or Self-Generator Permit Holder at least 24 hours prior to reading the meters and the Generator shall have the right to have a representative to witness such readings. In the event that AMI systems are being used, the Interconnection Agreement and/or PPA shall provide for an alternative electronic confirmation of the remote reading of meter data.

GC 3.8.2 RECORDS

As a backup of the manual records of the Demand actually experienced throughout the billing period, the meters shall be equipped with a mass memory module which will record the MWh and MVarh produced during each Demand Interval.

GC 3.9 METER READING RECONCILIATION PROCEDURES

GC 3.9.1 USE OF BACKUP METERING SYSTEM

For all Generators with a Backup Metering System, if the Generation Facility Primary Metering System is known to be inaccurate or otherwise functioning improperly, then the Backup Metering System shall be used during the period that the Primary Metering System is not in service.

GC 3.9.2 PRIMARY METERING SYSTEM FAILURE PROCEDURES

If the Primary Metering System is found to be inaccurate by more than the Allowable Error or to otherwise have functioned improperly during the previous Month, then the correct amount of Net Energy Output and Dependable Capacity for the actual period, during which inaccurate measurements if any were made, shall be determined as follows:

GC 3.9.2.1

First, the reading of the Backup Metering System shall be utilized to calculate the correct amount of Net Energy Output and Dependable Capacity, unless a test of such Backup Metering System, as required by either Party, reveals that the Backup Metering System is inaccurate by more than the Allowable Error under the applicable ANSI standard referenced under GC 3.4.1, or is otherwise functioning improperly; and

GC 3.9.2.2

If the Backup Metering System is not within the acceptable limits of accuracy or is otherwise functioning improperly, then the Generator and the Network Licensee shall jointly prepare a reasonable estimate of the correct reading on the basis of all available information and such guidelines as may have been previously agreed to between the Generator and the Network Licensee or specified in the PPA. This estimate shall take into account but not be limited to Dispatch Instructions as recorded in the Network Licensee dispatch log and meter readings, remote or manual.

GC 3.10 RESOLUTION OF DISPUTES OVER RECORDED METERING DATA

GC 3.10.1 METERING DISPUTE RECONCILIATION

Consistent with the provisions of TDC Section 17, “Metering Accuracy Checks and Disputes,” if the Network Licensee and a Generator Licensee or Self-Generator Permit Holder fail to agree upon an estimate for the correct reading under GC 3.9, “Metering Reconciliation Procedures,” the parties shall either (i) follow any applicable dispute resolution provisions of their Interconnection Agreement and/or PPA or (ii) within 30 days of the Dispute being raised, refer the matter for determination by the Commission.

GC 3.10.2 SMALL RENEWABLE ENERGY SELF-GENERATOR RECONCILIATION

If the Network Licensee and a Small Renewable Energy Self-Generator Permit Holder fail to agree upon an estimate for a correct reading in the event of a failed meter, the parties shall follow the controlling Code of Practice for Generation Metering dispute resolution procedure before the Commission.

GC 4 GENERATION SCHEDULING (UNIT COMMITMENT) AND DISPATCH

The Network Licensee is required to operate and maintain a Dispatch Policy which applies to all Generators which can be dispatched to meet the Grid demand.

In order to operate the Grid in a safe, secure, reliable, stable and economic manner, the Network Licensee will require accurate and timely information on Generating Units' availability, efficiency and technical operating capability.

This section outlines the principles used to determine how individual Generating Units are operated in parallel to achieve these objectives based on the information received by the Network Licensee.

GC 4.1 CRITERIA FOR SCHEDULING AND DISPATCH

The Network Licensee, shall seek at all times to minimize the total cost of production and supply of electricity subject to constraints of system security and reliability, safety, generator availability, fuel availability, emission limits and other environmental considerations and contractual obligations.

GC 4.2 MERIT ORDER SCHEDULING

GC 4.2.1 MERIT ORDER RANKING ESTABLISHMENT

The Network Licensee shall collaborate with the plant operators of all Generator Licensees and Self-Generator Permit Holders to establish a Final Merit Order ranking of Generators for Unit Commitment (UC) based on least cost principles and efficiency.

GC 4.2.2 MERIT ORDER METHODOLOGY

The methodology for determining the Final Merit Order shall take into consideration the following guidelines:

GC 4.2.2.1

Generating Units which are required to run for System security or inflexibility purposes shall be given the highest unit commitment and dispatch priority.

GC 4.2.2.2

Production from all renewable energy generation shall be given the second highest unit commitment and dispatch priority, consistent with Commission regulations and Orders, and with Interconnection Agreements and/or PPA requirements.

GC 4.2.2.3

Large Diesel Generating Units (>5MW) must be run between 80% and 100% of available capacity where practical to maximize their efficiency of operation.

GC 4.2.2.4

The Generating Units should be operated to minimize the coincidence of scheduled maintenance activities (inspections and overhauls) among Generators, and to ensure that at the planned time for running hours based maintenance activities, the Generators are as close to the operating hours specified by the original equipment manufacturers (OEMs).

GC 4.2.2.5

System Voltages and Frequencies shall be maintained within the standards established in this Code.

GC 4.2.2.6

Spinning Reserve should be as close as technically and economically feasible to the output of the largest Generating Unit currently online, with the goal of maximizing Grid security and minimizing electricity costs. As levels of intermittent renewable generation sources increase over time, this level shall be adjusted to accommodate intermittency issues.

GC 4.2.2.7

Generating Units should be committed and dispatched to maintain the highest level of System Reliability by taking into consideration the individual Generator Reliability and its potential impact on System Reliability.

GC 4.2.2.8

The Initial Merit Order Ranking of Generating Units shall be primarily determined based on their Merit Order Cost which is their Variable Operating Cost (Fuel Cost + Variable Operating and Maintenance Cost (VOM)) of production at full load utilizing the Generating Unit efficiency at full capacity and current fuel prices.

GC 4.2.2.9

$$\text{Merit Order Cost} \left(\frac{\$}{MWh} \right) = \frac{\text{Fuel Price} \left(\frac{\$}{\text{gallon}} \right) \times \text{Heat Rate} \left(\frac{MMBtu}{MWh} \right)}{\text{Fuel Calorific Value} \left(\frac{MMBtu}{\text{gallon}} \right)} + \text{VOM} \left(\frac{\$}{MW} \right)$$

Where:

Fuel Price is the price per gallon fuel

Heat Rate is the input needed to produce one unit of output

Fuel Calorific Value is the heat content per gallon of fuel

VOM is the operating and maintenance cost of the generating unit

GC 4.2.2.10

The Final Merit Order Ranking shall adjust the Initial Merit Order Ranking with consideration for the aforementioned guidelines. The Final Merit Order Ranking shall be used to commit Generators into service to meet System demand.

GC 4.3 ECONOMIC DISPATCH OF GENERATORS

Once committed into service, all Generators shall be operated in parallel and the Network Licensee shall dispatch all Generators in accordance with the approved Economic Dispatching Technique to minimize the cost of electricity to Customers subject to several constraints. These constraints include;

- (a) System Demand projections and demand geographical distribution;
- (b) Generator Operating Limits (Min MW and Max MW limits);
- (c) Generator Reliability;
- (d) System Spinning Reserve Requirements;
- (e) Transmission Constraints;
- (f) Power Quality (Voltage and Frequency) Requirements;
- (g) System Stability Considerations;
- (h) Generator's contracted operating characteristics; and
- (i) Contracted and declared Generator Heat Rate Curves.

GC 4.4 REVIEW OF MERIT ORDER

GC 4.4.1 FOSSIL FUEL GENERATORS

GC 4.4.1.1

The Merit Order is reviewed on the following bases:

- (a) Daily Fuel Efficiency and availability checks done by Operations; and
- (b) Semi -annual comprehensive fuel efficiency tests mandated by the Commission.

GC 4.4.1.2

A Generator Licensee may request a fuel efficiency test of any of its Generating Units if it can provide information to substantiate that it has made improvements in the performance of its Unit(s). No more than four such requests will be accommodated within any calendar year.

GC 4.4.1.3

Fuel efficiency tests for all Generating Units, shall be coordinated by the Network Licensee, on dates mutually agreed upon with the Generator. The Network Licensee has the right to observe all such tests. The Generator Licensee shall be responsible for all test costs.

GC 4.4.1.4

The Commission shall receive notice of all tests beforehand and shall have the right to observe all such tests. The Generator Licensee shall provide the Commission with the results of such tests within one month.

GC 4.4.2 RENEWABLE GENERATORS

GC 4.4.2.1

For Generator Licensees and Self-Generator Permit Holders supplying electrical power from Renewable Energy Generating Units, these units will be dispatched consistent with the approved Merit Order Economic Dispatching Technique, except that Renewable Energy Self-Generator with Permit with a Generating Facility up to 30 kW shall be dispatched consistent with the Code of Practice on Small Renewable Energy Self-Generators.

GC 4.4.2.2

The Network Licensee shall notify the Generator as to the relative position of its Generating Unit(s) in the Merit Order in terms of ranking number each day.

GC 4.4.2.3

The Network Licensee shall notify the Commission of the revised Merit Order each day.

GC 4.4.2.4

Consistent with GC 2.10, "Renewable Energy Generation Units," the Network Licensee, working with the Grid Code Review Committee, shall develop a detailed proposal for standards around curtailment, forecasting, storage and other related issues to enable more efficient dispatch of Renewable Energy Generation resources.

GC 4.5 SYSTEM SECURITY STANDARDS

GC 4.5.1 SPINNING RESERVE

The Network Licensee shall arrange for a minimum Spinning Reserve Margin as set out in GC Appendix D subject to the approval of the Commission. Before such approval can be granted, the Network Licensee shall submit the revised Spinning Reserve Margin policy to the Commission for review, analysis and determination. The determination of the Spinning Reserve Margin shall be based on economics and System security considerations.

GC 4.5.2 OPERATING RESERVE

The Network Licensee shall co-ordinate Scheduled Outages such that the N-2 Operating Margin and the Operating Reserve are maintained at or above the level set out in GC Appendix 4. This shall allow the Grid to be able to accommodate at least two

(2) of the largest Generating Units being out of service and still maintain adequate available Capacity to meet System Demand.

GC 4.5.3 SYSTEM EMERGENCY

In the case of System Emergency and unplanned outages, the Scheduled Outages of Generating Units shall be rescheduled if possible to maintain this Operating Reserve margin.

GC 4.6 UNIT COMMITMENT SCHEDULING AND SYSTEM OPERATION

GC 4.6.1 NETWORK LICENSEE OBLIGATION

It is the Network Licensee's obligation to prepare a Unit Commitment Schedule which reasonably reflects the likely System conditions. This schedule shall be prepared for the following week and revised on a daily basis. The scheduling of Generating Units shall be in accordance with the most recent available Merit Order, subject to relevant technical constraints specified in GC 4.5, "System Security Standards."

GC 4.6.2 DECLARATION OF PLANT AVAILABILITY AND CAPACITY

Generator Licensees and Self-Generator Permit Holders, other than intermittent Renewable Energy systems with high and rapid variability and Small Renewable Energy Self-Generator Permit Holders, must submit to the Network Licensee, by approved communication means, a declaration of plant availability and Capacity, and any other information as agreed between the Generator and the Network Licensee from time to time. This data is to be declared to facilitate the timely preparation of a Unit Commitment Schedule over the short term period specified.

GC 4.6.3 WEEKLY UNIT COMMITMENT SCHEDULE

A Weekly Unit Commitment Schedule shall not be regarded by any Generator to be Dispatch Instructions but shall be provided as a service to Generators for planning purposes.

GC 4.6.4 DAILY UNIT COMMITMENT SCHEDULE

The daily revision of the Unit Commitment Schedule will at all times take over the short term predictions.

GC 4.7 PREPARATION OF UNIT COMMITMENT SCHEDULE

GC 4.7.1 FACTORS CONTROLLING UNIT COMMITMENT SCHEDULE

In the preparation of Unit Commitment Schedule, the Network Licensee must take into consideration, among other things, pertinent to commitment schedule, the following factors:

- (a) Forecasted Demand and geographical Demand distribution;
- (b) Each Generator's declaration of each of their Generating Unit(s) MW capability and availability;

- (c) Generator's contracted operating characteristics;
- (d) Contracted and declared Heat Rate Curves;
- (e) Fuel prices and constraints;
- (f) System reserve requirements;
- (g) System Stability implications and frequency and voltage control; and
- (h) Grid constraints.

GC 4.7.2 DAILY REPORTING DEADLINES

The Unit Commitment Schedule shall be reported daily. A Generator required to report by GC 4.6, "Unit Commitment Scheduling and System Operation," shall deliver the Dispatch to the Network Licensee by 3p.m. each day for the 24 hour period starting 12 a.m. (midnight) the following day.

GC 4.7.3 UPDATES

The Generator shall provide Network Licensee with prompt updates on any change to the Dispatch Notice.

GC 4.7.4 NOTIFICATION OF COMMITMENT

The specific procedure for receiving data and making notification of commitment of Generating Units for dispatch shall be based on the following:

- (a) An agreed and approved means of communication between the Generator and Network Licensee with adequate backup in case of the failure of this approved means;
- (b) In order to ensure rapid transfer of information an interim declaration shall normally be verbally submitted in the first instance and shall be confirmed by the approved means without delay; and
- (c) Where a Generator becomes aware of any changes in these declared values or other data subsequent to the declaration, then the Generator shall, without delay, notify the Network Licensee.

GC 4.8 DISPATCH INSTRUCTIONS TO DISPATCHABLE UNITS

This section sets out the procedures for issuing Dispatch Instructions to the Generator Licensees operating Dispatchable Generating Units, and the responsibilities of the Network Licensee in the minute to minute control time frame.

GC 4.8.1 REAL POWER (KW)

Real Power (kW) dispatch shall be based on actual fuel efficiency. Dispatch Instructions are normally given on the timeframe that is warranted by the operational requirements of the System.

GC 4.8.2 REACTIVE POWER (KVAR)

GC 4.8.2.1

Reactive Power (KVAR) is dispatched at the discretion of Network Licensee to maintain the System voltage within the tolerable limits. The Generator shall operate within the power factor range established in the Interconnection Agreement and/or PPA and as dispatched by the Network Licensee.

GC 4.8.2.2

In instances when the Network Licensee makes the request for the Generator to absorb Reactive Power (KVAR), the Generator should not be penalized on their electricity bill during that period, to the extent that the absorption of reactive power has affected their demand charge.

GC 4.8.2.3

All Generators are required to provide the generator capability curve for each generating unit upon request by the Network Licensee.

GC 4.8.2.4

The Network Licensee shall at all times use the most economical choice available under the approved Economic Dispatching Technique to manage the system voltage.

GC 4.8.3 ANCILLARY SERVICE

The Network Licensee subject to the approval of the Commission may contract with suitably qualified Generators for ancillary services (Voltage Support, Frequency Control, Reserve Support, etc.) to the extent that it does not violate the Interconnection Agreement and/or PPA.

GC 4.9 INSTRUCTION TO SYNCHRONIZE / DESYNCHRONIZE

The times at which a Generator shall be synchronized and desynchronized shall be directed by the Network Licensee, according to the Generator characteristics.

GC 4.10 FREQUENCY AND VOLTAGE CONTROL

GC 4.10.1 DISPATCH INSTRUCTIONS

Adherence to the frequency and voltage standards shall be the responsibility of the Network Licensee who shall issue to each Generator the required Dispatch Instructions for both Real Power (kW) and Reactive Power (KVAR) output in accordance with the declared operating limits of each Generating Unit as agreed upon between the Network Licensee and the Generators or as prescribed in the Interconnection Agreement and/or PPA to ensure adherence to these operating standards.

GC 4.10.2 AUTOMATIC GENERATION CONTROL

Automatic Generation Control (AGC) can be used to perform frequency control by sending signals to the Generating Unit to adjust output. To the extent that the application of AGC is deemed economically feasible to the Consumer and technically possible based on the specific Generator capability and/or its expected operating regime, each new Generator shall ensure that the Generating Units are AGC enabled and can, without

human intervention, accept and respond to a signal to adjust load. Additionally, the SCADA/EMS system shall have the capability to facilitate the use of AGC. The range of control afforded by the implementation of AGC shall be the subject of the Generator's Interconnection Agreement and/or PPA.

GC 4.10.3 NETWORK LICENSEE RESPONSIBILITY IN SYSTEM CONTROL

The Network Licensee shall be responsible for issuing any instruction necessary to:

GC 4.10.3.1

Maintain the voltage on the 11 kV and 33 kV Systems in accordance with the stated operational limits with the normal operational limits of +4%/-8%, as set forth in GC 2.10.2.4 Table;

GC 4.10.3.2

Maintain, or enable others to maintain, the voltage of supply to Consumers within the statutory limits of +4 - 8% ⁶of the Nominal Operating Voltages;

GC 4.10.3.3

Supply the Reactive Power requirements of the System as economically as possible, and to organize the disposition of Reactive Power reserves for proper control of the System voltage in accordance with the requirement of i) and ii) above;

GC 4.10.3.4

Maintain frequency within the normal operational limits of 49.75Hz to 50.25Hz; and

GC 4.10.3.5

Assure that Generators will meet the System demand and Spinning Reserve requirements.

GC 4.10.4 GENERATOR RESPONSIBILITY

GC 4.10.4.1

The Generator shall be responsible for:

- (a) Ensuring that Generating Units operate in frequency control mode unless operation in this mode has been agreed as being impracticable between the Generator and the Network Licensee;
- (b) Ensuring that Generating Unit automatic voltage regulators are in service continuously. The Network Licensee shall be informed whenever a Generating Unit is operating without its automatic voltage regulator or Reactive Power Limiter; and
- (c) Notifying immediately the Network Licensee of any unusual voltage, frequency or power condition or any dynamic disturbances occurring upon any Generating Unit.

GC 4.10.4.2

In the event of a sudden change in System voltage a Generator must not take action to

⁶ The Electricity Act stipulates +3 to -3%

override automatic Reactive Power generation response, unless instructed otherwise by the Network Licensee or unless immediate action is necessary to comply with stability limits or declared constraints of plant apparatus.

GC 4.10.5 CHANGES TO GENERATION CONDITIONS

GC 4.10.5.1

The Generator shall notify the Network Licensee immediately of any factors which will or are likely to, affect the power output capacity, flexibility, response or cost of production of any of its Generating Units.

GC 4.10.5.2

Generating Units and apparatus shall not be taken out of service or rendered unavailable without reference to the Network Licensee except in cases of Emergency. In such cases the Network Licensee should be informed immediately of the action taken.

GC 4.10.5.3

A Generator experiencing an unplanned outage of any of its Generating Units shall inform the Network Licensee immediately of all relevant details concerning this outage. As soon as the cause of the outage has been properly assessed and a recovery plan established, the Generator shall inform the Network Licensee of the expected time and the condition under which the Generating Unit shall return to service.

GC 4.10.5.4

The actual time that the outage occurred and the Generating Unit was returned to service and any other information deemed to be important in relation to the outage shall be logged by the Network Licensee and the Generator.

GC 4.11 NETWORK LICENSEE SWITCHING PROCEDURE AND INSTRUCTIONS

Generators shall comply with the TDC 8.10.1, “Switching Instructions” requirements and the Section 11.6, “Switching Instructions.”

GC 4.12 NON-DISPATCHABLE GENERATING UNITS

GC 4.12.1 OPERATIONS

Non- Dispatchable Generating Units shall operate as agreed upon between the Network Licensee and the Generator. The Network Licensee shall inform such Generators where there is a need for outage on the Generating Unit or of any incident which would affect the operations or safety of the Generating Unit. During a System Emergency, or where there is life at risk, the Network Licensee may disconnect and so isolate any Generating Unit without prior notification.

GC 4.12.2 COMMUNICATIONS

The Generator shall communicate with the Network Licensee on matters of switching and synchronization during normal operations and in the event of System Emergency.

GC 5 COMMUNICATION AND REPORTING

Consistent with GC Appendix 1, “Required Communication Equipment” and TDC 11.4, “Communications,” the Network Licensee, Generation Licensees, and Self-Generator Permit Holders are required to establish a communication and reporting system that will ensure a timely and efficient information exchange concerning operations. This Section 5 shall not apply to Small Renewable Energy Self-Generators.

GC 5.1 DESIGNATED COMMUNICATIONS CONTACT

GC 5.1.1 NETWORK LICENSEE RESPONSIBILITIES

The Network Licensee shall at all times have a suitably qualified person designated for communication with the Generators on matters relating to the operation of the Grid. Additionally, the Network Licensee shall at all times have a suitably qualified person designated for communication with the Commission on matters relating to the operation of the Grid.

GC 5.1.2 GENERATOR RESPONSIBILITIES

Each Generator shall at all times have a suitably qualified person designated for communicating with the Network Licensee on matters relating to the operation of the Generating Units and the Grid. The Generator shall provide information as requested by the Network Licensee pertaining to the operation of its Generating Units.

GC 5.2 NETWORK LICENSEE RECORD OF DISPATCH

A record of events shall be kept at the Network Licensee’s facility, which shall include, but not be limited to:

- (a) All instructions regarding switching, voltage control and Generating Unit operation;
- (b) Details of changes in target frequency;
- (c) Each operation or sequence of operations of circuit breakers, disconnectors and earthing switches under the control of the Network Licensee and, where appropriate, alarms and protection indications;
- (d) Transformer tap changes instructed or operated by the Network Licensee;
- (e) The synchronization or taking off-line of Generating Units according to local procedures;
- (f) Details of the application and removal of main short and grounds and other safety precautions, including the issue and cancellation of safety documents and HV live line working certificates, by the Network Licensee or designate as required by the Network Licensee's safety rules;
- (g) The commissioning, taking out of service or re-commissioning of plant and apparatus, including automatic switching systems, protection and changes to relay settings, together with relevant details;
- (h) The failure, or change of state, of plant or apparatus on the Grid together with relevant details;

- (i) The failure of plant or apparatus affecting the availability of Generating Unit(s), together with relevant details;
- (j) The location and identification of switchgear for which a risk of trip is accepted;
- (k) Generating Units which are not operating in the frequency sensitive mode;
- (l) Any significant abnormal or dangerous occurrence in operation including incidents involving the use of emergency public service;
- (m) Any interruption and restoration of supply together with relevant details; and
- (n) Details of the Network Licensee system load reductions, restorations and Demand control.

GC 5.3 GENERATOR OPERATIONS LOG

Generators shall maintain an accurate and up-to-date Operations Log. The purpose of this Operations Log is to record events, plans, requests and instructions. Network Licensee shall include guidance in the Interconnection Code of Practice on the content and submittal method for the Operations Log tailored to the size and type of Generating Facility. Entries into the Operations Log should be made on a daily basis and should include, as necessary, the following:

- (a) Dispatching Instructions and times of receipt of such instructions from the Network Licensee;
- (b) Time of implementation of instructions;
- (c) Any request from the Generator to the Network Licensee which includes:
 - i. Scheduled outages;
 - ii. Forced outages;
 - iii. Load adjustments;
 - iv. Maintenance Outages;
 - v. Emergencies of any kind affecting the operation of the Generating Facility; and
 - vi. Daily available Capacity.
- (d) Daily midnight readings of fuel used in stock;
- (e) Statements relating to abnormal running conditions of Generating Unit (s) and auxiliaries;
- (f) All Real (kW) and Reactive (KVAR) Power at half hour intervals, frequency, 11 kV bus voltage and 33 kV bus voltage at one hour intervals;
- (g) Time of trip-out or removal of Generating Units from service and the time of return to service; and
- (h) Visits by local regulatory agencies to the Generator's facility.

GC 5.4 FUEL SUPPLY PLAN

All Generators using fuel storage systems shall be required to:

- (a) Obtain and maintain reliable supply of fuel of quality and quantity sufficient to generate the Dependable Capacity and the Net Energy Output requirements of their Generating Facilities consistent with the provisions of GC 2.8.7.1, “Fuel Supply Capability) and Section 5.5, “Fuel Supply Agreement;”
- (b) Provide the Network Licensee, for its prior written approval, the Fuel Supply Plan;
- (c) Only enter into fuel supply arrangements consistent with the Fuel Supply Plan most recently approved by the Network Licensee.

GC 5.5 FUEL SUPPLY AGREEMENT

GC 5.5.1 FUEL SUPPLY AGREEMENT

The Fuel Supply Agreement shall:

- (a) Demonstrate a dependable and sufficient fuel supply;
- (b) Detail the infrastructure installed for delivery of the fuel from the central storage point to the generating Units;
- (c) Provide mitigating strategies in the event of natural disaster affecting the supply of fuel delivery to Grenada, consistent with the provisions of GC 2.8.7.1, “Fuel Supply Capability”;
- (d) Detail Fuel Transportation Agreement; and
- (e) Detail alternative fuel supply arrangements and infrastructure requirements.

GC 5.5.2 GENERATOR RESPONSIBILITIES

All Generators shall be required to:

GC 5.5.2.1

Obtain and maintain reliable supply of fuel (whether on-site storage and/or offsite storage arrangements exclusive to the Generator’s facility) of quality and quantity sufficient to generate the Dependable Capacity and the Net Energy Output requirements of their Generating Facilities for a period of at least eighteen (18) days and the minimum inventory level should be at least twenty (20) days of fuel requirement at normal rated output, or any greater minimum requirement provided in the Interconnection Agreement and/or PPA, consistent with the emergency fuel provisions of GC 5.5, “Fuel Supply.”

GC 5.5.2.2

Generators must report inventory levels weekly in writing, and advise the Network Licensee when the levels are below required levels or trending negatively for uninterrupted operations. The Network Licensee shall seek permission via an application to the Commission to trigger an emergency plan.

GC 5.5.2.3

Provide the Network Licensee the Fuel Supply Plan; as duly approved by the Commission in consultation with the Network Licensee.

GC 5.5.2.4

Only enter into fuel supply arrangements consistent with the Fuel Supply Plan.

GC 6 GENERATOR SCHEDULING & DISPATCHING TOOLS

GC 6.1 NETWORK LICENSEE TOOLS

GC 6.1.1 NETWORK LICENSEE OBLIGATION

The Network Licensee is required to ensure consistency and objectivity in the decision making mechanisms used.

GC 6.1.2 DECISION MAKING MECHANISMS

These decision making mechanisms may be in the form of standardized procedures and/or computational systems.

GC 6.1.3 SYSTEM DISPATCH AND OPERATIONS UPDATE

The Network Licensee is responsible for updating the System Dispatch and Operations Policy & Procedures as required, due to changes in the system characteristics or international best practices, where it has relevance to Grenada's Grid.

GC 6.1.4 COMMUNICATION OF PROCEDURES

Documentation of the procedures followed in making System operations decisions must be promulgated to individual Generators after ratification by the Commission.

GC 6.1.5 DISPATCH TOOL

The tools used to assist in the Generating Units Scheduling and Dispatch optimization process must be based on an internationally accepted optimization algorithm. The tools must be used in accordance with its intended design and the Network Licensee is responsible for ensuring that it is functional and accurate.

GC 6.2 TRANSPARENCY AND FAIRNESS

In order to assure transparency and fairness while being cognizant of the confidentiality provisions in individual contracts, the following outlines how and what type of information will be shared among stakeholders in the generation market. Unless explicitly stated otherwise in the document, the following shall prevail:

- (a) The Regulator: The Commission shall be allowed access to any and all available information it requires from both the individual Generators and the Network Licensee. Periodically as agreed between the Network Licensee and the Commission, Technical Reports will be compiled by the Network Licensee and provided to the Commission, and will contain information from the logged system parameters as agreed from time to time.

- (b) Individual Generator: The Network Licensee is required to provide, in a timely manner, individual Generators with any technical system information that affects the operation of interconnected Generating Units for example, fault information should be shared with all Generators, with due consideration for the specific confidentiality provisions contained in each License and Interconnection Agreement and/or PPA.
- (c) System Operator: The Network Licensee shall have timely access to all information it reasonably requires from the individual Generators. In cases where a Generator proposes to use new generation technologies with parameters not covered by this Code, the Generator shall provide all data and consultation reasonably required or requested by the Network Operator and the Commission to demonstrate the technical compatibility of the technology with the Grid and the reliability of the technology.

GC 7 LOAD SHEDDING AND POWER RESTORATION

GC 7.1 LOAD SHEDDING PROCEDURES

GC 7.1.1 UNDER FREQUENCY (AUTOMATIC) LOAD SHEDDING

GC 7.1.1.1

During incidents in which the frequency decay is such that the Generating Units' governors cannot adequately compensate for the decay, the Under Frequency Load Shedding Scheme is designed to shed the appropriate amount of Load to improve the System frequency so as to prevent damage to the Generating Unit(s) and/or collapse of the System.

GC 7.1.1.2

The Network Licensee shall provide the Commission with the details of the Under-Frequency Load Shedding Scheme which may be in force from time to time. The Scheme will apply to Small Renewable Energy Self-Generators with Permits only to the extent necessary to ensure System Restoration.

GC 7.2 LOW FREQUENCY ALARMS

GC 7.2.1 GENERATION ALARMS

Low frequency alarms shall be installed in power station control rooms and shall be set at 49.75 Hz. These alarms will warn Unit Controllers of low frequency problems, but no action should be taken without verification from the System frequency meter at the Network Licensee.

GC 7.2.2 NETWORK LICENSEE ALARMS

Low frequency alarms shall be installed at the Network Licensee's premises and shall similarly be set at 49.75 Hz.

GC 7.3 ACTION AT LOW FREQUENCY ALARMS

GC 7.3.1 GENERATOR ACTION

At a low frequency alarm, Generator Plant Operators shall confirm:

- (a) That the alarm is genuine by reading the analog and digital frequency meters/charts; and
- (b) Whether the System is still interconnected and whether the alarm is for the entire System or section(s) thereof.

GC 7.3.2 CONSULTATION REQUIRED

At the first stage alarm the Generator shall not act to restore the System frequency without prior consultation of the Network Licensee.

GC 7.3.3 GENERATOR RESPONSE TO LOSS OF GENERATING UNIT

The exception to this rule is allowed when the decay in System frequency results from a loss in Generating Unit output, in which case the relevant Generator shall act to restore its former level of output. The Network Licensee must be informed immediately.

GC 7.4 ACTION BELOW 49.75 HZ

GC 7.4.1 GENERATOR ACTION

At 49.75 Hz and falling, the Generator shall act on the Network Licensee Dispatch Instructions to increase Generating Unit output within operating limits, in order to restore the System frequency and then report action taken to the Network Licensee.

GC 7.4.2 NETWORK LICENSEE LOAD SHEDDING

To help relieve the System overload, the Network Licensee may carry out further manual load shedding in accordance with GC 7.6, “Manual Load Shedding.”

GC 7.5 ACTION BELOW 49.5 HZ AND FALLING

GC 7.5.1 GENERATOR OBLIGATION

In order to save the System from total collapse and prolonged outage, the Generators shall follow the Low Frequency and Low Voltage Ride-Through, as described in detail in GC Appendix C, “Low and High Voltage Ride-Through” and in the Interconnection Agreement and/or PPA, and shall comply with any Network Licensee Dispatch Instructions.

GC 7.5.2 SYSTEM RESTORATION

After a total System failure is confirmed, designated Black Start Capability Generating Units shall comply with GC 7.7.1, “Procedures for Restoration of Power Following Blackout” and with the Network License System Restoration Strategy as described in TDC 12.4, “System Restoration Strategy.”

GC 7.6 MANUAL LOAD SHEDDING

GC 7.6.1 NETWORK LICENSEE RESPONSIBILITY

The Network Licensee is responsible for development of a Manual Load Shedding Program to address the contingency that there is insufficient Generation to meet the System Load. The Network Licensee shall assure that the Manual Load Shedding Program is fully consistent with and integrated into the System Restoration Strategy described in TDC 12.4, "System Restoration Strategy." The Network Licensee shall assure that all Generator Interconnection Agreements and/or PPAs (other than Small-Scale Renewable Energy Self-Generators) incorporate the Manual Load Shedding Program and shall assure prompt communications with Generators concerning Program status and implementation.

GC 7.6.2 BLOCK IMPLEMENTATION

When it is known that Generation deficiency will extend over a period of several hours or days, particularly during Peak Hours, the Manual Load Shedding Program shall provide for implementation in blocks consisting of a number of feeders supplying various sections of the System, usually for 1 to 4 hour periods. The Load represented by the blocks shall be arranged to equate the amount of Load shed with the extent of the known generation deficiency and also to equitably distribute the time and period of Load Shedding among the blocks.

GC 7.6.3 MANUAL LOAD SHEDDING PROCEDURE

A Manual Load Shedding procedure may be implemented to rotate the blocks shed after Under-frequency Load Shedding has taken place. Manual Load Shedding may also be implemented to prevent further Under-frequency Load Shedding.

GC 7.6.4 SCHEDULE COMPLIANCE

Every effort must be made to ensure that the programmed duration of each outage is maintained as near as possible to the planned schedule or for a shorter duration where possible.

GC 7.6.5 CRITICAL LOAD

Feeders supplying critical loads should be identified and whenever possible the shedding of these feeders should be avoided.

GC 7.6.6 PRIOR NOTICE FOR CRITICAL LOAD

If the shedding of feeders supplying hospitals and other critical loads becomes necessary the following actions must be taken by the Network Licensee prior to effecting this measure:

- (a) Alert the hospital(s) and critical loads supplied from the feeder(s); and
- (b) Advise the staff at these institutions to activate stand-by plant if available.

GC 7.6.7 MINIMIZING IMPACTS

In order to maintain supplies to the maximum number of Consumers permitted by available Capacity, the Network Licensee must, whenever possible, avoid shedding a complete block of Load when a portion thereof will provide the necessary relief to the Generating Units. The Load Shedding log sheet shall be properly completed.

GC 7.6.8 FREQUENCY TARGET VARIATION

To achieve Load reduction and upon consultation with the Commission, the Network Licensee may be allowed to change the target frequency from 50.0 Hz to a minimum of 49.75 Hz. or reduce busbar voltages by up to 4% if necessary at all Generating Facilities.

GC 7.6.9 SUBSTATIONS WITH AUTOMATIC ON-LOAD TAP CHANGERS

During Manual Load Shedding program implementation, Substation locations having automatic on-load tap changers shall attempt to maintain normal voltage. The result of bus voltage reduction must be carefully noted.

GC 7.6.10 REPORTING ADVERSE EFFECTS ON GENERATING UNITS

Any adverse effect of changing target frequencies and/or voltages on any Generating Unit must be reported to the Network Licensee immediately, who will take the necessary corrective action.

GC 7.7 CONTINGENCY PLANS FOR POWER RESTORATION

GC 7.7.1 PROCEDURES FOR RESTORATION OF POWER FOLLOWING WIDESPREAD BLACKOUT

GC 7.7.1.1

The Network Licensee is responsible for coordinating all activities required to restore the System following partial or total System shutdown.

GC 7.7.1.2

All Generators shall cooperate with the Network Licensee in development and implementation of the System Restoration Strategy described in TDC 12.4, "System Restoration Strategy." The Network Licensee shall include the requirements for System Restoration applicable to Small Renewable Energy Self-Generators in the applicable Code of Practice after consultation with representatives of this Generator class.

GC 7.7.1.3

Such Generators shall be prepared to cooperate fully with the Network Licensee in establishing the following procedures controlling Generators, and the Network Licensee shall assure that the System Restoration Strategy fully incorporates these procedures:

- (a) Designate Generating Units with Black Start Capabilities to commence restoration;
- (b) Restart these designated Generating Units;
- (c) Establish a transmission line pathway to the nearest other Generating Unit which is to be restarted while clearing all Load in this pathway;

- (d) Establish a manageable distribution load preferably adjacent to the Generating Unit;
- (e) Start and synchronize the Generating Unit;
- (f) Repeat procedures 7.7.1.3. (d) to 7.7.1.3(e) above until all Generating Units required to restore power are brought back into service; and
- (g) Gradually return Load to the System while ramping up the power output of the Generating Units until System is totally restored.
- (h) Procedures 7.7.1 (d) to 7.7.1 (g) may be used to restore the System after partial System shutdown.

GC 7.8 PERIODIC REVIEW OF RESTORATION PLAN

GC 7.8.1 RESTORATION PLAN UPDATES

At the end of each year, or less than a year if deemed appropriate, the Network Licensee shall review and revise, as necessary, its System Restoration Plans based on any changes in the configuration of the System, consistent with the provisions of TDC 12.2(iv), “Emergency and Contingency Planning.” Any revised Plan shall be presented to the Grid Code Review Committee for review prior to implementation.

GC 7.8.2 AUDIT OF IMPLEMENTATION CAPACITY

Following implementation, the Network Licensee shall have the right to audit and test each Generator's ability to carry out the assigned duties.

GC 8 GENERATOR MAINTENANCE PLANNING

GC 8.1 LONG TERM MAINTENANCE

The Network Licensee is responsible for development and coordination of a Generator Maintenance Program as part of System planning under TDC 10.6.1, “Maintenance Coordination/Outage Planning. All Generators with a Generating Facility with a rated capacity above 500kW interconnected to the Grid shall consult and comply fully with the Generator obligations under that section. This section addresses Generator-specific details in the Generator Maintenance Planning Process.

GC 8.2 PLANNING HORIZON

The Network Licensee shall develop overall generation maintenance plans for three (3) years in advance. The plans must incorporate all relevant technical and legal Generator maintenance requirements, and shall be reviewed annually and updated as may be necessary.

To achieve this objective, Generators shall submit to Network Licensee on or before the first day of September each year a rolling three year plan for the scheduled maintenance requirement for their facility beginning in January of the following year. The Network Licensee shall endeavour to schedule both long and short term Maintenance Outages in a non-discriminatory manner as far as System security constraints allow. Both Network

Licensee and Generator shall make best efforts to ensure that interconnection and other related facilities are maintained within the periods stipulated for scheduled maintenance of the Generating Facility.

GC 8.3 ANNUAL COMMITMENT OF MAINTENANCE PROGRAM

Generators shall submit to the Network Licensee on or before the first day of September of each year, a schedule called the 'Maintenance Schedule' describing the proposed availability of the Generating Facility for each month of the twelve (12) month period beginning with January of the following year. The Maintenance Schedule shall indicate the Generators' preferred dates and durations of all scheduled maintenance. In developing the plans the Network Licensee shall take into account the manufacturer's recommendations for maintenance of the plant.

The Network Licensee shall notify the Generator in writing whether the scheduled maintenance periods requested on the Maintenance Schedule are acceptable. The Network Licensee shall have the right to request the Generator to conduct scheduled maintenance during periods other than those indicated in the Maintenance Schedule, provided that the period specified by the Network Licensee shall be as close as reasonably practicable to the periods requested by the Generator, shall be of equal duration as the periods requested by the Generator and shall be within the range of time periods identified by the Generator as the range of time periods within which such scheduled maintenance must be performed in accordance with the manufacturer's recommendations for the Generating Facility.

GC 8.4 CHANGES TO THE COMMITTED MAINTENANCE SCHEDULES

Committed Generating Unit Maintenance Schedules shall be strictly adhered to unless unanticipated circumstances may mean interruption of Supply to Customers or a compromise in System security if the Maintenance Schedule is not adjusted. Under such circumstances both the Network Licensee and the Generator shall make best efforts to reschedule the outage as follows:

- (a) Network Licensee may upon ten (10) days prior notice request a Generator to reschedule a scheduled maintenance provided, however, that Network Licensee shall not request that scheduled maintenance be rescheduled to a time that is outside of the range of time periods identified by the Generator as the range of time periods within which such scheduled maintenance must be performed in accordance with the manufacturers recommendations for the Generating Facility;
- (b) The Generator may, upon five (5) days prior written notice, request that it be permitted to conduct an additional scheduled maintenance period not identified in the Maintenance Schedule if the maintenance to be conducted cannot be postponed until the next period of scheduled maintenance identified on the Maintenance Schedules without damaging or otherwise threatening the Generating Facilities. The Generator's request shall also identify the range of time periods within which such additional scheduled maintenance must be performed in order to avoid damaging or otherwise threatening the Generating Facilities. The Network Licensee may upon three (3) days prior written notice, request the Generator to reschedule such additional scheduled maintenance; provided, however, that Network Licensee shall not request that such

additional scheduled maintenance be rescheduled to a time that is outside of the time periods identified by the Generator as the range of time period within which such additional scheduled maintenance must be performed in order to avoid damaging or otherwise threatening the Generating Facilities.

GC 8.5 SHORT TERM OUTAGE PROGRAM

For short term outages Generators shall give Network Licensee at least two (2) hours' notice prior to taking the Generating Facilities out of service.

GC 9 TESTING AND MONITORING PROCEDURES

GC 9.1 GENERATOR TEST TIMETABLE

All Generators, other than Small Renewable Energy Self-Generators, shall provide to the Network Licensee a timetable and list of all tests to be performed on the Generating Units, and such tests shall be subject to approval by the Network Licensee. The Network Licensee shall be given five (5) days' notice of any testing and shall reserve the right to have a representative present during any such tests. The Generator and Network Licensee shall conform to the requirements of TDC 16.3, "Authorization and Test Procedures."

GC 9.2 STANDARD TESTS

This section addresses procedures for testing and monitoring of Generating Units for purposes of determining available Capacity and, if relevant, operating characteristics in accordance with the commercial and technical conditions of the Interconnection Agreement and/or PPA. The manufacturer's representative shall be required for the commissioning of new Generating Facilities. The standard tests shall include all tests outlined in GC 9.3 "Tests to be Completed Prior to First Synchronization of a Generating Unit" through GC 9.5 "Tests to be Completed After First Synchronization."

GC 9.3 TESTS TO BE COMPLETED PRIOR TO FIRST SYNCHRONIZATION OF A GENERATING UNIT

GC 9.3.1 PRE-SYNCHRONIZATION OF GENERATION UNIT

Prior to the synchronization of each new Generating Unit, the Generator shall carry out, or shall cause its contractors to carry out, the following tests at the Generator's expense:

GC 9.3.2 MANDATORY FACTORY TESTS

Mandatory Tests that may be carried out at the Factory prior to Equipment delivery at the Site of the new Generator Facility include the following:

- (a) Automatic voltage regulator setting up and adjusting, statically and with the Generating Unit running at no load;
- (b) Governor control checks;
- (c) Open and short circuit tests on the Generating Unit; open and short circuit tests on the generator as per ANSI/IEEE or equivalent standards approved by

the Network Licensee;

- (d) Grounding test at the generator switchyard.
- (e) Functional testing and timing of High Voltage switchgear in the Substation;
- (f) Voltage phasing checks between the Substation to which the Generating Unit is connected and the Grid;
- (g) Primary and/or secondary injection tests and functional tests to prove the calibration and function of the Generating Unit inter-tripping protection scheme under conditions inclusive of the following:
 - i. Loss of excitation;
 - ii. Stator earth fault;
 - iii. Negative phase sequence;
 - iv. Reverse power;
 - v. Generating Unit transformer over current and earth faults;
 - vi. Generating Unit under/over voltage and under/over frequency protection;
 - vii. Differential protection relays covering all zones; and
 - viii. Engine/Turbine Overspeed

GC 9.3.3 ADDITIONAL TESTING

The Network Licensee shall have the right to request additional testing if, in its sole judgment, any test results are not satisfactory for establishing the purpose for which the test was intended. Such additional testing shall be performed at the Generator's expense.

GC 9.3.4 NOTICE OF TEST PROGRAM

The Generator shall confirm to the Network Licensee the program for any test as specified or advise of any adjustments thereto, not less than five (5) days prior to the commencement.

GC 9.3.5 INDIVIDUAL TEST RESULTS

Upon completion of each test the Generator shall within forty eight (48) hours provide Network Licensee with two (2) copies of the results of such tests.

GC 9.3.6 ALL TEST RESULTS

In each instance, the Generator shall provide the Network Licensee with the results of all such tests, within a reasonable time of the test being completed.

GC 9.4 TESTS TO BE COMPLETED AT THE SITE OF NEW GENERATING FACILITY

GC 9.4.1 MANDATORY SITE TESTS

Mandatory Tests that shall be completed at the site of the new Generating Facility include the following:

- (a) Grounding test at the generator switchyard;
- (b) Functional testing and timing of High Voltage switchgear in the Substation;
- (c) Voltage phasing checks between the Substation to which the Generating Unit is connected and the Grid; and
- (d) Primary and/or secondary injection tests and functional tests to prove the calibration and function of all electrical protection schemes installed for the Generating Unit(s) and the Facility.

GC 9.4.2 INDIVIDUAL TEST RESULTS

Upon completion of each test the Generator shall within forty eight (48) hours provide the Network Licensee with two (2) copies of the results of such tests.

GC 9.4.3 ADDITIONAL TESTING

The Network Licensee shall have the right to request additional testing if, in its judgment verified by an Independent Engineer acceptable to the Network Licensee and Generator, any test results are not satisfactory for establishing the purpose for which the test was intended. Such additional testing shall be performed at the Generator's expense.

GC 9.4.4 NOTICE OF TEST PROGRAM

The Generator shall confirm to the System Operator the programme for any test as specified or advise of any adjustments thereto, not less than five (5) days prior to the commencement.

GC 9.5 TESTS TO BE COMPLETED AFTER FIRST SYNCHRONIZATION

GC 9.5.1 ADDITIONAL PRE-COMMISSIONING TESTING

After the Pre-Synchronization tests described in this Section are complete, and prior to the commissioning date, and subject to any additional requirements imposed by the Interconnection Agreement and/or PPA, the Generator shall carry out the following tests at the Generator's expense:

GC 9.5.1.1 Dependable Capacity:

If the Generator intends to supply capacity and energy the Generator shall test the Dependable Capacity of the Generating Unit. The test shall be performed according to ASME, IEEE, and NEMA standards or to equivalent standards approved by the Network Licensee. If any such standards are inconsistent in any respect, the test shall be performed in accordance with the most stringent standard.

GC 9.5.1.2 Reliability Run:

The Generator shall test the reliability of the Generating Unit. The test shall be in accordance with industry standards based on the type of plant and prudent utility practice. The method and duration of this test shall be agreed by the Network Licensee

and the Generator

GC 9.5.1.3 Automatic Voltage Regulator (AVR) Droop:

The Generator shall test the AVR to demonstrate control of the Generating Unit voltage over the range of plus or minus five (± 5) percent of rated voltage with a droop characteristic of plus or minus one half (± 0.5) percent.

GC 9.5.1.4 Governor Operation:

The Generator shall demonstrate that the speed governor for each Generating Unit operates over its range, the droop being adjustable from two (2) percent to five (5) percent.

GC 9.5.1.5 Reactive Capacity:

The Generator shall test each Generating Unit's capability to operate at rated voltage and frequency at power factors and under reactive conditions as follows: 100% output: .80 lag; .99 lead.

GC 9.5.1.6 Short-term Load Capability:

The Generator shall test each Generating Unit's capability to operate at a maximum safe load of one hundred ten (110) percent of the Dependable Capacity for one (1) hour and at a minimum safe load of zero (0) percent of the Dependable Capacity (0 MW) for one (1) hour.

GC 9.5.1.7 Response of Unit to Step Load Changes:

The Generator shall test the capability of each Generating Unit to increase load by steps.

GC 9.5.1.8 Full Load Rejection:

The Generator shall test the capability of each Generating Unit and auxiliaries to withstand full and part load rejection, all the while remaining in a safe condition and without initiating a trip of the Generating Unit.

GC 9.5.1.9 Thermal Performance Tests:

The Generator shall test the Heat Rate of each fuel burning Generating Unit and shall be conducted according to ANSI/IEEE Standards or equivalent standard approved by the Network Licensee.

The Network Licensee shall have the right to request additional testing if, in its sole judgment, any test results are not satisfactory for establishing the purpose for which the test was intended. Such additional testing shall be performed at the Generator's expense. The results of the immediately prior test shall govern until the additional test is completed. The results of the additional test shall supersede the prior test for all purposes commencing on the day following the additional test.

The Generator shall notify the Network Licensee of the proposed program for any test specified in this Section, or advise of any adjustments thereto, not less than five (5) days prior to the proposed commencement of the relevant test. Upon receiving such notice, the Network Licensee shall have the right to reschedule the commencement of such test; provided that the rescheduled commencement shall not be more than three (3) days before the proposed commencement nor more than ten (10) days after the proposed commencement. The Network Licensee shall be entitled to have representatives present for the purpose of observing any such test.

Upon completion of each test specified in this Section, the Generator shall promptly provide the Network Licensee with two (2) copies of the results of such test; provided that the Generator shall submit all such test results to the Network Licensee no later than ninety (90) days after the commissioned date of the relevant unit.

GC 9.6 TESTS TO BE COMPLETED BY CO-GENERATORS AND NON-DISPATCHABLE GENERATORS

Co-Generators and Generators with Non-Dispatchable Generating Units (in terms of an approved rated capacity and standby usage) shall be required to perform all Standard Tests described above in GC 9.2, “Standard Tests.”

GC 9.7 TESTING OF METERING SYSTEM

All Generators other than Small-Scale Renewable Energy Self-Generator Permit Holders are required to comply fully with the requirements of GC 2, “Operational Metering as an integrated part of these required testing and monitoring procedures.

GC 9.8 MONITORING

Network Licensee shall, in consultation with the Grid Code Review Committee, establish a schedule for Generator submittal of monitoring data on key Generating operating parameters to provide accurate data to support Network Licensee’s Grid modeling obligations. All Generators other than Small-Scale Renewable Energy Self-Generators shall be required to submit the Generator operating parameters to determine if there is any decay which should be modeled.

Following major refurbishment or upgrade of any Generating Unit or Generating Facility, a Generator other than a Small-Scale Renewable Energy Self-Generator, may be required to conduct any or all of the Standard Tests outlined in GC 9.2, “Standard Tests.” Generators shall carry out routine and prototype response tests on excitation systems and governor systems (unit frequency response) for new power stations coming on-line or power stations at which major refurbishment or upgrades of these systems have taken place. Routine review is required of all power stations at least once every five (5) years.

GC 10 GENERAL PROVISIONS

GC 10.1 UNFORESEEN CIRCUMSTANCES AND SYSTEM EMERGENCIES UNFORESEEN CIRCUMSTANCES

GC 10.1.1 CONSULTATION AND DECISION RESPONSIBILITY

If circumstances arise which the provisions of the Generation Code had not foreseen the Network Licensee, shall, to the extent practicable in the circumstances, consult promptly and in good faith with all affected Parties in an effort to reach agreement as to the required course of action. If such agreement cannot be reached in the time available the Network Licensee shall determine the course of action to be taken.

GC 10.1.2 REFERRAL TO GRID CODE REVIEW COMMITTEE

Whenever the Network Licensee makes a determination, it shall do so having regard, wherever possible, the view expressed by the Generators and, in any event, to what is reasonable in the circumstances. Each Generator shall comply with the instructions given to it by the Network Licensee as a consequence of such a determination, provided that the instructions are consistent with the technical parameters set out in the Code and the Interconnection Agreement and/or PPA. The Network Licensee shall promptly refer all unforeseen circumstances and any determinations to the Grid Code Review Committee for consideration.

GC 10.2 FORCE MAJEURE

The provisions of the Generation Code may be suspended, in whole or in part, due to Force Majeure. In the event of Force Majeure, the Network Licensee, Generators and all System Users shall cooperate to facilitate System Restoration as efficiently and expeditiously as feasible.

GC 10.3 NON-COMPLIANCE

If a Generator finds that it is, or will be, unable to comply with any provision of the Generation Code it shall, without delay, report such non-compliance to the Network Licensee and, subject to the Derogation provisions of IC 12, “Code Effective Date; Transitional Provisions,” make all reasonable efforts as are required to remedy the cause of non-compliance as soon as reasonably practicable.

The Network Licensee shall report all material incidents of non-compliance with Generation Code provisions to the Commission.

APPENDIX A

REQUIRED COMMUNICATION EQUIPMENT

A Generation Licensee or a Self-Generator Permit Holder shall provide the following listed required communication equipment at its sole cost and expense. These provisions do not apply to Small Renewable Energy Self-Generators, who are instead governed by the Small Renewable Energy Self-Generator Code of Practice described in SC 4.2, “Small Renewable Energy Self-Generator Interconnection.”

1. Adequate control, communication and data acquisition channels to the Network Licensee for the purpose of telemetering, protection and telecommunications.
2. An extension of System Controls Center PBX System in the Generating Units control room to facilitate voice communication between the Generator control room and Network Licensee.
3. Equipment in the Generating Units control room to transmit and receive telecopies and electronic mail to and from Network Licensee respectively.
4. UHF and/or VHF radio equipment to permit voice communication between the Generating Unit control room and Network Licensee.

APPENDIX B

RENEWABLE ENERGY INTERCONNECTION POLICY

The Network Licensee's most current Renewable Energy Interconnection Policy and Programme can be accessed at:

http://grenlec.com/Portals/0/Grenlec_Energy_Renewable_Standard_Offer_Overview_ver5.pdf

DRAFT

APPENDIX C

GRENADA TRANSMISSION AND DISTRIBUTION SYSTEM LOW VOLTAGE/HIGH VOLTAGE RIDE-THROUGH REQUIREMENTS

The required Generating Facility response to Grid voltage and frequency excursions are specified in the two tables below⁷

Voltage Range (% of base voltage)	Required Response	Clearing Time (s)	Reconnection Delay (s)
$V \geq 120\%$	Disconnection	0.2	180-300
$120\% > V \geq 104\%$	Ride Through	1	180-300
$104\% > V \geq 92\%$ (Normal Voltage)	Normal Operation	N/A	N/A
$92\% > V \geq 50\%$	Ride Through	10-20	180-300
$V < 50\%$	Disconnection	0.2	180-300

Table 1: DG Facility Response to Abnormal Voltages¹

Frequency Range (Hz)	Required Response	Clearing Time (s)	Reconnection Delay (s)
$F \geq 53$	Disconnection	0.2	180-300
$53 > F \geq 51.5$	Ride Through	20	180-300
$51.5 > F \geq 48.5$ (Normal Frequency)	Normal Operation	N/A	N/A
$48.5 > F \geq 47$	Ride Through	20	180-300
$F < 47$	Disconnection	0.2	180-300

Table 2: DG Facility Response to Abnormal Frequencies²

⁷ Values need to be in line with the Electricity Act, 2016

APPENDIX D

SPINNING RESERVE MARGIN POLICY⁸

[Attach Grenlec Spinning Reserve Margin Policy]

DRAFT

⁸ Requested from GRENLEC

APPENDIX E

LIST OF REFERENCES

1. The Electricity Act, 2016, as amended by the Electricity Supply (Amendment) Act, 2017
2. Public Utilities Regulatory Commission Act, 2015 as amended by the Public Utilities Commission Regulatory Act (Amendment) Act, 2017
3. National Energy Policy
4. Grenlec Renewable Energy Interconnection Policy Version 3.2 dated November 2015
5. Grenlec Electricity Services Limited Suspense Policy Revision 1.01, dated February 16, 2009
6. Grenlec Electricity Services Limited Service Application Checklist
7. Grenlec Tariff Rate Schedule