



# **Columbia Water & Light Department**

## **Facilities Connection Requirements**

For Transmission and Generation Interconnections

**(FCR)**

**2019.12**



# City of Columbia Water & Light

## Facilities Connection Requirements

### For Transmission and Generation Interconnections

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## Responsible Entity

The Responsible Entity for NERC Reliability Standards is the City of Columbia Water and Light Department (CWLD)

## Review and Re-Certification Requirements

This procedure will be reviewed at least annually and more frequently as appropriate by the Responsible Entity for possible revision. The existing or revised document will be re-certified and distributed to appropriate staff members and other approved entities who submit requests for the City of Columbia's Facilities Connection Requirements.

## Applicability

The U.S. Federal Energy Regulatory Commission (FERC) granted NERC the legal authority to enforce reliability standards with all U.S. users, owners, and operators of the Bulk Power System, and made compliance with those standards mandatory and enforceable. The policies described in this document apply to Facilities solely owned by the Columbia Water and Light Department, also referred to as CWLD, and all Customer Facilities with existing interconnection, or requests for interconnection with CWLD. CWLD may be referred to as the Department.

## Effective Date

This revision [2019.12] supersedes all previous revisions of this document as of the effective date of 12/31/2019.

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## Terms and Definitions

The use of the capitalized terms; Connections, Customer, Project, and Agreement all refer to the specific Customer, their specific Project, its specific Connection to CWLD's System, and the Agreement specifying the legal rights and obligations of the Customer and CWLD. The term Party either refers to CWLD or the Customer. All other capitalized terms used in this document can be found in the *Glossary of Terms Used in NERC Reliability Standards*.

## Purpose and Scope

### *Purpose*

This document outlines the requirements for generation, transmission, and end-use facilities of customers to be connected to the Columbia Water & Light Department (CWLD) electric system. Its purpose is to promote safety of people and equipment, compatibility between customer facilities and CWLD facilities, and maintenance of reliability of the regional electric system when a customer requests an interconnection with CWLD. It complies with the requirements of the NERC Standard FAC-001, and FAC-002.

### *Scope*

1. This document describes requirements for Projects involving generation, transmission, and end use facilities. The *Generation Requirements* and *Transmission Requirements* sections describe additional requirements specific to Projects involving generating facilities or transmission facilities.
2. All Connections will require the Customer to submit a proposal to serve as an application to CWLD for each Customer Project; more detail is outlined below. In general, the size (MW and MVAR), connection voltage level, and degree of complexity of the proposed connection of the Customer's Project will determine the extent of detail and studies needed for approval. Large loads and generators, and higher voltage interconnections will need more comprehensive study and protective design. CWLD will have the right of approval of aspects of a Project that may have an effect on its system.
3. All Connections will require an Agreement specifying the legal rights and obligations of the Customer and CWLD.

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4. The Customer's access to and conditions of use of the CWLD system for transmission service may be governed by the Midcontinent Independent System Operator (MISO)'s Open Access Transmission Tariff. In that event, a Request for Transmission Service must be made as required in the tariff and terms will be as specified in the Tariff.

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## Facilities Connection Requirements

### 1. Application & Modifications

- 1.1. Customers must submit a proposal that will serve as the initial application to CWLD for proposed generation, transmission, or end use Projects and associated connections to CWLD's System. Applications must include sufficient information for CWLD to conduct the necessary inspections, evaluations, studies and approvals, and for discussions and changes as necessary.
- 1.2. Sufficient lead-time, considering project scope (complexity, size, location, etc.) is required prior to starting construction to assure a thorough and orderly review process and construction schedule.
- 1.3. The Application will include:
  - Customer name & address
  - Contact person, with phone, fax, and e-mail
  - Project and connection site description
  - Design and test specifications
  - Schedule for the design and construction of Customer's Project and connection
  - Operation and maintenance plans, including staffing, to the extent coordination with CWLD is affected
  - Electrical schematics, which will include but not be limited to:
    - One line diagram showing the connections between the Customer Project and the CWLD System
    - Three-line diagrams showing current and potential circuits for protective relays
    - Relay tripping and control schematic diagram

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- 1.4. CWLD reserves the right to approve the proposed settings for relays. If requested by Customer, CWLD will provide system data needed to determine the relay settings which may include:
- Communication and control schemes
  - Generator and load specifications
  - Schedules of intended generation, transfers, and load levels that will affect CWLD's System
- 1.5. Customer will also provide to CWLD any other information or documents related to the Project which are necessary for the purpose of ensuring the safety, reliability, security, and protection of the CWLD System and the regional electric System. Examples of such information are detailed in this document.
- 1.6. The Customer will provide prior written notice to CWLD of any material modification or change to the Project during construction or operation, which may affect the CWLD System. CWLD may require modifications to the Customer's Project, when necessary for the integrity of its System. Customer will not make any major modifications to the Project without the prior written consent of CWLD. Proposed Customer modifications to existing facilities must be mutually planned, coordinated, and integrated into CWLD's bulk transmission System.

## 2. Confidentiality

- 2.1. It is recognized that certain information relating to the Project may be confidential, proprietary or of competitive value. To the extent allowed by law CWLD will keep in confidence and will not disclose any such information designated as confidential.
- 2.2. Additional disclosures may be made to the extent required by regulatory or legal authorities and proceedings, or as required for evaluations by NERC, SERC Reliability Corporation (SERC) or MISO. If CWLD is required to disclose confidential information, CWLD will give the Customer prompt notice of such requirement.

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### **3. Agreement**

- 3.1. An Agreement will be required to specify the legal rights and responsibilities of the Customer and CWLD related to the Project. The Agreement will include: cost and work responsibilities; reasonable security deposits, communications, liability, insurance, penalties for non-performance, responsibilities under normal and emergency conditions, and other provisions as required.
- 3.2. The Customer will be responsible for any and all costs which CWLD incurs as a direct or indirect result of the Project. This includes installation, operating and maintenance expenses, study costs, and administrative costs which would not have been incurred but for the Customer's Project.
- 3.3. Customer will reimburse CWLD for all costs incurred by CWLD resulting from the Project and will pay all other charges or amounts payable by Customer under the Agreement.

### **4. Adherence to Standards**

- 4.1. All facilities designed and installed by Customer and CWLD must be designed, installed, maintained and operated in accordance with the Agreement, good utility practices, the National Electrical Code, the National Electrical Safety Code, the practices, standards and guidelines of CWLD, NERC, SERC and MISO, and all applicable laws and regulations.
- 4.2. If applicable, Customer will comply with all practices, methods, policies, procedures, standards, guidelines, criteria, tariffs and other requirements (including regional interconnection requirements) with respect to the construction, installation, maintenance and operation of the Customer's facility, delivery of energy to the CWLD System and access to and use of the CWLD System.
- 4.3. During construction and start-up CWLD will monitor construction of the Customer's facility to assure compliance with CWLD safety and construction standards. CWLD reserves the right during system start-up and operation to witness all service checks, protection and control device calibrations, settings and routine testing. CWLD's review process does not relieve the Customer of its obligation to perform and document these activities.

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- 4.4. CWLD may periodically review pertinent aspects of the Project's operation, maintenance, and condition during the Project's life, in order to assure continuing safety and reliability of CWLD's System.
- 4.5. If the Customer's testing and maintenance program is not performed to the satisfaction of CWLD or at the required maintenance interval (i.e. in accordance with good utility practice), CWLD reserves the right to inspect, test, or maintain devices required for the protection of CWLD's bulk transmission System at the Customer's expense. If the Customer's protective equipment is determined to be unsatisfactory, CWLD reserves the right to disconnect the Customer from the CWLD System until the protective equipment is brought into conformance at the Customer's expense.

## **5. Reliability Studies**

- 5.1. CWLD will evaluate the impact of the Customer's Project on its system, and on the electric System in the region. Studies will be made before Project startup and periodically during its operation. Studies may include load flow, fault duty (breaker duty and surge protection), short circuit, stability, torsional oscillations, transfer capability, and power quality impacts. The types and extent of necessary studies will be determined by the nature and size of the Project.
- 5.2. The studies may identify System problems and alternative solutions. Modifications to the Project may be required. If CWLD System modifications are needed, these System facilities will be provided only if they are acceptable to the applicable regulatory authorities and CWLD believes the improvements are a prudent business decision.
- 5.3. The Customer's Project may require other design, planning, or operational studies to assure the desired performance of the integrated facilities, depending upon size, location and type of facility characteristics and systems. Such studies may be done jointly with entities responsible for regional reliability, such as SERC or MISO.
- 5.4. Studies, analyses, reviews, testing, witness checks or audits, requested by or required due to the Project, performed or contracted by CWLD will be at the Customer's expense.
- 5.5. CWLD will ensure that information gathered from project studies that result in new or materially modified interconnections or facilities include the identification of those

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entities responsible for the reliability of affected system(s), as well as ensuring that said facilities/interconnections exist within a Balancing Authority's metered boundaries.

## 6. Regional Review

Review of the Project's impact on the local and/or regional electric System may be required. Projects with characteristics that may include new or materially modified interconnections or facilities, will be reviewed as appropriate by NERC, SERC, or MISO technical assessment panels. These reviews will be conducted prior to project startup, and can be periodically assessed at the purview of the applicable authority.

## 7. Regulatory Approval

7.1. Filings at, and approvals from, regulatory agencies may be required for interconnection facilities associated with the Project. Possible agencies include FERC, local governmental agencies, and environmental agencies, depending on the nature of the Project and associated CWLD facilities.

7.2. The interconnecting party is responsible for making arrangements with the Balancing Authority to ensure that the facilities reside within the BA's metered boundaries. CWLD as the Transmission Owner will confirm that the interconnecting party has made appropriate provisions with a Balancing Authority to operate within its metered boundaries.

7.3. Customer and CWLD will assist one another and use all reasonable efforts in making necessary filings and obtaining any necessary approvals of the Agreement as promptly as practicable. In the event any agency requires changes in the Agreement as a condition to its acceptance or, if applicable, approval of the Agreement, the parties will negotiate in good faith with respect to revising the Agreement to reflect such changes.

## 8. Transmission Requirements

### 8.1. *System Protection and Coordination*

8.1.1. The Customer's protection and control systems must be designed, installed, operated and maintained to coordinate properly with CWLD protection and control systems for all normal and potential abnormal power System conditions. These systems must prevent or limit damage to the Project and to the CWLD System. They must provide acceptable redundancy; be easily maintained;

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accurate; fast; reliable (dependable and secure); sensitive; selective; meet CWLD, IEEE, SERC and NERC standards; protect the general public; minimize damage to facilities; prevent cascading outages; minimize unnecessary outages; and provide the flexibility for rapid restoration of service.

8.1.2. CWLD will have the right to review and accept the Customer's proposed grounding design and voltage transformations to avoid adverse impact upon CWLD and Customer facilities, operations and safety.

8.1.3. The Customer's interconnection protective devices should conform IEEE Standard C37.90, *Relays and Relay Systems Associated with Electric Power Apparatus* and have appropriate test plugs/switches for testing the operation of the relay, and have targets to indicate relay operation.

8.1.4. CWLD will review and approve relay settings for the Customer's relays to assure coordination between the Customer's protective equipment and the CWLD System relays. It is the Customer's responsibility to determine that their other protective equipment coordinates with the required CWLD protective equipment and is adequate to meet all applicable standards to which the Project is subject. CWLD further reserves the right to modify interconnection relay settings when deemed necessary to avoid safety hazards to utility personnel or the public and to prevent any disturbance, impairment, or interference with CWLD's ability to serve other customers.

### 8.2. *Metering*

8.2.1. All electrical energy delivered at the Connection will be measured by suitable metering equipment. The metering interface equipment must be compatible with the data acquisition systems of both CWLD and the Customer. CWLD may install, own, operate and maintain all metering equipment at Customer's expense. Customer will provide suitable accessible space for the installation of the metering equipment at no cost to CWLD. These meters will measure and record peak and integrated real and reactive power in and out of the interconnection every 15 minutes.

8.2.2. Metering equipment installed by CWLD will be tested by CWLD at regular intervals and at any other reasonable time upon request by either Party, at the

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requesting Party's expense. Customer will have the right to witness all testing and will be furnished all test results on a timely basis.

8.2.3. Customer may, but will have no obligation to, install, own, operate and maintain at its own expense meters and associated equipment used to back up metering equipment maintained by CWLD.

8.2.4. If, for any reason, any metering equipment is out of service or malfunctioning, the electrical energy delivered during the period of outage will be estimated and agreed upon using the best data available. The correction and compensation for metering errors and losses will be covered contractually in the Agreement.

### 8.3. *Telemetry*

8.3.1. If, at the discretion of CWLD, the Customer's Project necessitates Real-time telemetry to the CWLD Control Center, the Customer will install and operate at its expense the necessary supervisory control and data acquisition equipment, communication channel, the telemetry equipment and all associated devices.

8.3.2. Telemetry equipment will include transducers, remote terminal units, modems, telecommunication lines, and any other equipment necessary to transmit information necessary for the proper operation of the CWLD System. The remote terminal unit, or equivalent device, may need to have multiple communication ports to allow simultaneous communications with third parties, such as ISOs or other regional reliability Control Centers. That device will accommodate data communication requirements specified by each party's Control Center, including communication protocol, rate and mode (either synchronous or asynchronous).

8.3.3. All metered values provided to the telemetry equipment will originate from common metering equipment. All transducers used for telemetry will meet industry standard accuracy. As part of Real-time data to be provided, CWLD has the right to require the status and remote control of switching devices at the Project.

### 8.4. *Visual Disconnect*

8.4.1. Customer will furnish a manual disconnect device whose open condition is visibly verifiable, to separate Customer's Connection and related equipment and

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facilities from interconnection with the CWLD System. This device will have a means for padlocking in the open position. The location of this device will be determined by mutual agreement and be readily accessible to CWLD at all times. Where the disconnect device is a part of or directly connected to the CWLD System the disconnect device will be operated only after authorization from CWLD's dispatcher or its designated representative.

8.4.2. CWLD reserves the right without liability to open this disconnecting device or other devices under its control, isolating Customer's Connection and related equipment and facilities, if in its sole judgment an Emergency has occurred or is imminent.

8.4.3. Except in the case of an Emergency, CWLD will provide to Customer oral or written notice prior to any disconnection. As soon as reasonably practicable after occurrence of an Emergency, CWLD will provide to Customer oral or written notice of the nature thereof, together with the expected duration of the disconnection from the CWLD System.

### 8.5. *Insulations Coordination*

The Customer must coordinate its switching surge and lightning protection systems with CWLD lightning protection systems. Careful attention needs to be given to the proper insulation levels and grounding techniques employed. If switching surges are expected to be a problem, circuit breakers may need to be equipped with closing and/or opening resistors and/or zero crossing switching capability.

### 8.6. *Voltage, Reactive, and Power Factor Control*

8.6.1. The Customer will not cause excessive voltage excursions and will remain within +/- 5% of nominal voltage ratings during normal and single contingency operation. Further restriction may be necessary to prevent harm to other customers' equipment.

8.6.2. Other requirements for Customers with generation are in Section 12.

### 8.7. *Power Quality Impacts*

8.7.1. In cases where it is determined by CWLD in its sole reasonable judgment that starting of induction motors or Load changes on other equipment at the facility could have an adverse impact on the CWLD System voltage, Customer will

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take such action as reasonably required by CWLD to bring voltage changes to acceptable levels.

8.7.2. Customers with unusual Load characteristics which create damaging torsional oscillations on motors and generators shall install the requisite electrical equipment (filtering and/or damping) needed to modify their load characteristic so their resulting load characteristic at the point of interconnection does not harm the CWLD System or its customers.

8.7.3. The maximum voltage wave distortion caused by the Customer will be less than 5.0% (Including a 1.0% phase voltage unbalance). Voltage unbalance is defined as the maximum phase deviation from average as specified in ANSI C84.1, *American National Standard for Electric Power Systems and Equipment – Voltage Ratings, 60 Hertz*.

8.7.4. The customer shall limit harmonic voltage and current distortion and/or voltage flicker (objectionable low voltage fluctuation) caused by the Project. Limits for harmonic distortion (including inductive telephone influence factors) are consistent with those published in the current version of IEEE 519, *Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*. Flicker occurring at the point of interconnection shall remain below the *Border Line of Visibility* curve on the IEEE/GE curve for fluctuations less than 1 per second or greater than 10 per second. However, in the range of 1 to 10 fluctuations per second, voltage flicker shall remain below 0.4%. Depending upon the nature of the Project and its location, CWLD may require the installation of a monitoring system to permit ongoing assessment of compliance with these criteria. The monitoring system, if required, will be installed at the customer's expense.

### 8.8. *Equipment Ratings*

8.8.1. CWLD facilities are rated according to industry standard methods and assumptions, including IEEE Standard 738-2012, and IEEE Standard C37.37.

8.8.2. The Customer's Project should be consistent with CWLD ratings, and be able to operate in its expected mode without undue maintenance or life reduction.

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#### 8.9. *Maintenance Coordination*

- 8.9.1. The Customer's Project should be designed to permit safe routine and emergency maintenance on all components. Redundancy levels should be consistent with the Project's operational obligations.
- 8.9.2. Project maintenance schedules should be provided to CWLD with enough lead time to resolve coordination issues.
- 8.9.3. Except in the case of an Emergency, the Parties will use commercially reasonable efforts to schedule planned and unplanned inspection and maintenance of interconnection facilities. Planned and unplanned clearance and maintenance of equipment that requires disconnection of the facility from the CWLD System will be, to the extent feasible, at mutually agreed upon times designed to avoid disruption of the operation of the facility and CWLD's operations and service to its other customers.

#### 8.10. *Emergency Conditions*

- 8.10.1. CWLD reserves the right (without consultation when time does not permit) to open the interconnecting facilities or curtail flows for compliance with safety and reliability standards, abnormal operating conditions or characteristics (including system disturbances, open conductors, etc.), and operating emergencies until such time as compliance is achieved. In some instances the Customer may be required to interrupt or curtail service under the operating authority of CWLD to avoid injury to life or property.
- 8.10.2. Customer will not energize or remain energized to disconnected CWLD facilities unless directed to do so by CWLD. Normal energizing and manual restoration of service to CWLD and Customer interconnected facilities will be directed by CWLD. The Customer's protection and control schemes must recognize the loss of source(s) at the interconnection point and initiate automatic disconnection from the point of interconnection.
- 8.10.3. Customer transactions may be curtailed if CWLD or regional facilities become overloaded, in accordance with established line loading relief practices.

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### 9. Inspections

9.1. Before the facility is interconnected with the CWLD System, Customer will provide CWLD with reasonable notice and opportunity to inspect and test Customer's interconnection facilities. This inspection and testing may include, but need not be limited to:

- Acceptance testing of all protective equipment according to CWLD minimum requirements
- Placement of in-service relay taps according to settings
- Operability of the protective equipment
- Phasing and synchronizing checks of all related equipment

9.2. Customer will provide CWLD with test and maintenance data as reasonably required by CWLD.

### 10. Communications

10.1. The Customer will establish voice communication channels with CWLD so that responsible and authorized personnel can issue requests and/or orders that may impact Project reliability as well as the security and stability of the CWLD System. The Customer will be expected to notify CWLD of the occurrence or expectation of any event that may affect the CWLD System.

10.2. The Customer will maintain redundant communication links to CWLD. Standard telephone lines may be used for communications. The telephone numbers to be used are as follows:

CWLD Control Center Phone Numbers		
Voice:	(573) 441-5511	(573) 441-5510
Fax:	(573) 499-0437	(573) 441-5512

10.3. Customer will notify CWLD as soon as possible of any disruption, malfunctioning or unavailability of the communication link.

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## 11. Available Capacity

- 11.1. Transmission facility connection requirements are for balanced three phase 60 Hertz alternating current connections. The CWLD System includes nominal 161 kV Transmission voltages and 69 kV sub- transmission voltages. Network power flows with normal and emergency conditions may be made to determine system capability at particular locations.
- 11.2. Site specific limitations affect the available Transmission and sub-transmission system capacities. These include the electrical characteristics and use of facilities already connected or being planned for connection to the Transmission system. Other examples of site specific issues include: availability or proximity of CWLD facilities; local zoning and other ordinances; environmental regulations; availability of permits, easements and rights-of-way; customer electrical characteristics; pre-existing and projected line loading in the area; and margins to provide for abnormal system conditions.

## 12. Generation Requirements

### 12.1. *Size Consideration*

When the Customer's Project includes generation, the size and other characteristics of the Project will determine the extent of the requirements for connection to the CWLD System. In general, small generators will have fewer or less exhaustive study and technical requirements. However, safety and coordination dictate certain minimum standards for all facilities.

### 12.2. *Application Requirements*

The Customer will provide to CWLD electrical static and dynamic characteristics of the facility's generators and associated control systems and transformers, including generator capability curves and all turbine, generator step-up, voltage regulator and governor data, promptly after receipt thereof by Customer. Customer will notify CWLD promptly in writing of any change to such characteristics.

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#### 12.3. *Studies*

12.3.1. CWLD may perform, or cause to be performed, stability analyses in order to verify that the generating units at the facility meet CWLD System stability requirements. If any such analysis shows that such equipment loses or could lose synchronization under any reasonable scenario, Customer will install at its expense out-of-step protection or special generator trip schemes as reasonably required by CWLD. If detailed stability simulations are required, Customer will provide data pertaining to the generator(s) and related control systems. Stability studies performed by or for CWLD will not evaluate the risk to the facility or equipment of Customer due to unstable operation of Customer's generator(s). It is the responsibility of Customer to assess these risks and protect accordingly.

12.3.2. Any Fuel Cell, Photovoltaics, Dispersed Generation, or Energy Storage must comply and adhere to the standards set forth in the IEEE STD 1547-2018, IEEE Standard for interconnection and interoperability of distributed energy resources with associated electric power system interfaces.

#### 12.4. *Integrations into the Balancing Authority Area*

12.4.1. Customer will operate the facility with its speed governors and voltage regulators in operation whenever the facility is connected to or operated in parallel with the CWLD System. If the facility's voltage regulators are out-of-service, the Customer will immediately notify CWLD's dispatcher or its designated representative and will maintain voltage as prescribed by CWLD's dispatcher or its designated representative and ensure that generator Mvar levels are within the capability of the facility's generators and steady state stability limits. Customer will not cause the facility to disconnect automatically or instantaneously from the CWLD System or trip any generating unit comprising the facility for an under or over frequency condition unless the abnormal frequency condition persists in time beyond the limits set forth in IEEE Standard C37.106.

12.4.2. Customer will be solely responsible for properly synchronizing with the CWLD System all generator(s) that are a part of the facility in accordance with the synchronization procedures provided by Customer and approved by CWLD for generators interconnected to the CWLD System. CWLD will have the right to review, approve and monitor such synchronization procedures.

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12.4.3. Customer will not energize a de-energized circuit owned by CWLD except in accordance with all CWLD safety and operational protocols, as in effect from time to time.

12.4.4. The Customer with generation will provide CWLD with immunity from consequences of torsional oscillations resulting from Transmission System operations, and insure that the turbine-generator is not excited into resonance by normal System operations.

### 12.5. *Protections Systems and Controls*

Customer will install and maintain protective equipment that will open the connection of Customer's facilities to the CWLD System prior to the action of CWLD's protective equipment, upon the occurrence of a disturbance on or at the facility.

### 12.6. *Abnormal System Conditions*

12.6.1. It is the sole responsibility of Customer to protect its equipment from excessive negative sequence currents, system faults, voltage or frequency excursions or other abnormal System conditions, and CWLD will have no responsibility or liability to Customer for any consequence thereof.

12.6.2. Upon loss of CWLD supply the Customer will separate from CWLD's Transmission System. The customer will coordinate synchronization and operation of the facility with CWLD. The Customer is solely responsible for all synchronizing damages that may ensue from improperly synchronizing their generation to the CWLD bulk Transmission System.

12.6.3. The Agreement between CWLD and Customers with generation will include emergency operating procedures and switching responsibilities for generation connected to CWLD's bulk Transmission System. The Agreement will also specify coordination and facility integration responsibilities during normal and abnormal operation, and, if applicable, penalties resulting from differences between the Customer's actual and scheduled generation.

12.6.4. Abnormal frequency relays may be required. Settings will be reviewed with CWLD. The Customer will consult with the turbine manufacturer to assure this capability.

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12.6.5. Large generating facilities may be required to maintain some amount of spinning reserve during normal operation, to allow its participation in area load balancing.

### 12.7. *Voltage, Reactive, and Power Factor Control*

12.7.1. The Customer will provide automatic reactive control and coordinate its control with CWLD's System.

12.7.2. The facility's generating unit(s) will not cause voltage excursions outside of the range of 95% to 105% nominal. Customer will operate the facility to maintain voltage levels reasonably prescribed by CWLD. Without limiting the generality of the foregoing, the generating units at the facility will be capable of operating at a power factor of 90% lagging and 95% leading when the generating units are at full gross power output, as measured on the low side of the facility's main transformer, it being understood that steady state stability limits may restrict leading power factor operation to levels higher than 95% leading power factor. So that voltage levels are maintained at the levels prescribed by CWLD, Customer will monitor and adjust the reactive output of the generators at the facility to maintain such voltage levels. Such adjustment will be subject to the limitations imposed by line voltages, generator capability curves and other in-plant system limitations.

12.7.3. All generating unit(s) on CWLD's System will conform to CWLD's generating control and protection requirements.

### 12.8. *Flicker, Harmonics, and Interference*

12.8.1. Power output at the facility will be in accordance with the power quality standards contained in the Institute of Electrical Engineers Standard 519, and the facility will not introduce any distortion of CWLD's waveform, telephone or carrier interference that is inconsistent or conflicts with such standard.

12.8.2. Projects including inverters to convert DC output to AC connected to the CWLD System shall comply with the applicable IEEE Standards.

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12.8.3. In cases where it is determined by CWLD in its sole reasonable judgment that starting of induction motors or load changes on other equipment at the facility could have an adverse impact on the CWLD System voltage, Customer will take such action as reasonably required by CWLD to bring voltage changes to acceptable levels.

### 12.9. *Frequency*

12.9.1. All energy delivered at the Interconnection point will be in the form of three-phase alternating current having a nominal frequency of sixty cycles per second, and a harmonic content consistent with the requirements of the Institute of Electrical and Electronic Engineers Standard No. 519.

12.9.2. Customer will provide and maintain operable governor systems that are responsive to system frequency deviations. Overspeed protection in the event of load rejection is the responsibility of the Customer.

### 12.10. *Reporting Requirements*

12.10.1. Customer will report generation schedules to CWLD as needed for area operational control.

12.10.2. At the discretion of CWLD, generation control facilities and supervisory control and data acquisition of specific electrical devices may be necessary to integrate the Customer's generation into CWLD's control area. Such facilities, including required communication channels, will, if required, be furnished and installed at the Customer's expense. The requirement for data acquisition and control will depend on the generation capacity, system location and voltage, and the net generation delivered at the point of interconnection to CWLD's bulk Transmission System.

12.10.3. For CWLD and regional planning purposes, historical and projected long term future capability, output, availability, and other records may need to be compiled and reported.

### 12.11. *Synchronization Requirements*

Customer will install and maintain protective equipment that will synchronize the connection of Customer's facilities to the CWLD System.

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## References

ANSI C84.1

IEEE STANDARD C37.106.

IEEE STANDARD C37.37-1996

IEEE 519

IEEE STANDARD 738-2012

NERC STANDARD FAC-001, FAC-002

IEEE STANDARD C37.90

IEEE STD 1547-2018

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# City of Columbia Water & Light

## Facilities Connection Requirements

For Transmission and  
Generation Interconnections

### Review/Revision History

Revision	Date	Description/Comments
FCR 2019.12	12/12/2019	Update to new format.
FCR 2018.12	12/12/2018	Updated sections 4.2, 5.5, 6, and 7.2 for new NERC Standard FAC-001-3.
FCR 2018.11	11/01/2018	Update to new logo. Updated section 12.3.2. and references to reflect IEEE STD 1547-2018.
FCR 2018.05	05/09/2018	Update to new format. Updated document name for clarity.
FCR-5	4/25/2017	Updated IEEE standards. Reviewed and Approved by CWLD Engineering and Operations Working Group
FCR-4	4/18/2016	Updated to new template, removed appendix. Reviewed and Approved by CWLD Engineering and Operations Working Group
3	5/1/2015	Annual Review, updated IEEE versions, added clarifications and references
2	5/20/2014	Correction to appendix listing
1	5/25/2010	Additional clarifications added
0	2/4/2009	Converted from CWLD FACILITIES CONNECTION REQUIREMENTS dated 5/17/2007

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