



RULE NO. 30 - CONTINUED

MICROGRID SERVICES

- g. "Customer" or "Customers" used herein is as defined in Company Rule No. 1.
- h. "Customer Interconnection Agreement" means the applicable interconnection agreement for a non-utility Generating Facility.
- i. "Customer Microgrid" is a Microgrid that uses non-utility infrastructure on the customer side of the Point of Common Coupling<sup>1</sup> (PCC), including distribution lines and related equipment, to meet its interconnected loads.
- j. "Disclosure Checklist" means the Hybrid Microgrid Operator Disclosure Checklist attached hereto as, Appendix I.
- k. "Distributed Generation Facility" is as defined in Rule No. 14.
- l. "Distribution Level" is defined as Interconnection to electrical wires, equipment, and other facilities at the distribution voltage levels (such as 25kV (Oahu only), 12kV, or 4kV) owned or provided by the Company, through which the Company provides electrical service to its Customers.
- m. "Emergency Events" means emergency conditions and pre-emergency conditions as specified in footnotes 5 and 7 in Rule No. 14H Appendix I.
- n. "Generating Facility" means Customer or utility-owned electrical power generation or electric power generation that is included in a microgrid and is under the operating control of the Microgrid Operator and is Interconnected to the Company System.
- o. "Grid-Connected Mode" means a mode of operation when the Microgrid is Interconnected to and operating in parallel with the Company System, is not operating in Island Mode, and the Company maintains operational coordination of the delivery of electric service to the Point of Common Coupling.
- p. "Hybrid Microgrid" is a Microgrid that uses utility and non-utility infrastructure on the Microgrid's side of the PCC, including distribution lines, Generating Facilities, and related equipment, to meet its interconnected loads.

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<sup>1</sup> For Customer Microgrids, there may be instances where the Point of Common Coupling (e.g., utility meter) is located on the low side of Customer electrical equipment.









































































































metering and relaying. Downstream of the high-voltage circuit breaker, a structure shall be provided for metering transformers. From the high-voltage circuit breaker, another bus connection shall be made to another pole mounted disconnect switch, with surge protection.

- B. If applicable, Microgrid Operator shall provide within the Microgrid Operator Interconnection Facilities a separate, fenced area with separate access for Company. Microgrid Operator shall provide all conduits, structures and accessories necessary for Company to install a metering package if needed. Microgrid Operator shall also provide within such area, space for Company to install its communications, SCADA, RTU, and certain relaying if necessary for the Interconnection. Microgrid Operator shall also provide AC and DC source lines as specified later by Company. Microgrid Operator shall work with Company to determine an acceptable location and size of the fenced-in area. Microgrid Operator shall provide an acceptable demarcation cabinet on its side of the fence where Microgrid Operator and Company wiring will connect/interface.
- C. Microgrid Operator shall ensure that the Microgrid Operator Interconnection Facilities have a lockable cabinet for switching station relaying equipment. Microgrid Operator shall select and install relaying equipment acceptable to Company. At a minimum the relaying equipment will provide over and under frequency (81) negative phase sequence (46), under voltage (27), over voltage (59), ground over voltage (59G), over current functions (50/51) and other protection elements as required by this Exhibit B. Microgrid Operator shall install protective relays that operate a lockout relay, which in turn will trip the main circuit breaker.
- E. Microgrid Operator's equipment also shall provide at a minimum: **[NOTE: ADDITIONAL ITEMS AND DETAILS MAY BE ADDED PRIOR TO EXECUTION OF AGREEMENT UPON COMPLETION OF TECHNICAL REVIEW.]**
- (i) Interface with Company's RTU to provide telemetry of electrical quantities as identified by the Company;
  - (ii) Interface with Company's RTU to provide status of devices, as identified by the Company;
  - (iii) Interface with Company's RTU to provide control to incrementally raise and lower the voltage target at the point of regulation operating in automatic voltage regulation control. If Company's RTU is unavailable, due to loss of communication link, RTU failure, or other event resulting in loss of the remote control by Company, provision must be made for Microgrid Operator to be able to institute via local controls, within 30 minutes (or such other period as Company accepts in writing) of the verbal directive by the Company System operator, such change in voltage regulation target as directed by the Company System operator; and
- (ii) Interface with Company's RTU to provide active power control to incrementally limit net real power export from the Hybrid Microgrid and to incrementally remove the limit
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of the net real power export of the Hybrid Microgrid. The incremental size will be determined as part of the technical review taking into account the size of the Hybrid Microgrid and the dynamic system frequency bias.

- e. Maintenance Plan. Microgrid Operator shall maintain Microgrid Operator Interconnection Facilities in accordance with the following maintenance plan:

Distribution line: \_\_\_\_\_

\_\_\_ kV Facility switching station:  
\_\_\_\_\_

Relay protection equipment: \_\_\_\_\_

Other equipment as identified: \_\_\_\_\_

Microgrid Operator shall furnish to Company a copy of records documenting such maintenance, within thirty (30) calendar days of completion of such maintenance work.

- f. Communications and Control Interface.

- (i) The acceptable method(s) of implementing the Hybrid Microgrid's telemetry and control interface ("Communications and Control Interface") requirements will be specified by the Company. The Hybrid Microgrid will require a supervisory control interface to the Company SCADA/EMS system. Company shall review and provide prior written approval of the design for the Communications and Control Interface to ensure compatibility with Company System. If Microgrid Operator materially changes the approved design, such changes will also require Company's review and prior written approval.
- A. The Microgrid Operator shall provide and maintain in good working order all equipment, necessary to interface the Hybrid Microgrid with the Company System. The Communications and Control Interface shall provide for remote monitoring and control of the real-power output of the Hybrid Microgrid by Company at all times. If the Communications and Control Interface is unavailable, disabled, or otherwise not performing the required capabilities, or if a required protection scheme is unavailable for any reason, including due to loss of communication link or other event resulting in the loss of the remote control by the Company, then the Hybrid Microgrid shall remain in the operating mode present prior to the unavailability of the Communication and Control Interface (i.e., Grid-Connected or Island Mode) until the Communications and Control interface is fully restored, unless Microgrid Operator and Company agree on an alternate means of control. Notwithstanding the foregoing, if Microgrid Operator fails to provide such remote control features (whether temporarily or throughout the term of this Agreement) and fails to remain in its last operating state prior to the unavailability of the Communication and Control Interface, then, notwithstanding any other provision of this Agreement, Company shall have the right to disable the operation of the entire Hybrid Microgrid (and its Generating Facilities) during those periods that such control features are not provided. .

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B. Microgrid Operator shall not override Company's active power controls without first obtaining specific approval to do so from the Company System operator.

(ii) The requirements of the Communications and Control Interface may be modified as mutually agreed upon in writing by the Parties.

g. Control System Acceptance Test Procedures.

- (i) Conditions Precedent. The Hybrid Microgrid will be required to complete a Control System Acceptance Test ("CSAT"). The "CSAT" is a test performed on the centralized control system of the Hybrid Microgrid in accordance with the procedures set forth in Exhibit E, attached hereto. Each and all of the following conditions precedent must be satisfied prior to the conduct of the CSAT:
- Successful Completion of the acceptance test. The acceptance test is a test conducted by Microgrid Operator and witnessed by Company, within thirty (30) calendar days of completion of all interconnection facilities and in accordance with the criteria and procedures determined by Company and Microgrid Operator as set forth in Schedule II to Exhibit E
  - The Hybrid Microgrid has been successfully energized.
  - All of the Hybrid Microgrid's generators have been fully commissioned.
  - The control system computer has been programmed for normal operations.
  - All equipment that is relied upon for normal operations (including ancillary devices such as capacitors/inductors, energy storage device, statcom, etc.) shall have been commissioned and be operating within normal parameters.
- (ii) Hybrid Microgrid Generators. Unless all of the Hybrid Microgrid's generators are available for the duration of the CSAT, the CSAT will have to be re-run from the beginning unless Microgrid Operator demonstrates to the satisfaction of the Company that the test results attained with less than all of the Hybrid Microgrid's generators are consistent with the results that would have been attained if all of the Hybrid Microgrid's generators had been available for the duration of the test.
- (iii) Procedures. The CSAT will be conducted on business days during normal working hours on a mutually agreed upon schedule. No CSAT will be scheduled during the final 21 calendar days of a calendar year. No later than thirty (30) calendar days prior to conducting the CSAT, Company and Microgrid Operator shall agree on a written protocol setting out the detailed procedure and criteria for passing the CSAT. Schedule III to Exhibit E provides general criteria to be included in the written protocol for the CSAT. Within fifteen (15) business days of completion of the CSAT, Company shall notify Microgrid Operator in writing whether the CSAT(s) has been passed and, if so, the date upon which such CSAT(s) was passed. If any changes have been made to the technical specifications of the Hybrid Microgrid or the design of the Hybrid Microgrid in accordance with this Exhibit B, such changes shall be reflected in an amendment to this Agreement, and the written protocol for the CSAT shall be based on the Hybrid Microgrid as modified. Such amendment shall be executed prior to conducting the

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CSAT and Company shall have no obligation for any delay in performing the CSAT due to the need to complete and execute such amendment.

2. **Performance Standards.**

- a. **Reactive Power Control.** Microgrid Operator shall control its reactive power by automatic voltage regulation control. Microgrid Operator shall automatically regulate voltage at a point, the point of regulation, between the Microgrid Operator's generator terminal and the point of interconnection ("POI") to be specified by Company, to within 0.5% of a voltage specified by the Company System operator to the extent allowed by the Hybrid Microgrid reactive power capabilities as defined in this Section 5(b) of this Section. **[NOTE: FOR FACILITIES CONNECTED TO THE DISTRIBUTION SYSTEM, THESE REQUIREMENTS MAY BE CHANGED BY COMPANY UPON COMPLETION OF THE TECHNICAL REVIEW.]**
- b. **Reactive Amount.**
- (i) Microgrid Operator shall install sufficient equipment so that each Generating Facility part of the Hybrid Microgrid will have the ability to deliver or receive, at its terminal, reactive power as illustrated in the **[generator capability]** curve[s] attached to this Agreement by the Microgrid Operator. (Generator Capability Curve(s)). **[NOTE: THE TECHNICAL REVIEW WILL DETERMINE IF ANY ADDITIONAL REACTIVE POWER RESOURCES WILL BE REQUIRED.]**
  - (ii) The Hybrid Microgrid shall contain equipment able to continuously and actively control the output of reactive power under automatic voltage regulation control reacting to system or Microgrid voltage fluctuations. The automatic voltage regulation response speed at the point of regulation shall be such that at least 90% of the initial voltage correction needed to reach the voltage control target will be achieved within 1 second following a step change.
  - (iii) If the Hybrid Microgrid does not operate in accordance with this Section 2(b), Company may disconnect all or a part of the Hybrid Microgrid from Company System until Microgrid Operator corrects its operation (such as by installing capacitors at Microgrid Operator's expense).
- c. **Ramp Rates.**

Microgrid Operator shall ensure that the ramp rate of the aggregate of the Hybrid Microgrid is less than the following limits for all conditions including start up, normal operations, curtailing and uncurtailing, Microgrid Operator adjusting the Hybrid Microgrid's net real power export, changes in the solar resource, and shut down for the following periods as calculated in accordance with Schedule I to this Exhibit E.

- Maximum Ramp Rate Upward of [ ] MW/minute for all periods. [TO BE DETERMINED FOLLOWING Technical Review.]

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