DRAFT

REQUEST FOR PROPOSALS

FOR

COMMUNITY-BASED RENEWABLE ENERGY PROJECTS

ISLAND OF MOLOKA‘I

AUGUST 21, 2020

Docket No. 2015-0389

Appendix H – Interconnection Facilities and Cost Information

Maui Electric

Tariff Rule No. 19, approved by the PUC, establishes provisions for Interconnection and Transmission Upgrades (see Appendix I). The tariff provisions are intended to simplify the rules regarding who pays for, installs, owns, and operates interconnection facilities in the context of competitive bidding. Tariff Rule No. 19 will be utilized as the basis for addressing interconnection and transmission upgrades for any projects developed through this RFP. Bidders will comply with the terms and conditions as specified therein.

To assist Bidders in assessing the impacts of location on potential projects, the per unit cost figures provided in the tables below are to be used to provide an approximate estimated cost for interconnecting, including communications and distribution line cost to the existing Moloka‘i Electric System. The per-unit cost figures below should not be used to create a detailed project estimate. A detailed project estimate typically requires a certain level of engineering to assess project site conditions and to factor in other parameters specific to the project.

The Bidder should identify the components assumed for their project and the quantity assumed for each. Each table below provides notes on the assumptions for each of the unit cost estimates. If a Bidder’s project requirements are different than what is assumed in the notes, the Bidder should identify each difference and provide an estimated additional cost or savings resulting from those different requirements.

2.1 Distribution Line Interconnection Costs

Component	Description	Cost per Mile
1	New 12kV Overhead line (accessible 250' spans)	$1,020,000
2	12 kV underbuild on existing line (accessible 250’ spans)	$735,000
3	12 kV underbuild on existing line (inaccessible 250’ spans)	$1,292,000
4	New 12kV Underground line	$1,369,000
5	Padmount service 500 kVA transformer (for station service)	$89,000
6	PME9 and PME3 switches for 1-ph and 3-ph transformers	$307,000

Notes:

1. Please refer to Attachment 1 (for Projects greater 250 kW and less than 1 MW) or Attachment 2 (for Projects 1 MW or greater) of this Appendix H for a single line diagram depicting the required interconnection to the Company’s system. Conceptual Design is not intended to cover all interconnection requirements. Final interconnection design will be subject to the results of a technical review.
2. Component 1 assumes wood pole construction.
3. Components 2 and 3 assume no poles need to be replaced.

4. Component 4 assumes one set of 1000 KCM AL 15kV (600A) cable but does NOT include duct bank and MH construction.
5. Exclusions to these rough costs are as follows but not limited to the following. Proposers should conduct their own due diligence for these costs
    a. Development of the PUC application/proceedings timeline
    b. State or County right-of-way permitting and SMA
    c. Environmental studies cost
    d. Survey proposed line extension route
    e. Easement/Land Issues if discovered in the course of final design
    f. Archaeological survey and monitoring cost/duration (if needed)
    g. Clearing/grading along power line corridor and access road
    h. Final design adjustments required to negotiate terrain, physical landmarks, existing utilities and access
    i. Construction of permanent roadways/truck access
    j. Helicopter services
    k. Traffic Control
    l. Removals (MECO & HTCOM as applicable)
    m. Salvage and depreciation credits
    n. Street lights
    o. Delays due to weather and material acquisitions
    p. Civil infrastructure (duct bank, MH, equipment pads, etc.) construction
6. All estimates are provided in 2022 dollars.
7. The customer shall be responsible to confirm if independent station power is required. Meter requirements should be discussed with Maui Electric during the customer's design stage. Station power shall emanate from an existing 12kV distribution line to the customer's point of connection, either by overhead utility poles or underground line extension. For underground line extensions, the customer shall be responsible for installing and maintaining the infrastructure consisting of, but not limited to, concrete encased ducts, manholes/handholes, transformer and switchgear pads, and meter equipment.

2.2 Typical CBRE SLD Interconnection Costs (Projects > 250 kW and less than 1 MW)

Please refer to Attachment 1 of this Appendix H (for Projects greater 250 kW and less than 1 MW). Conceptual Design is not intended to cover all interconnection requirements. Final interconnection design will be subject to the results of the Detailed Evaluation, Technical Review, or an IRS.

Maui Electric Company
APPENDIX H - INTERCONNECTION FACILITIES AND COST INFORMATION

Component	Description	Cost
1	All other components in Attachment 1 except for the line extension from the project to the utility distribution circuit (See 2.1)	$313,000

Notes:

1. Costs includes components on the Company side of the demarcation shown in Attachment 1.
2. Costs for line extension from the project to tap the distribution circuit should be estimated using 2.1, above.
3. Company shall own a high-speed power quality device (i.e., Tesla Lite Model) near the point of interconnection, which shall be in continuous service and on a rolling window basis monitoring sub-cycle voltages, currents and harmonics, as well as disturbance events and capable of remote interrogation following an event. Company requires 24-hour access to this equipment. Customer to provide the following hard-wired inputs to Company's power quality device:
    a. Status of Customer's main AC breaker CB-A (MECO# XXXX);
    b. Line amps (3 phase); and
    c. Line-to-line voltage (3 phase)
4. Secure and reliable communication is required for the following:
    a. Revenue metering for power export and consumption readings;
    b. Phone circuits as required.
5. Customer to design revenue metering facilities in accordance with the requirements in Chapter 4 of the HECO Electric Service Installation Manual.
6. PTs and CTs for high speed digital fault recorder should be the same quality as the PTs and CTs for the protective relaying.
7. Estimate does not contain any of the following costs:
    a. Telecommunication infrastructure
    b. Relay Coordination Study
    c. Land Cost
    d. Environmental Assessment/Environmental Impact Statement
    e. Project Management
8. Substation relay protection requirements have not been identified, so costs are based upon typical line protection relaying requirements.

2.3 Typical CBRE SLD Interconnection Costs (Projects 1 MW or greater)

Please refer to Attachment 2 of this Appendix H (for Projects 1 MW or greater). Conceptual Design is not intended to cover all interconnection requirements. Final interconnection design will be subject to the results of the Detailed Evaluation, Technical Review, or an IRS.

Component	Description	Cost
1	All other components in Attachment 2 except for the line extension from the project to the utility distribution circuit (See 2.1)	$480,000
2	Components at Company Substation including DTT and relaying requirements	$330,000

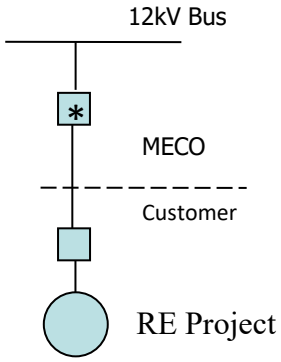
Notes:

1. Costs includes components on the Company side of the demarcation shown in Attachment 2.
2. Costs for line extension from the project to tap the distribution circuit should be estimated using 2.1, above.
3. Company shall own a high-speed power quality device (i.e., Tesla Model No. 4000) near the point of interconnection, which shall be in continuous service and on a rolling window basis monitoring sub-cycle voltages, currents and harmonics, as well as disturbance events and capable of remote interrogation following an event. Company requires 24-hour access to this equipment. Customer to provide the following hard-wired inputs to Company's power quality device:
    a. Status of Customer's main AC breaker CB-A (MECO# XXXX);
    b. Status of remotely-resettable lockouts;
    c. Line amps (3 phase); and
    d. line-to-line voltage (3 phase)
4. Secure and reliable communication is required for the following:
    a. Direct transfer trip from ____(HECO 12kV circuit) 12kV CB ____(HECO breaker number);
    b. SCADA to/ from Customer's facility;
    c. Revenue metering for power export and consumption readings;
    d. Power quality and fault recording and retrieval; and
    e. Phone circuits as required.
5. Customer to provide a reliable DC Source for 12-hour backup period; specific voltage to be determined by Company at a later date.
6. Upon receipt of direct transfer trip signal from ____(MECO substation name) Substation opening of breaker ____(MECO breaker number), trip and block close Customer's 12 kV breaker CB-A (MECO# XXXX) via Company-owned SCADA resettable lockout relay.

7. Upon DTT communication channel failure longer than 6 seconds:
    a. Company to provide signal to Customer to initiate Customer performed ramp down and tripping of Customer's 12 kV breaker CB-A (MECO# XXXX).
    b. Company to initiate trip and block close of Customer's 12 kV breaker CB-A (MECO# XXXX) via Company-owned SCADA resettable lockout relay after _____(Project size MW/2 MW per minute ramp down) minutes.
8. Customer to design revenue metering facilities in accordance with the requirements in Chapter 4 of the HECO Electric Service Installation Manual.
9. PTs and CTs for high speed digital fault recorder should be the same quality as the PTs and CTs for the protective relaying.
10. Component 2 assumes Company Substation is already SCADA enabled.
11. Estimate does not contain any of the following costs:
    a. Telecommunication infrastructure
    b. Relay Coordination Study
    c. Land Cost
    d. Environmental Assessment/Environmental Impact Statement
    e. Project Management
12. Substation relay protection requirements have not been identified, so costs are based upon typical line protection relaying requirements.

2.4 Pala'au Interconnection Costs

2.2.1 Substation 12kV Interconnection Costs FIRM and VARIABLE Projects



Component	Description	Cost
1	*1 – 12kV circuit breaker (MECO)	$600,000

Notes:

1. Conceptual Design is not intended to cover all interconnection requirements. Final interconnection design will be subject to the results of a technical review.
2. Substation land has been graded per Maui Electric's civil and structural requirements. No costs for excavation and fill are included in the estimates.
3. Permits are not included in indicated costs.
4. Costs are in 2020 dollars.
5. Estimate does not contain any of the following costs:
   a. Telecommunication infrastructure
   b. Relay Coordination Study
   c. Land Cost
   d. Environmental Assessment/Environmental Impact Statement
   e. Project Management
   f. Any required upgrades to existing substations to integrate the new generating facility into the system.
6. Substation relay protection requirements have not been identified, so costs are based upon typical line protection relaying requirements.
7. Local SCADA equipment are included in cost estimates.
8. The estimate does not contain any line extension cost.
9. Projects shall be designed to limit the maximum loss-of-generation contingency to 2.7 MW for Moloka'i. Additionally, in meeting this requirement, the Facility must be segmented in equally sized capacities (MW).

2.5 Telecommunications

All projects that require telecommunications will require facilities to store the communications equipment. An example for a communications cabinet is provided but other alternatives can be available upon request. The communications equipment will require a communications channel. Some of the communication channel options include microwave, fiber, lease line, or licensed radio. The number of communication circuits (primary/backup) and type of communication circuits required will vary depending on the type/size of the project.

1. Microwave Equipment
   a. Point-To-Point Microwave: $684,117 with the following assumptions:
      i. There is radio line-of-sight clearance between the communication endpoints.
      ii. FCC licensed Microwave Frequencies are available.
      iii. There are existing structures/buildings with space available on both ends to house the radio equipment.
      iv. Telecommunications grounding standards are up-to-date at both sites.
      v. 48 V DC power with 12 hour battery backup is available.

vi. This estimate does not include any special site-specific permit/approval activities that may be required including, but not limited to, Neighborhood Board (s), Conservation District Use Application, Environmental Assessment, Shoreline Management Area approval, biological (endangered species or habitat) surveys, and/or cultural (archeological) surveys or the cost of any migration required for approvals to be granted.

vii. Space is available at both ends to construct antenna towers or structures that are rated to survive a Saffir-Simpson category 4 hurricane.

viii. Cost to interconnect to Hawaiian Electric's existing communications network is not included.

ix. Costs are in 2022 dollars.

b. 50 Foot Microwave Tower: $591,021 with the following assumptions:

i. Telecommunications grounding standards are up-to-date.

ii. This estimate does not include any special site-specific permit/approval activities that may be required including, but not limited to, Neighborhood Board (s), Conservation District Use Application, Environmental Assessment, Shoreline Management Area approval, biological (endangered species or habitat) surveys, and/or cultural (archeological) surveys or the cost of any migration required for approvals to be granted.

iii. Costs are in 2022 dollars.

c. 100 Foot Microwave Tower: $858,563 with the following assumptions:

i. Telecommunications grounding standards are up-to-date.

ii. This estimate does not include any special site-specific permit/approval activities that may be required including, but not limited to, Neighborhood Board (s), Conservation District Use Application, Environmental Assessment, Shoreline Management Area approval, biological (endangered species or habitat) surveys, and/or cultural (archeological) surveys or the cost of any migration required for approvals to be granted.

iii. Costs are in 2022 dollars.

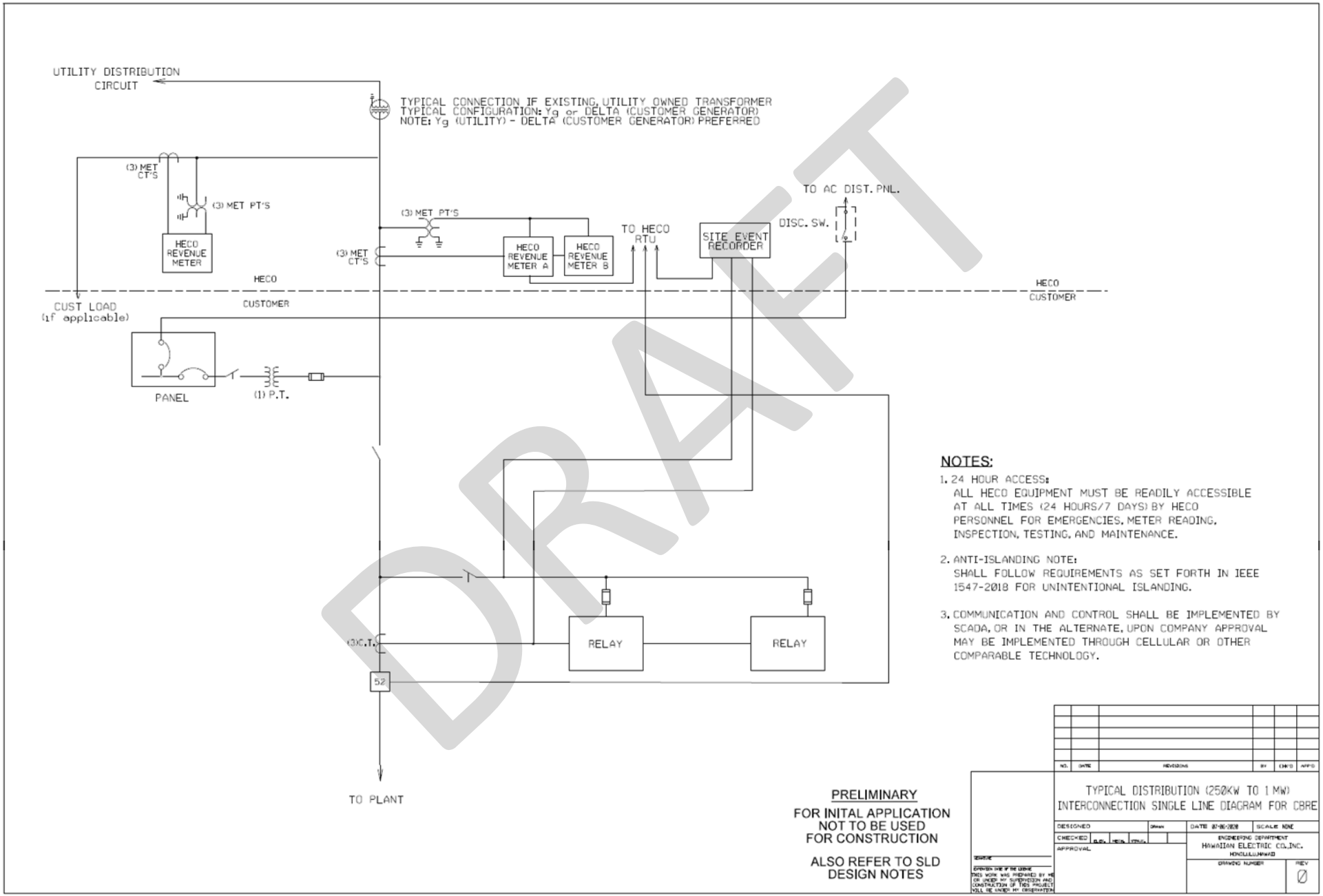
2. Fiber with overbuild and new construction: $456,000 per mile with the following assumptions:
   a. Accessible 250' average spans.
   b. The poles are in good condition and do not need replacing.
   c. The poles are not overloaded.
   d. The poles and the attachments are in accordance with NESC 2002 and no work is required to upgrade the poles to current standards.
3. Leased Line: Cost will be the responsibility of the developer and to be negotiated with the lease provider.
   a. Communication circuit requirements will be based on applications needed for the project.

b. Company can provide communication circuit interconnection requirements and assist with order review as needed.

4. Communications Cabinet: $207,365 with the following assumptions:
   a. Cabinet used to support company equipment and capable of providing communications circuit for SCADA
   b. Communications cabinet does not include fiber, microwave, or lease circuits.
      i. Customer to work directly with lease provider if a lease line circuit is needed.
      ii. Check with company to understand the current lease requirements.
   c. Customer will provide all conduits, PAD, handholes, AC Power, grounding as required per company standards.
   d. Costs are in 2022 dollars.
5. Licensed 900 MHz Radio: $143,626 with the following assumptions:
   a. This cost will be in addition to the Communication Cabinet cost. The radio equipment will be installed within the Communication Cabinet.
   b. There is radio line-of-sight clearance between the communication endpoints.
   c. FCC licensed 900Mhz Frequencies is available.
   d. There is an existing structure/building with space available on the company side to mount the antenna equipment and house the radio equipment.
   e. The customer will install a structure to mount the antenna equipment on the customers side.
      i. Customer will provide any conduit required between the Communications Cabinet and antenna mount structure.
   f. The cost includes 2 each antenna equipment to create a radio link.
   g. Cost are in 2022 dollars.

2.6 Security System Interconnection Costs

[NOTE: Specific security requirements for the Molokaʻi System are under review and will be included in the final RFP.]



NOTES:

1. 24 HOUR ACCESS:
   ALL HECO EQUIPMENT MUST BE READILY ACCESSIBLE AT ALL TIMES (24 HOURS/7 DAYS) BY HECO PERSONNEL FOR EMERGENCIES, METER READING, INSPECTION, TESTING, AND MAINTENANCE.
2. ANTI-ISLANDING NOTE:
   SHALL FOLLOW REQUIREMENTS AS SET FORTH IN IEEE 1547-2018 FOR UNINTENTIONAL ISLANDING.
3. COMMUNICATION AND CONTROL SHALL BE IMPLEMENTED BY SCADA, OR IN THE ALTERNATE, UPON COMPANY APPROVAL MAY BE IMPLEMENTED THROUGH CELLULAR OR OTHER COMPARABLE TECHNOLOGY.

PRELIMINARY

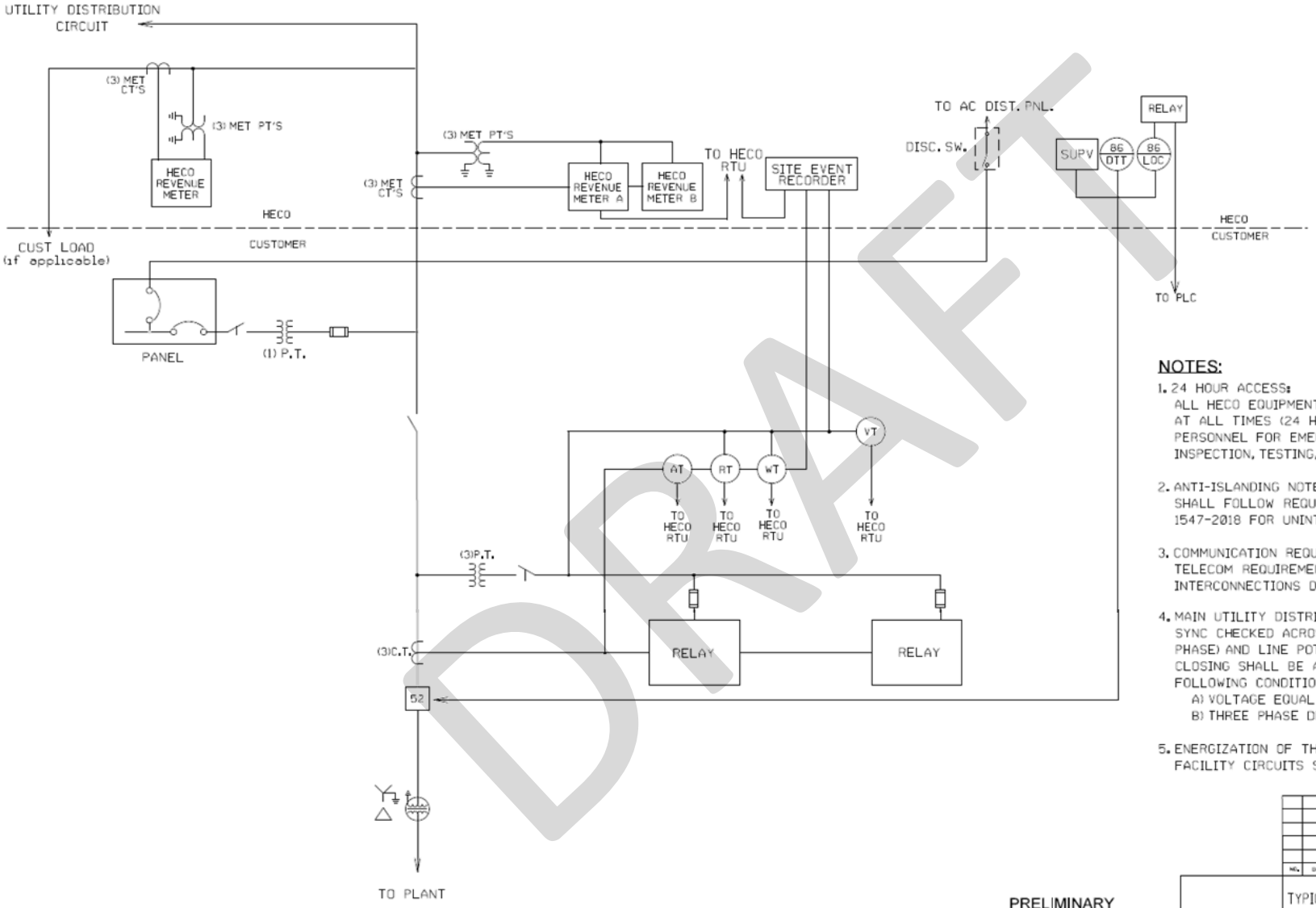
FOR INITAL APPLICATION
NOT TO BE USED
FOR CONSTRUCTION

ALSO REFER TO SLD
DESIGN NOTES

NO.	DATE	REVISIONS	BY	CHK'D	APP'D

TYPICAL DISTRIBUTION (250KW TO 1 MW)
INTERCONNECTION SINGLE LINE DIAGRAM FOR CBRE

DESIGNED	Drawn	DATE 07-26-2020	SCALE NONE
CHECKED		ENGINEERING DEPARTMENT HAWAIIAN ELECTRIC CO.,INC. HONOLULU,HAWAII	
APPROVAL		DRAWING NUMBER	REV Ø



NOTES:

1. 24 HOUR ACCESS:
   ALL HECO EQUIPMENT MUST BE READILY ACCESSIBLE AT ALL TIMES (24 HOURS/7 DAYS) BY HECO PERSONNEL FOR EMERGENCIES, METER READING, INSPECTION, TESTING, AND MAINTENANCE.

2. ANTI-ISLANDING NOTE:
   SHALL FOLLOW REQUIREMENTS AS SET FORTH IN IEEE 1547-2018 FOR UNINTENTIONAL ISLANDING.

3. COMMUNICATION REQUIREMENTS SHALL FOLLOW THE TELECOM REQUIREMENTS FOR RENEWABLE ENERGY INTERCONNECTIONS DOCUMENT - 46KV STANDARD - SCADA.

4. MAIN UTILITY DISTRIBUTION CIRCUIT BREAKER TO BE SYNC CHECKED ACROSS DISTRIBUTION BUS POTENTIAL (3 PHASE) AND LINE POTENTIAL (3 PHASE). SUPV AND MANUAL CLOSING SHALL BE ALLOWED FOR EITHER OF THE FOLLOWING CONDITIONS:
   A) VOLTAGE EQUAL IN MAGNITUDE AND PHASE
   B) THREE PHASE DEAD LINE

5. ENERGIZATION OF THE MAIN SITE TRANSFORMER AND/OR FACILITY CIRCUITS SHOULD NOT VIOLATE IEEE 519.

PRELIMINARY

FOR INITAL APPLICATION
NOT TO BE USED
FOR CONSTRUCTION

ALSO REFER TO SLD
DESIGN NOTES

NO.	DATE	REVISIONS	BY	CHK'D	APP'D

TYPICAL DISTRIBUTION INTERCONNECTION (GREATER THAN 1MW) SINGLE LINE DIAGRAM FOR CBRE

DESIGNED | DRAWN | DATE 07-07-2020 | SCALE NONE
CHECKED | APPROVAL
ENGINEERING DEPARTMENT
HAWAIIAN ELECTRIC CO., INC.
HONOLULU, HAWAII
DRAWING NUMBER | REV Ø