REQUEST FOR PROPOSALS

FOR

NORTH KOHALA

ENERGY STORAGE

ISLAND OF HAWAIʻI

MARCH 24, 2023

Docket No. 2022-0012

Appendix B – Proposer's Response Package / Project Interconnection Data Request

Hawaiʻi Electric Light

1.0 GENERAL INSTRUCTIONS TO PROPOSERS

The Company has elected to use the services of PowerAdvocate®, a third-party electronic platform provider. Sourcing Intelligence®, developed by PowerAdvocate®, is the Electronic Procurement Platform that the Company has licensed and will utilize for the RFP process. All Proposals and all relevant information must be submitted via the Electronic Procurement Platform, in the manner described in this RFP.

Proposers must adhere to the response structure and file naming conventions identified in this Appendix for the Proposer's response package. Information submitted in the wrong location/section or submitted though communication means not specifically identified by the Company will not be considered by the Company.

Proposers must provide a response for every item. If input/submission items in the RFP are not applicable to a specific Proposer or Proposal, Proposers must clearly mark such items as "N/A" (Not Applicable) and provide a brief explanation.

Proposers must clearly identify all confidential information in their Proposals, as described in more detail in Section 3.12 of the RFP.

All information (including attachments) must be provided in English. All financial information must be provided in U.S. Dollars and using U.S. credit ratings.

It is the Proposer's sole responsibility to notify the Company of any conflicting requirements, ambiguities, omission of information, or the need for clarification prior to submitting a Proposal.

The RFP will be conducted as a "Sealed Bid" event within Sourcing Intelligence, meaning the Company will not be able to see or access any of the Proposer's submitted information until after the event closes.

1.1 ELECTRONIC PROCUREMENT PLATFORM

To access the RFP event, the Proposer must register as a "Supplier"[1] on Sourcing Intelligence (Electronic Procurement Platform). One Proposal may be submitted with each Supplier registration.

If a Proposer is already registered on Sourcing Intelligence, the Proposer may use their current login information to submit their Proposal. Proposers are asked to refer to their chosen unique company name throughout when referring to it in text responses.

Proposers can register for an account on Sourcing Intelligence by clicking on the "Registration" button (located in the top right corner of the webpage) on the PowerAdvocate website at the following address: **www.poweradvocate.com**

The Proposer's use of the Electronic Procurement Platform is governed by PowerAdvocate's Terms of Use. By registering as a "Supplier" on the Electronic Procurement Platform, the Proposer acknowledges that the Proposer has read these Terms of Use and accepts and agrees that, each time the Proposer uses the Electronic Procurement

[1] The language in Appendix B sometimes refers to "Energy Contract Managers" as "Bid Event Coordinator" and to "Proposers" as "Suppliers" (Bid Event Coordinator and Supplier are terms used by PowerAdvocate).

Platform, the Proposer will be bound by the Terms of Use then accessible through the link(s) on the PowerAdvocate login page.

Once a Proposer has successfully registered as a "Supplier" with PowerAdvocate, the Proposer shall request access to the subject RFP event from the Company Contact via Email through the RFP Email address set forth in Section 1.6 of the RFP. The Email request must list the Company Name field and username under which the Proposer has registered with PowerAdvocate. After being added to the event, the Proposer will see the bid event on their dashboard upon logging into Sourcing Intelligence. Once the RFP event opens, the Proposer may begin submitting their Proposal.

After registering and prior to the opening of the RFP, Proposers are encouraged to familiarize themselves with the Electronic Procurement Platform, including tabs, the dashboard, PowerAdvocate User Information (RFP Appendix D), etc. Proposers should note that they will not be able to access any bid documents until the event officially opens.

Proposers may contact PowerAdvocate Support for help with registration or modification of registration if desired. Support is available from 8 AM to 8 PM Eastern Time (2 AM to 2 PM Hawai'i Standard Time when daylight savings is in effect) Monday to Friday, except for Holidays posted on the PowerAdvocate website, both by phone (857-453-5800) and by Email (support@poweradvocate.com).

Contact information for PowerAdvocate Support can also be found on the bottom border of the PowerAdvocate website: **www.poweradvocate.com**

Once the RFP event is opened, registered Proposers will have online access to general notices and RFP-related documents via the Electronic Procurement Platform. Proposers should also monitor the RFP Website throughout the RFP event.

1.2 PROPOSAL SUBMISSION PROCEDURES

An Email notification will be sent to all registered Proposers when the event has been opened to receive Proposals.

After logging onto the Electronic Procurement Platform, the RFP will be visible on the Proposer's dashboard with several tabs, including the following:

- "**1. Download Documents:**" Documents stored under this tab are provided for the Proposer's use and information. All documents can be downloaded and/or printed, as required.
- "**2. Upload Documents:**" Proposal submission documents requested in Appendix B must be uploaded using this tab.
- Note that "3. Commercial Data:", "4. Technical Data:", and "5. Pricing Data:" tabs are NOT USED for this event.

Step-by-step instructions for submitting a complete Proposal are provided below:

1. Proposers must upload their Proposal files, including all required forms and files, to submit a complete Proposal. All files must be uploaded before their respective Proposal Due Date (RFP Section 3.1, Table 1).

2. Submit (upload) one consolidated PDF representing your Proposal via the "2. Upload Documents" tab. That Proposal PDF must abide by the format specified in this Appendix B. A MSWord.docx template that outlines the format of this document is available under the "1. Download Documents" tab for the Proposer's use. **Response information must be provided in the order, format, and manner specified in this Appendix B and must clearly identify and reference the Appendix B section number that the information relates to**.
    a. Proposers shall use a filename denoting: CompanyName.pdf.
    (example: AceEnergy.pdf)

3. Proposal information that cannot be easily consolidated into the PDF file described in Step 2 (such as large-scale drawing files) or files that must remain in native file format (such as computer models and spreadsheets) shall be **uploaded separately but must be referenced from within the main Proposal PDF file** (e.g., "See AceEnergy_2.5_SiteMap.kmz"). Such additional files must follow the naming convention below:
    a. File names must include, in order, Company Name, Appendix B section number, and a file descriptor, as shown in the example file name below:
    AceEnergy_2.5_SiteMap.kmz
    Proposers may use abbreviations if they are clear and easy to follow.

4. Upload files using the "**2. Upload Documents**" tab on the Electronic Procurement Platform.
    a. For all documents identify the "Document Type" as "Technical Information." (Do not identify any documents as "Commercial and Administrative" or "Pricing.")
    b. "Reference ID" may be left blank.
    c. Select "Choose File..." Navigate to and choose the corresponding file from your computer. Select "Open" and then "Submit Document."

    There is no limit to the number or size of files that can be uploaded. Multiple files may be grouped into a .zip archive for upload. (Any zipped files must still adhere to the naming directions in #3 above.) When successfully uploaded, documents will appear under the "Bid Submissions" section on the bottom of the tab's page, organized within the "Technical Information" Document Type. Repeat steps a, b, and c, as required for each file upload.

    If a file with the same name is uploaded twice, the Platform will automatically append a unique numerical extension to the Document Name. To delete a file that has been previously uploaded, click on the "X" button in the "Actions" column for the file to be deleted. Do not upload any files prior to the issuance of the Final RFP.

5. The Company will not be responsible for technical problems that interfere with the upload or download of Proposal information. Support is available to answer technical questions about PowerAdvocate's Sourcing Intelligence from 8 AM to 8 PM Eastern Time (2 AM to 2 PM Hawai‘i Standard Time when daylight savings is in effect) Monday to Friday, except for Holidays posted on the PowerAdvocate website, both by phone (857-453-5800) and by Email (support@poweradvocate.com).

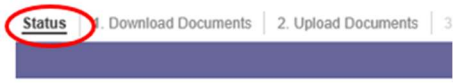
6. Proposers are strongly encouraged to start early and avoid waiting until the last minute to submit the required information. Proposers are allowed to add, modify, and/or delete documents that have been previously submitted any time prior to the event close deadline. For clarity, it is the Proposer's responsibility to ensure a complete Proposal is uploaded into PowerAdvocate before the Proposal Due Date.

7. Any questions or concerns regarding the RFP may be submitted to the Company Contact via the RFP Email address provided in Section 1.6 of the RFP. Per RFP Section 1.4.2, the Independent Observer will monitor messages within the bid event. Proposers are responsible for following instructions and uploading documents in their appropriate locations. Documents uploaded in the wrong tab will not be considered by the Company.

1.3 PROPOSAL COMPLETION AND CONFIRMATION PROCEDURES

To confirm the submission of all proposal files, in the "Status" tab on the Electronic Procurement Platform, confirm that the "Total Uploaded Files" is the number of expected files to be included in the submission by checking it against your list of submitted files.

Example "Status" tab view:



Your Bid Intention: Bidding	
Total Uploaded Files:	0
Saved Commercial Datasheets:	0 of 0
Saved Technical Datasheets:	0 of 0
Saved Pricing Datasheets:	0 of 0

Your Bid Intention: Bidding		
Total Uploaded Files:	18	Last Upload: 02/08/18
Saved Commercial Datasheets:	1 of 1	Last Saved: 02/08/18
Saved Technical Datasheets:	0 of 0	
Saved Pricing Datasheets:	1 of 1	Last Saved: 02/08/18

As stated above in Section 1.2, nothing should be uploaded to the Commercial, Technical, or Pricing Datasheet tabs. Documents uploaded there will not be included in your Proposal submission.

1.3.1 **Proposal Fee Delivery Information.** Provide the Proposal Fee submission information for this Proposal. Include:

- The Date the Proposal Fee was sent.
- The delivery service used and the tracking number for the parcel.
- The U.S.-chartered bank name that issued the cashier's check and the check number.

2.0 PROPOSAL SUMMARY TABLE

To be filled out completely by IPP or Affiliate Proposers:

1	**Proposer Name (Company Name)**	
2	**Parent Company/Owner/Sponsor/Business Affiliation/etc.**	
3	**Project Name**	
4	**Lump Sum Payment** ($/Year)	
5	**Energy Storage Capability for the Facility** (MW and MWh)	
6	**The Proposal hereby certifies that Proposer will fulfill all Community Outreach and Engagement / Cultural Resource Impacts requirements identified in Section 5.3.1 of the RFP?** (Yes/No)	
7	**Proposal Guaranteed Commercial Operations Date** (MM/DD/YYYY)	
8	**The Proposer hereby certifies that the Project meets all performance attributes identified in this Section 2.1 of the RFP and Attachment B, Section 3 of the ESSA?** (Yes/No)	
9	**The Proposer hereby certifies that the Proposal (including its pricing elements) is not contingent upon changes to existing County, State, or Federal laws or regulations.** (Yes/No)	
10	**The Proposer hereby agrees to provide Development Period Security and Operating Period Security as set forth in the ESSA.** (Yes/No)	
11	**The Proposer hereby certifies under penalties of perjury that this Proposal has been made in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business partnership, corporation, union, committee, club, or organization, entity, or group of individuals.** (Yes/No)	
12	**The Proposer hereby certifies that the Proposer, its parent company, or any affiliate of the Proposer has not either defaulted on a current contract with the Company, had a contract terminated by the Company, or has any pending litigation in which the Proposer has made claims against the Company** (Yes/No)	
13	**Does the Proposer accept the contract terms identified in the ESSA in its entirety?** (Yes/No)	
13a	If the response to item 13 is "No," specify the name of the Microsoft Word red-line file that identifies the proposed modifications to the agreement, provided, however, that such proposed modifications shall be limited to targeted revisions to, and not deletions or waivers of, the agreement's terms, conditions, covenants, requirements or representations.	

To be filled out completely by Hawaiian Electric Proposers:

1	**Proposer Name (Company Name)**	
2	**Parent Company/Owner/Sponsor/Business Affiliation/etc.**	
3	**Project Name**	
4	**Energy Storage Capability for the Facility** (MW and MWh)	
5	**The Proposal hereby certifies that Proposer will fulfill all Community Outreach and Engagement / Cultural Resource Impacts requirements identified in Section 5.3.1 of the RFP?** (Yes/No)	
6	**Proposal Guaranteed Commercial Operations Date** (MM/DD/YYYY)	
7	**The Proposer hereby certifies that the Project meets all performance attributes identified in Section 2.1 of the RFP and Attachment B, Section 3 of the ESSA?** (Yes/No)	
8	**The Proposer hereby certifies that the Proposal (including its pricing elements) is not contingent upon changes to existing County, State or Federal laws or regulations.** (Yes/No)	
9	**The Proposer hereby agrees to provide Development Period Security and Operating Period Security as set forth in the ESSA.** (Yes/No)	
10	**The Proposer hereby certifies under penalties of perjury that this Proposal has been made in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business partnership, corporation, union, committee, club, or organization, entity, or group of individuals.** (Yes/No)	

11	**Year (YYYY)**	**Project Capital Cost ($)**
12	**Year (YYYY)**	**O&M Cost ($)**
13	**Year (YYYY)**	**Annual Revenue Requirement ($)**

Extend the table for questions 11, 12, and 13 for as many years as needed up to the 10-year ESSA term.

2.1 REQUIRED FORMS ACCOMPANYING PROPOSAL PDF

The following forms must accompany each proposal, must be attached to the Proposal PDF, and uploaded via the "2. Upload Documents" tab:

- Document signed by a representative for the Proposer **authorizing the submission** of the Proposal
- Fully executed **Mutual Confidentiality and Non-Disclosure Agreement ("NDA")** (Appendix E to the RFP, may be downloaded from the "1. Download Documents" tab in the Electronic Procurement Platform).
- **Certificate of Vendor Compliance** for the Proposer
    - **Certificate of Good Standing** for the Proposer and **Federal and State tax clearance certificates** for the Proposer may be provided in lieu of the Certificate of Vendor Compliance
- **Certification of Counsel for Proposer**, if applicable. (See Appendix B Attachment 1.)
- Completed applicable **Project Interconnection Data Request worksheet** for the proposed technology and **project single line diagram(s). Models for equipment and controls, list(s)** identifying components and **respective files** (for inverters and power plant controller), and **complete documentation with instructions** as specified in the Data Request worksheet shall be submitted within the respective timeframes specified in Section 5.1 of the RFP.[2] (See Section 2.11.1 below)
- [For Hawaiian Electric Proposals Only] **Hawaiian Electric Proposal Team Certification Form**. See Appendix G Attachment 1.
- [For Hawaiian Electric Proposals Only] **Revenue Requirements Worksheets** that support the annual revenue requirements estimates shall be submitted. A starter revenue requirements template file can be requested by the Hawaiian Electric Proposal Team via email to the RFP Email Address or through the PowerAdvocate Messaging function once the RFP event opens. The revenue requirements worksheets submitted will be modified to reflect the details of the Project's Proposal. All assumptions used will be reflected in an assumptions input tab.

2.2 PROPOSAL SUMMARY/CONTACT INFORMATION

2.2.1 Provide a **primary point of contact** for the Proposal being submitted:

- Name
- Title
- Mailing Address
- Phone Number
- Email Address - this will be the official communication address used during the RFP process

2.2.2 **Executive Summary of Proposal.** The executive summary must include an approach and description of the important elements of the Proposal.

[2] If the Models, lists, respective files and complete documentation are not submitted with the Proposal upload, they shall be submitted via PowerAdvocate's Messaging as attachments within the respective timeframes specified in Section 5.1 of the RFP.

2.2.3 **Pricing information.** Pricing information must be filled out in the Section 2.0 Proposal Summary Table above. Provide any pricing information only in those table sections – do not embed pricing information in any other portion of the Proposal PDF.

2.2.4 Provide a **high-level overview of the proposed Facility**, including at a minimum the following information:

- Technology Type (i.e. lithium ion battery)
- Maximum Rated Output, as defined in the applicable contract (MW)
- Discharge Duration at Maximum Rated Output (hours)
- Storage Energy Capacity (MWh) available at the point of interconnection (i.e. BESS Contract Capacity as defined in the appliable contract)
- Operational Limitations, such as, but not limited to: energy throughput limits (daily, monthly, annually), State of Charge restrictions (min/max SOC while at rest (not charging/discharging)), etc. Proposed Operational Limits cannot be in conflict with the energy discharge requirement in Section 1.2.7 of the RFP. If such a conflict is identified, the Proposal may be disqualified.
- Round Trip Efficiency ("RTE") Specify a single value (percentage) that the Facility is required to maintain throughout the term of the ESSA. The RTE must consider and reflect:
  - the technical requirements of the Facility (as further set forth in the applicable contract);
  - that the measurement location of charging and discharged energy is at the point of interconnection;
  - electrical losses associated with the point of interconnection measurement location;
  - any auxiliary and station loads that need to be served by BESS energy during charge and discharge that may not be done at Maximum Rated Output or over a fixed duration; and
  - that the data used to validate the RTE will be captured during a full charge cycle (0%-100% SOC) directly followed by a full discharge cycle (100%-0% SOC).
- Describe any augmentation plans for the storage component to maintain the functionality and characteristics of the storage during the term of the applicable contract. Include any expected interval of augmentation (months/years).
- Estimated useful life of the storage component (including augmentation if used) (years).

2.3 FINANCIAL

Provide the following financial information identified below. As specified in the General Instructions in Section 1.0 above, all information (including attachments) must be provided in English, be provided in U.S. Dollars and use U. S. credit ratings.

2.3.1 Identification of Equity Participants

2.3.1.1 Who are the **equity participants** in the Project (or the equity partners' other partners)?

2.3.1.2 Provide an **organizational structure** for the Proposer including any general and limited partners and providers of capital that identifies:

- Associated responsibilities from a financial and legal perspective
- Percentage interest of each party

2.3.2 Project Financing

2.3.2.1 **How will the Project be financed** (including construction and term financing)? Address at a minimum:

- The Project's projected financial structure
- Expected source of debt and equity financing

2.3.2.2 [For IPP and Affiliate Proposals] Identify all **estimated development and capital costs** for, at a minimum:

- Equipment
  - Identify the manufacturer and model number for all major equipment
- Construction
  - Identify and breakdown what is included in this category and any assumptions made
- Engineering
- Seller-Owned Interconnection Facilities
  - Identify and breakdown what is included in this category and any assumptions made
- Land
- Annual O&M
- Specify a percentage of the total project cost that is estimated to be attributed to the storage functionality of the Facility. As the storage functionality is treated as a lease, the Company will use the percentage for its preliminary calculation of the lease liability only. This percentage requested for the Company's accounting purposes does not affect nor alter the liquidated damage provisions of the ESSA, as those provisions reflect the benefit the Company seeks from the Project's storage functionality.

[For Hawaiian Electric Proposals Only] Identify all **estimated development and capital costs** for, at a minimum:

- Facility (including any generation and storage components)
- Outside Services
- Interconnection
- Overhead Costs
- Allowance for Funds Used During Construction
- Annual O&M
- Specify a percentage of the total project cost that is estimated to be attributed to the storage functionality of the Facility. As the storage functionality is treated as a lease, the Company will use the percentage for its preliminary calculation of the lease liability only. This percentage requested for the Company's accounting purposes does not affect nor alter the liquidated damage provisions of the ESSA, as those provisions reflect the benefit the Company seeks from the Project's storage functionality.

2.3.2.3 Discuss and/or provide **supporting information on any project financing guarantees**.

2.3.2.4 Describe any **written commitments obtained from the equity participants**.

2.3.2.5 Describe any **conditions precedent to project financing**, and the Proposer's plan to address them, other than execution of the Energy Storage Services Agreement or any other applicable project agreements and State of Hawai'i Public Utilities Commission approval of the Energy Storage Services Agreement and other agreements.

2.3.2.6 Provide any **additional evidence to demonstrate that the Project is financeable**.

2.3.3 Project Financing Experience of the Proposer

Describe **the project financing experience of the Proposer** in securing financing for projects of a similar size (i.e., no less than two-thirds the size) and technology as the one being proposed including the following information for any referenced projects:

- Project Name
- Project Technology
- Project Size
- Location
- Date of Construction and Permanent Financing
- Commercial Operations Date
- Proposer's Role in Financing of the Project
- Off-taker
- Term of the Interconnection Agreement
- Financing Structure
- Major Pricing Terms
- Name(s) of Finance Team Member(s); Time (i.e., years, months) worked on the project and Role/Responsibilities

2.3.4 Evidence of the Proposer's Financial Strength

2.3.4.1 Provide **copies of the Proposer's audited financial statements** (balance sheet, income statement, and statement of cash flows):

- Legal Entity
  - Three (3) most recent fiscal years
  - Quarterly report for the most recent quarter ended
- Parent Company
  - Three (3) most recent fiscal years
  - Quarterly report for the most recent quarter ended

2.3.4.2 Provide the **current credit ratings** for the Proposer (or Parent Company, if not available for Proposer), affiliates, partners, and credit support provider:

- Standard & Poor's
- Moody's
- Fitch

2.3.4.3 Describe any **current credit issues** regarding the Proposer or affiliate entities raised by rating agencies, banks, or accounting firms.

2.3.4.4 Provide any **additional evidence that the Proposer has the financial resources and financial strength** to complete and operate the Project as proposed.

2.3.5 Provide evidence that the Proposer can provide the required securities

2.3.5.1 Describe the Proposer's **ability (and/or the ability of its credit support provider) and proposed plans to provide the required securities** including:

- Irrevocable standby letter of credit
- Sources of security
- Description of its credit support provider

2.3.6 Disclosure of Litigation and Disputes

Disclose any **litigation, disputes, and the status of any lawsuits or dispute resolution** related to projects owned or managed by the Proposer or any of its affiliates.

2.3.7 State to the best of the Proposer's knowledge: Will the Project result in **consolidation** of the Developer entity's finances onto the Company's financial statements under FASB 810. **Provide supporting information** to allow the Company to verify such conclusion.

2.4 CONTRACT EXCEPTIONS AND FINANCIAL COMPLIANCE

2.4.1 If Proposers elect to propose modifications to the ESSA, **provide a Microsoft Word red-line version of the ESSA** identifying specific proposed modifications to the model language that the Proposer is agreeable to and a detailed explanation and supporting rationale for each modification. General comments, drafting notes, and footnotes such as "parties to discuss" are unacceptable and will be considered non-responsive.

Proposers that do not upload redlines of the ESSA with their Proposal submission will be deemed to have accepted the ESSA in its entirety. If no modifications are proposed, please state in this section "no modifications to the ESSA".

As set forth in RFP Section 3.8.5.1, proposed modifications to the ESSA will be subject to negotiation between the Company and the Final Award Group and should not be assumed to have been accepted either as a result of being selected to the Final Award Group or based on any previously executed PPA.

2.5 AKONI PULE SITE INFORMATION

2.5.1 Provide a **site layout plan** which illustrates:

- Proposed location of all equipment
- Proposed location of all facilities on the Akoni Pule Site, including any proposed line extensions
- Site boundaries (if the proposed Project does not cover the entire Akoni Pule Site)

2.5.2 Describe the **Interconnection route** and include:

- Site sketches of how the facility will be interconnected to the Company's System (above-ground and/or underground)
- Description of the rationale for the interconnection route

2.6 ENVIRONMENTAL COMPLIANCE AND PERMITTING PLAN

Scoring of proposals for the non-price evaluation criteria of this section will be based on the completeness and thoroughness of responses to each of the criteria listed below. The Company recommends that each Proposal incorporate the list below as an outline together with complete and thorough responses to each item in the list. Proposals that closely follow this recommendation will typically be awarded higher scores than proposals that do not.

2.6.1 Describe your **overall land use and environmental permits and approvals strategy** and approach to obtaining successful, positive results from the agencies and authorities having jurisdiction, including:

- Explanation of the conceptual plans for siting
- Studies/assessments
- Permits and approvals
- Gantt format schedule which identifies the sequencing of permit application and approval activities and critical path. (Schedule must be in MM/DD/YY format.)

2.6.2 Discuss the **city zoning and state land use classification**:

- Identify present and required zoning and the ability to site the proposed Project within those zoning allowances.
- Identify present and required land use classifications and the ability to site the proposed Project within those classifications.
- Provide evidence of proper zoning and land use classifications for selected site and interconnection route.
- If changes in the above are required for the proposed Project, provide a plan and timeline to secure the necessary approvals.

2.6.3 Identify all required discretionary and non-discretionary **land use, environmental and construction permits, and approvals** required for development, financing, construction, and operation of the proposed Project, including but not limited to zoning changes, Environmental Assessments, and/or Environmental Impacts Statements.

Provide a **listing of such permits and approvals** indicating:

- Permit Name
- Federal, State, or Local agencies and authorities having jurisdiction over the issuance
- Status of approval and anticipated timeline for seeking and receiving the required permit and/or license
- Explanation of your basis for the assumed timeline
- Explain any situation where a permit or license for one aspect of the Project may influence the timing or permit of another aspect (e.g., a case where one permit is contingent upon completion of another permit or license), if applicable.
- Explain your plans to secure all permits and approvals required for the Project.

2.6.4 Provide a **preliminary environmental assessment of the site** (including any pre-existing environmental conditions) and potential short- and long-term **impacts** associated with, or resulting from, the proposed Project – including direct, indirect, and cumulative impacts associated with development, construction, operation, and maintenance of the proposed Project in every area identified below. Discuss if alternatives have been or will be considered. The assessment shall also include Proposer's short- and long-

term plans to mitigate such impacts and explanation of the mitigation strategies for, but not limited to, each of the major environmental areas as presented below:

- Natural Environment
  - Air quality
  - Biology (Natural habitats and ecosystems, flora/fauna/vegetation, and animals, especially if threatened or endangered)
  - Climate
  - Soils
  - Topography and geology
- Land Regulation
  - Land Uses, including any land use restrictions and/or pre-existing environmental conditions/contamination
  - Flood and tsunami hazards
  - Noise
  - Roadways and Road and Air Traffic
  - Utilities
- Socio-Economic Characteristics
- Aesthetic/Visual Resources and Impact
- Solid Waste
- Hazardous Materials
- Water Quality
- Public Safety Services (Police, Fire, Emergency Medical Services)
- Recreation
- Potential Cumulative and Secondary Impacts

2.6.5 Provide a **decommissioning plan**, including:

- Developing and implementing program for recycling to the fullest extent possible, or otherwise properly disposing of installed infrastructure, if any, and
- Demonstrating how restoration of the Site to its original ecological condition is guaranteed in the event of default by the Proposer in the applicable Site Control documentation.

2.7 RESERVED

2.8 WEBSITE INFORMATION

2.8.1 Proposer selected to the Final Award Group must provide the below table of information to the Company as described in Section 5.3 of the RFP to provide communities Project information that is of interest to them in a standard format.

PROJECT SUMMARY

*	Proposer Name (Company name)	
*	Parent Company/Owner/Sponsor/Business Affiliate/etc.	
*	Project Name	
*	Net AC Capacity of the Facility (MW) (must match Proposal information)	

*	Proposed Facility Location, Street Address if available, or what City/Area on the island it is near	
*	TMK(s) of Facility Location (must match Proposal information)	
*	Point of Interconnection's Circuit (must match Proposal information)	
*	Project Description (in 200 words or less)	*(A description that includes information about the project that will enable the community to understand the impact that the Project might have on the community.)*
*	Project site map	*(provide a map similar to what was provided in Section 2.5.2)*
*	Site layout plan	*(provide a layout similar to what was provided in Section 2.5.3)*
*	Interconnection route	*(provide a map of the route similar to what was provided in Section 2.5.4)*
Environmental Compliance and Permitting Plan		
*	Overall land use and environmental permits and approvals strategy	*(provide information in level of detail as provided in Section 2.6.1)*
*	Gantt format schedule which identifies the sequencing of permit applications and approval activities and critical path. Schedule must be in MM/DD/YY format)	*(provide information in level of detail as provided in Section 2.6.1)*
*	City Zoning and Land Use Classification	*(provide information in level of detail as provided in Section 2.6.2)*
*	Discretionary and non-discretionary Land use, environmental and construction permits and approvals	(*provide information in level of detail as provided in* Section 2.6.3)
*	Listing of Permits and approvals	(*provide information in level of detail as provided in* Section 2.6.3)
*	Preliminary environmental assessment of the Site (including any pre-existing environmental conditions)	(*provide information in level of detail as provided in* Section 2.6.4)

2.9 OPERATIONS AND MAINTENANCE (O&M)

2.9.1 To demonstrate the long-term operational viability of the proposed Project, describe the **planned operations and maintenance**, including:

- Operations and maintenance funding levels, annually, throughout the term of the contract.

- Description of the operational requirements by frequency (daily, weekly, monthly, yearly, as-necessary, run hour interval) and maintenance requirements by frequency (daily, weekly, monthly, yearly, as-necessary, run hour interval).
- A discussion of the staffing levels proposed for the Project and location of such staff. If such staff is offsite, describe response time and ability to control the Project remotely.
- Technology specific maintenance experience records.
- Identification of any O&M providers.
- The expected role of the Proposer (Owner) or outside contractor.
- Scheduling of major maintenance activity.
- Plan for testing equipment.
- Estimated life of Storage Facilities and associated Interconnection Facilities.
- Safety plan, including historical safety records with environmental history records, violations, and compliance plans.
- Security plan.
- Site maintenance plan.
- Substation equipment maintenance plan.

2.9.2 State whether the Proposer would **consider 24-hour staffing**. Explain how this would be done.

2.9.3 Describe the **Proposer's contingency plan**, including the Proposer's mitigation plans to address failures. Such information should be described in the Proposal to demonstrate the Project's reliability with regard to potential operational issues.

2.9.4 Describe if the Proposer will **coordinate their maintenance schedule** for the Project with the Company's annual planned generation maintenance. See Article 5 of the ESSA.

2.9.5 Describe the **status of any O&M agreements or contracts** that the Proposer is required to secure. Include a discussion of the Proposer's plan for securing a long-term O&M contract.

2.9.6 Provide **examples of the Proposer's experience** with O&M services for other similar projects.

2.10 PERFORMANCE STANDARDS

2.10.1 Design and operating information. Provide a **description of the project design**. Description shall include:

- Configuration description, including conceptual or schematic diagrams. Overview of the Facility Control Systems – central control and inverter- or resource-level control.
- Diagrams approved by a Professional Electrical Engineer registered in the State of Hawai‘i, indicated by the presence of the Engineer's Professional seal on all drawings and documents. Including but not limited to:
    - A single-line diagram, relay list, trip scheme and settings of the generating facility, which identifies the Point of Interconnection, circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes.

2.10.2 Capability of **Meeting Performance Standards**. The proposed Facility must meet the performance attributes identified in Section 2.1 of the RFP and Attachment B, Section 3 of the ESSA. Provide **confirmation that the proposed Facility will meet the requirements identified** or provide clarification or comments about the Facility's ability to meet the performance standards. Proposals should include sufficient documentation to support the stated claim that the Facility will be able to meet the Performance Standards. The Proposal should include information required to make such a determination in an organized manner to ensure this evaluation can be completed within the evaluation review period.

2.10.3 Reactive Power Control: Provide the facility's **ability to meet the Reactive Power Control capabilities,** including Voltage Regulation at the point of interconnection, required in the Performance Standards, including contribution from the energy storage inverters and means of coordinating the response. Provide the inverter capability curve(s). Confirm ability to provide reactive power at zero active power.

2.10.4 **Ramp Rate** for Generation Facilities: Confirm the ability to meet the ramp rate requirement specified in the ESSA.

2.10.5 **Undervoltage ride-through:** Provide the facility's terminal voltage level(s) and elapsed time at which the facility will disconnect from the utility system during the disturbance, if any. Confirm the ability to meet ride-through requirements and include supporting documentation regarding inverter design, control parameters, etc.

2.10.6 **Overvoltage ride-through:** Provide the facility's terminal voltage level(s) and elapsed time at which the facility will disconnect from the utility system during the disturbance, if any. Confirm the ability to meet ride-through requirements and include supporting documentation regarding inverter design, control parameters, etc.

2.10.7 **Transient stability ride-through:** Provide the facility's ability to stay online during Company System: (1) three-phase fault located anywhere on the Company System and lasting up to__ cycles; and (2) a single line to ground fault located anywhere on the Company System and lasting up to__ cycles. Provide the Facility's ability to withstand subsequent events.

2.10.8 **Short-Term Over-Current**: Provide the facility's short-term over-current capability to supply inrush currents during energizing of transformers and distribution feeders and starting auxiliary motors of conventional power plants.

2.10.9 **Underfrequency ride-through:** Provide the facility's terminal frequency level(s) and elapsed time at which the facility will disconnect from the utility system during the disturbance, if any. Confirm the ability to meet ride-through requirements and include supporting documentation regarding inverter design, control parameters, etc.

2.10.10 **Overfrequency ride-through:** Provide the facility's terminal frequency level(s) and elapsed time at which the facility will disconnect from the utility system during the disturbance, if any. Confirm the ability to meet ride-through requirements and include supporting documentation regarding inverter design, control parameters, etc.

2.10. 11 **Frequency Response:** Provide the facility's frequency response characteristics as required by the ESSA, including time of response, tunable parameters, alternate frequency response modes, and means of implementing such features.

2.10.12 **Auxiliary Power Information:** Proposer must provide the maximum auxiliary power requirements for:

- Start-up
- Normal Operations (from generator)
- Normal Operating Shutdown
- Forced Emergency Shutdown
- Maintenance Outage

2.10.13 **Coordination of Operations:** Provide a description of the control facilities required to coordinate generator operation with and between the Company's System Operator and the Company's System.

- Include a description of the equipment and technology used to facilitate dispatch to the Company and communicate with the Company.
- Include a description of the control and protection requirements of the generator and the Company's System.

2.10.14 **Cycling Capability:** Describe the Facility's ability to cycle on/off and provide limitations.

2.10.15 **Active Power Control Interface:** Describe the means of implementing active power control and the Power Possible, including the contribution to the dispatch signal from paired storage, if any. Provide the Proposer's **experience** dealing with active power control, dispatch, frequency response, and ride-through.

2.10.16 Provide the details of the **major equipment** (i.e., batteries, inverters, battery management system), including, but not limited to, name of manufacturer, models, key metrics, characteristics of the equipment, and performance specifications.

2.10.17 **Energy Storage performance standards:** Provide additional performance standard descriptions as follows:

- MWh storage output for a full year
- Ramp Rate: Provide the Facility's ramp rate, which should be no more than 2 MW/minute for all conditions other than those under control of the Company System Operator and/or those due to desired frequency response.
- System Response Time – Idle to Design Maximum (minutes)
- Discharge Start-up time (minutes from notification)
- Charge Start-up time (minutes from notification)
- Start and run-time limitations, if any

2.11 INTERCONNECTION SUBMITTAL REQUIREMENTS

2.11.1 A summary of the model requirements and impact study scope can be found in Appx B Att 4 from the "1. Download Documents" tab.

2.11.2 Provide the completed **Project Interconnection Requirement Study Data Request worksheet** with the Proposal submission. The worksheet can be found in the "1. Download Documents" tab as Appx B Att 2 with the file name of Project Interconnection Data Request Worksheets (storage) MSExcel files. Also provide all **project diagram(s)** with the Proposal submission. **Models for equipment and controls, list(s)** identifying components and **respective files** (for inverters and power plant controller), and **complete documentation with instructions** shall be submitted within the timeframes specified in Section 2.3.2 of the RFP.[2] Proposers may also download the Facility Technical Model Requirements and Review Process documentation labelled as Appx B Att 3 from the "1. Download Documents" tab.

2.12 PROVEN TECHNOLOGY

2.12.1 Provide all supporting information for the Company to assess the **commercial and financial maturity of the technology** being proposed. Provide any supporting documentation that shows examples of projects that:

- Use the technology at the scale being proposed
- Have successfully reached commercial operations (for example, by submitting a PPA)
- Demonstrate experience in providing Active Power dispatch

2.13 EXPERIENCE AND QUALIFICATIONS

Proposers, its affiliated companies, partners, and/or contractors and consultants are required to demonstrate project experience and management capability to successfully develop and operate the proposed Project.

2.13.1 Provide a hierarchical **organizational / management chart** for the Project that lists all key personnel and project participants dedicated to this Project and that identifies the management structure and responsibilities. In addition to the chart, Proposers must provide biographies / resumes of the key personnel, including position, years of relevant experience and similar project experience. Proposers must provide specifics as they relate to financing of renewable energy projects. Identify architects and engineers or provision to provide same that are licensed to practice in the State of Hawaii. Providers must also provide a completed table:

- For each of the project participants (including the Proposer, partners, and proposed contractors), fill out the table below and provide statements that list the specific experience of the individual in: financing, designing, constructing, interconnecting, owning, operating, and maintaining renewable energy generating or storage facilities, or other projects of similar size and technology, and
- Provide any evidence that the project participants have worked jointly on other projects.

	EXPERIENCE: In the applicable columns below, include project details (i.e., project name, location, technology, size) and relevant job duties (role/responsibilities) and time (in years/months) spent on the project. List multiple projects if applicable.						
Participant Name:	**Financing**	**Designing**	**Constructing**	**Interconnecting**	**Owning**	**Operating**	**Maintaining**
1.							
2.							
3.							
…							

2.13.2 Identify those **member(s) of the team** the Proposer is submitting to meet the experience and qualifications requirement, including the Threshold Requirement. Identify those **members of the team with experience and qualifications,** including affiliates, and their principal personnel who will be involved in the project. If the Proposer consists of multiple parties, such as joint ventures or partnerships, demonstrate each member(s) firm commitment to provide services to the project (e.g., letter of intent); provide this information for each party, clearly indicating the proposed role of each party, including an ownership chart indicating direct and indirect ownership, and percentage interests in the partnership or joint venture.

2.13.3 Provide a **listing in the table format below, of all energy storage projects for the purposes of a microgrid of a similar MW scale for large commercial operations (ex. military bases, educational institutions, business facilities, utility plants)** the Proposer has successfully developed or that are currently under construction. Describe the Proposer's role and responsibilities associated with these projects (lead developer, owner, investor, etc.). Provide the following information as part of the response:

Project Name	**Location (City, State)**	**Storage Technology**	**Size (MW/ MWh)**	**Commercial Operation Date**	**Offtaker (if applicable)**	**Role & Responsibilities**
1.						
2.						
3.						
…						

2.14 STATE OF PROJECT DEVELOPMENT AND SCHEDULE

2.14.1 Provide a **project schedule in GANTT chart format** with complete **critical path activities** identified for the Proposal from the Notice of Selection of the Proposal to the start of Commercial Operations.

- The **schedule** must include:
  - Interconnection Requirement Study (IRS) assumptions
  - Anticipated contract negotiation period assumptions
  - Regulatory assumptions
  - Anticipated submittal and approval dates for permitting (including but not limited to environmental and archaeological compliance)
  - Cultural Resource implications and mitigation activities
  - Community outreach and engagement activities

- Energy resource assessment
- Financing
- Engineering
- Procurement
- Facility construction including construction management events
- Applicable reporting milestone events specified in the ESSA
- Testing
- Interconnection (including engineering, procurement, and construction)
- Commercial Operations Date
- All other important elements outside of the direct construction of the Project

- The project schedule must be created in Microsoft Project and submitted in a .mpp file format.
- For each project element, list the start and end date (must be in MM/DD/YY format), and include predecessors to clearly illustrate schedule dependencies and durations.
- Proposers must also list and describe critical path activities and milestone events, particularly as they relate to the integration and coordination of the project components and the Company's Electric System. Proposers must ensure that the schedule provided in this section is consistent with the milestone events contained in the ESSA and/or other agreements.

2.14.2 Describe the **construction execution strategy** including:

- Identification of contracting/subcontracting plans
- Modular construction
- Safety plans[3]
- Quality control and assurance plan
- Labor availability
- Likely manufacturing sites and procurement plans
- Similar projects where these construction methods have been used by the Proposer.

2.14.3 Provide a description of any **project activities that have been performed to date**.

2.14.4 Explain how you plan to reach **safe harbor milestones** (if applicable) and **guaranteed commercial operations**, including durations and dependencies which support this achievement.

2.15 CARBON EMISSION QUESTIONNAIRE

2.15.1 Answer the following Carbon Criteria questions. To mitigate the possibility of providing responses to questions that are optimistic or would result in a better score for the Carbon Criteria questions, please provide conservative answers where answers are unknown or uncertain. Guidance for providing conservative answers has been provided for each question. If a question or Category's questions are not applicable to the Project, please leave blank. For instance, if the Project generation technology does not include solar, leave questions in Category "3e. Procurement – Solar" blank.

[3] A document that describes the various safety procedures and practices that will be implemented on the Project and how applicable safety regulations, standards, and work practices will be enforced on the Project.

Category	#	Question	*Answer Choices*
1. Siting	1	Please provide the Project's expected annual production capacity per developed Site area in units of MWh/yr/m^2. *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected annual production capacity per developed Site area in units of MWh/yr/m^2.*	*Numerical write in*
	2	What is the expected distance from the Project's generation/storage location to the point of interconnection? *If the answer to this question is unknown or if there are multiple possibilities, please conservatively provide the furthest expected distance from the Project's generation/storage location to the point of interconnection*	*Numerical write in*
	3	What fraction of the Project's Site is a "greenfield", e.g. has not been previously developed? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected "greenfield" fraction.*	*Numerical write in*
	4	What fraction of the Project's Site requires grading? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected fraction.*	*Numerical write in*
	5	What is the expected fraction (in terms of CAPEX) of infrastructure being reused (includes roads, buildings, trenches, pads) for the Project? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
2. Procurement	6	What fraction of concrete, fencing, gravel and other roadway materials used for the Project will be locally sourced on island? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	7	If available, please provide manufacturer-specific carbon footprint for major components and feedstock, along with supporting documentation. For power generating components, such as solar panels/wind turbines/biomass combustor, please provide the carbon footprint in units of kg CO_2e/kWh. For carbon feedstock, please provide in units of kg CO_2e/MMBtu energy content. *If this information is unavailable, please answer "Not available at this time".*	*Numerical write-in and supporting documentation*
	8	What fraction of roadway materials and gravel used for the Project will be made from recycled materials?	*Numerical write in*

		If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.	
3a. Procurement – Biofuels ***please answer only if the project includes biofuels-based generation***	9	What fraction of the biofuel feedstock used for the Project is also a food or animal feedstock? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected fraction.*	*Numerical write in*
	10	What fraction of the biofuel feedstock used for the Project is a waste product? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	11	What fraction of the harvested biofuel feedstock used for the Project will be replaced and regrown within one year of harvesting? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum fraction.*	*Numerical write in*
	12	How much hydrogen will be used in the biofuel production process for hydroprocessing (kg hydrogen/kg biofuel produced)? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected amount in units of kg hydrogen/kg biofuel produced.*	*Numerical write in*
	13	How much fossil fuel energy will be consumed per electricity generated by the Project (kg fossil fuel/kWh)? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected amount in units of kg fossil fuel/kWh.*	*Numerical write in*
3b. Procurement – Biomass ***please answer only if the project includes biomass-based generation***	14	What is the expected overall efficiency of the Project's biomass conversion to electricity (electricity generated by the Project divided by the energy in the biomass combusted)? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected overall efficiency.*	*Numerical write in*
	15	What is the expected biomass combustion efficiency of the biomass used for the Project (actual heat produced by combustion divided by the total heat potential of the biomass combusted)? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected biomass combustion efficiency.*	*Numerical write in*
	16	What fraction of the harvested biomass feedstock used for the Project will be replaced and regrown within one year of harvesting?	*Numerical write in*

		If the answer to this question is unknown or uncertain, please conservatively provide the minimum fraction.	
3c. Procurement – Energy Storage ***please answer only if the project includes energy storage***	17	What is the expected return efficiency of the Project's energy storage system (MWh returned to the grid/MWh stored)? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected return efficiency.*	*Numerical write in*
	18	How many cycles will the batteries used for the Project's energy storage system undergo annually? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected number of cycles.*	*Numerical write in*
	19	What is the expected battery lifetime before degradation of the Project's energy storage efficiency below 80%? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected lifetime.*	*Numerical write in*
3d. Procurement – Geothermal ***please answer only if the project includes geothermal generation***	20	Will the Project's geothermal process be an enhanced geothermal system (EGS), flash/dry steam, or binary steam power plant? *If the answer to this question is unknown or uncertain, please conservatively answer "Not known at this time".*	*Text write in*
	21	Will the Project's geothermal process be closed loop? *If the answer to this question is unknown or uncertain, please conservatively answer "No".*	*Yes / No*
	22	What percentage of mass of fluid will be cascaded compared to total extracted fluid mass? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected percentage.*	*Numerical write in*
	23	Will new geothermal wells need to be drilled for the Project? *If the answer to this question is unknown or uncertain, please conservatively answer "Yes".*	*Yes / No*
3e. Procurement – Solar ***please answer only if the project includes solar generation***	24	What is the expected solar irradiance for the Project (kW/m^2)? *If the answer to this question is unknown or uncertain, please conservatively answer "Not known at this time".*	*Numerical write in*
	25	Which type of solar panels will be installed for the Project? a. Cadmium Telluride b. Single Crystalline Silicon c. Multicrystalline Silicon d. Other, if yes, please provide details regarding solar panel technology type.	*Yes/No* *If "Other", include write-in*

		If the answer to this question is unknown or uncertain, please conservatively answer "Not known at this time".	
	26	What is the solar conversion efficiency of the solar panels (solar kW/m^2 / kW/m^2 produced) used for the Project? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum solar conversion efficiency.*	*Numerical write in*
3f. Procurement – Waste-to-Energy ***please answer only if the project includes Waste-to-Energy generation***	27	What fraction of the waste feedstock used for the Project will be organic waste (food, waste paper, green (i.e. compostable) waste, etc.)? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	28	What fraction of the fleet used to transport the waste feedstock to the Facility will consume renewable diesel or be electric? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	29	If the Waste-to-Energy process used for the Project will emit greenhouse gases, what fraction of the greenhouse gases will be captured? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Yes / No* *If "Yes", include numerical write in*
	30	What is the expected overall electrical efficiency of the Project process (electricity produced divided by the energy utilized for the waste-to-energy process) (kWh produced/kWh utilized for processing)? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum overall electrical efficiency expected.*	*Numerical write in*
3g. Procurement – Wind ***please answer only if the project includes wind generation***	31	What fraction of the rotors used for the Project will be made from recycled materials? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	32	Please provide the expected wind energy availability for the Project's location as it is related to the available wind speed (MW). *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected wind energy availability.*	*Numerical write in*
	33	Please provide the expected power generation ratio of the Project.	*Numerical write in*

		If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected power generation ratio.	
	34	Please provide the expected power coefficient of the Project. *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected power coefficient of the Project.*	*Numerical write in*
	35	What percentage by weight of the turbine tower will be steel? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected percentage.*	*Numerical write in*
4. Construction	36	What fraction of the equipment used during the construction phase of the Project will consume renewable fuel? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
	37	Will the Site have an anti-idle policy for the equipment used during the construction phase of the Project? *If the answer to this question is unknown or uncertain, please conservatively answer "No".*	*Yes / No*
	38	How many hours of helicopter use will be required for construction phase of the Project? *If the answer to this question is unknown or uncertain, please conservatively answer "Yes".*	*Numerical write in*
	39	What fraction of construction workers traveling to the Site during the construction phase of the Project will be local to Hawai'i? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum fraction of construction workers traveling to the Site during the construction phase of the Project may be local to Hawai'i.*	*Numerical write in*
5. Operations & Maintenance	40	What fraction of Project equipment and materials will need to be replaced during the Project's proposed Contract Term (e.g., Project lifetime) as a percentage of capital cost? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected fraction of Project equipment and materials may need to be replaced during the Project's proposed Contract Term by using an above-average scenario for number of equipment failures and wear-and-tear on project materials.*	*Numerical write in*
	41	Will any equipment containing high global warming potential gases (such as sulfur hexafluoride (SF_6) or hydrofluorocarbons (HFCs)) be installed or used during operation? If yes, please	*Yes / No If "Yes", include*

		provide the type of equipment and high global warming potential greenhouse gas and approximate quantity (kg) leaked per year. *If the answer to this question is unknown or uncertain, please conservatively assume "Yes" and provide a maximum expected quantity(kg) leaked per year.*	*numerical write in*
	42	What is the expected electricity load from the grid over the Project's proposed Contract Term as a percentage of the Project's total electricity production? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum electricity load from the grid as a percentage of the Project's total electricity production.*	*Numerical write in*
	43	What is the expected onsite electricity use over the Project's proposed Contract Term as a percentage of the Project's total electricity production? *If the answer to this question is unknown or uncertain, please conservatively provide the maximum expected onsite electricity use over the Project's proposed Contract Term as a percentage of the Project's total electricity production.*	*Numerical write in*
	44	What fraction of the equipment used for the Operations & Maintenance of the Project will consume renewable fuel or be electric? *If the answer to this question is unknown or uncertain, please conservatively provide the minimum expected fraction.*	*Numerical write in*
6. General	45	Please provide any additional information available likely to impact the Project's lifecycle (i.e., including raw materials and extraction, transportation, construction, operations & maintenance, and decommissioning & disposal) greenhouse gas emissions.	*Text write in*
	46	Please describe any additional actions that will be taken to reduce the Project's lifecycle greenhouse gas emissions, if not already captured in above responses. If no actions are intended at this time, please state that.	*Text write in*

Certification of Counsel for Proposer
Hawai‘i Electric Light Company, Inc.

Pursuant to Section 1.7.4 of Hawai‘i Electric Light Company, Inc.(“Company) Request For Proposals for Energy Storage, North Kohala, Island of Hawai‘i (“RFP”), the Company may require legal counsel who represent multiple unaffiliated proposers to sign a certification that they have not shared confidential information obtained through the representation of one proposer with any other unaffiliated proposer.

Accordingly, by signing below, I hereby acknowledge, agree and certify that:

(1) in connection with the RFP, I represent the following company that has submitted a proposal(s) for the RFP: _____ ;

(2) irrespective of any proposer’s direction, waiver or request to the contrary, I will not share a proposer’s confidential information or the Company’s confidential information associated with such proposer, including, but not limited to, a proposer’s or Company’s negotiating positions, with third parties unaffiliated with such proposer (by contract or organizational structure), including other proposers responding to the RFP;

(3) the Company may rely on this certification for purposes of the RFP; and

(4) at the conclusion of power purchase agreement negotiations, if any, the Company may require me to sign a certificate certifying that I have not shared a proposer’s confidential information or the Company’s confidential information associated with such proposer, including, but not limited to, a proposer’s or Company’s negotiating positions, with third parties unaffiliated with such proposer (by contract or organizational structure), including other proposers responding to the RFP.

_____
Name (print)

_____
Law Firm (if applicable)

_____ _____
Signature Date

Section 1.7.4 of the RFP provides in relevant part that:

In submitting a Proposal in response to this RFP, each Proposer certifies that the Proposal has been submitted in good faith and without fraud or collusion with any other unaffiliated person or entity. The Proposer shall acknowledge this in the Response Package submitted with its Proposal. Furthermore, in executing the NDA provided as Appendix E, the Proposer agrees on behalf of its Representatives (as defined in the NDA) that the Company’s negotiating positions will not be shared with other Proposers or their respective Representatives.

In addition, in submitting a Proposal, a Proposer will be required to provide Company with its legal counsel’s written certification in the form attached as Appendix B Attachment 1 certifying in relevant part that irrespective of any proposer’s direction,

waiver, or request to the contrary, the attorney will not share a proposer's confidential information associated with such Proposer with others, including, but not limited to, such information such as a Proposer's or Company's negotiating positions. Such legal counsel will also be required to submit a similar certification at the conclusion of contract negotiations that he or she has not shared a Proposer's confidential information or the Company's confidential information associated with such Proposer with others, including but not limited to, such information as a Proposer's or Company's negotiating positions.

Project Interconnection - Data Request
FOR STORAGE
PROJECT: _____
DATE: _____
(Nonexclusive Preliminary List)
*****ALL ITEMS ARE REQUIRED AND ALL RESPONSES MUST BE FILLED UNLESS NOT APPLICABLE.*****

		Response
1)	**Please provide a plan map of the Renewable Generation facility. Please indicate the interconnection point to the HECO system.**	
2)	**Please provide the following generation and load information for the Renewable Generation facility:**	
	a. Gross and net output of the facility	
	b. Expected KW and KVAR loads including, but not limited to, generators' auxiliary load curve, process load(s) profile(s), etc.	
	c. Expected minimum and maximum MW and MVAR "import from" AND "export to" HECO.	
3)	**Please provide Single-Line Diagram(s), Three-Line Diagram(s), and Protective Relay List & Trip Schedule for the generation and interconnection facilities:**	
	a. The Single-line diagram(s) and Three-line diagram (s) should include:	
	i. For main and generator step up transformer(s), please show:	
	• Transformer voltage and MVA ratings.	
	• Transformer impedance(s).	
	• Transformer winding connections and grounding. If neutrals are grounded through impedance, please show the impedance value.	
	ii. The protective relaying and metering for the generators, transformers, buses, and all other main substation equipment.	
	iii. For the potential transformers, please indicate the type, quantity, ratio, and accuracy rating.	
	iv. For the current transformers, please indicate the type, quantity, ratio, and accuracy rating, and thermal rating factor.	
	v. Auxiliary power devices (e.g. capacitors, reactors, storage systems, etc.) and their rating(s); additional inquiries may be made to obtain technical data for these devices.	
	vi. For the interconnection / tie lines (overhead or underground) and the plant's generation system, please provide the following, as applicable:	
	• Installation details such as cross-section(s), plan and profiles, etc.	
	• Conductor data such as size, insulation, length etc.	
	• Continuous and emergency current ratings.	
	• Voltage rating (nominal and maximum KV).	
	• BIL rating.	
	• Positive, negative, and zero-sequence impedances (resistance, reactance, and susceptance)	
	• Capacitance or charging current.	
	• Short-circuit current capability.	
	vii. Include station power for facility and all applicable details.	
	viii. All applicable notes pertaining to the design and operation of the facility.	
	b. The Protective relay list & trip schedule should list the protected equipment; the relay description, type, style number, quantity, ANSI Device No., and range; and the breaker(s)/switching device(s) tripped, for both the generator protection and the interconnection facilities protection.	
	c. Please provide both a paper and an electronic version (e.g. dgn, dxf, or pdf) of the single-line diagram(s) and the protective relay list & trip schedule.	
	d. Single-line diagrams should be provided for both the generation plant and the interconnection substation.	

Project Interconnection - Data Request
FOR STORAGE
PROJECT: _____
DATE: _____
(Nonexclusive Preliminary List)
*****ALL ITEMS ARE REQUIRED AND ALL RESPONSES MUST BE FILLED UNLESS NOT APPLICABLE.*****

		Response
4)	**For the Inverter Based Generating Facility, please provide the following data:**	
	a. Inverter manufacturer, Type, Size, Impedances. Attach copy of inverter data sheet.	
	b. Power Factor Range Capability	
	c. Inverter Reactive Power Capability Curve	
	d. Auxiliary loads (P, Q, Power Factor)	
	e. Inverter's Internal Isolation Transformer Grounding Method, if used (i.e. effectively grounded, resonant grounded, low inductance grounded, high-resistance grounded, low-resistance grounded, ungrounded). If the transformer is not solidly grounded , provide the impedance value for the grounding neutral and the impedance for the isolation transformer.	
	f. Diagram for Inverter's internal isolation transformer	
	g. Switching and service restoration practice	
	h. Protection data (voltage ride-through and trip settings, frequency ride-through and trip settings etc.). Include setpoint and clearing time ranges for voltage and frequency settings.	
	i. Description of harmonic spectrum of inverter injection (order, magnitude)	

5)	**Energy Storage System**	
	a. Operation characteristics	
	b. Voltage level	
	c. Capacity (how long and how much can the battery support)	
	d. Deployment strategy/schedule	
	e. Energy storage system data sheet	

6)	**For the plant's collector system, please provide the following, as applicable:**	
	a. Conductor data such as size, insulation, etc.	
	b. Continuous and emergency current ratings.	
	c. Voltage rating (nominal and maximum kV).	
	d. BIL rating.	
	e. Positive, negative, and zero-sequence impedances (resistance, reactance, and susceptance).	
	f. Capacitance or charging current.	
	g. Short-circuit current capability.	

Project Interconnection - Data Request
FOR STORAGE
PROJECT: _____
DATE: _____
(Nonexclusive Preliminary List)
*****ALL ITEMS ARE REQUIRED AND ALL RESPONSES MUST BE FILLED UNLESS NOT APPLICABLE.*****

		Response
7)	**Please provide the following software models that accurately represent the Facility:** (For model requirements, refer to the HECO Facility Technical Model Requirements and Review Process and PSCAD Model Requirements Rev.9)	
	a. Validated PSS/E load flow model up to the point of interconnection. The PSS/E model shall include the main transformer, collection system, generator step-up transformers, inverter systems, and any other components including capacitor banks, energy storage systems, DVAR, etc. An equivalent representation of the collection system, generator step-up transformers, and inverter systems is acceptable. Documentation on the model shall be provided.	
	b. Validated PSS/E dynamic model for the inverter; and other components including energy storage system, DVAR, etc. if applicable. The inverter model shall include the generator/converter, electrical controls, plant-level controller, and protection relays. Generic and Detailed models shall be provided. Documentation on the model(s) shall be provided, including the PSS/E dyre file with model parameters.	
	i. Generic models shall parameterize models available within the PSS/E standard model library.	
	ii. Detailed models shall be supplied by the vendor/manufacturer as user-written models. The uncompiled source code for the user-written model shall be provided to ensure compatibility with future versions of PSS/E. In lieu of the uncompiled source code, a compiled object file and applicable library files shall be provided in PSS/E versions 33 AND 34 format. Updates of the object file compatible with future PSS/E versions must be provided as requested for the life of the project as written in the power purchase agreement. Documentation shall include the characteristics of the model, including block diagrams, values, names for all model parameters, and a list of all state variables.	
	c. Validated PSCAD model of the inverter; and other components including energy storage system, DVAR, auxiliary plant controllers, etc. if applicable. Documentation on the model(s) shall be provided. Refer to PSCAD Model Requirements Memo for model requirements.	
	d. Overlayed plots validating the performance of the three dynamic models for a three-phase fault. Plots shall include voltage, real and reactive power, real and reactive current.	
	e. Validated Aspen Oneliner short circuit model that accurately represents the facility (including energy storage system if applicable), and is valid for all faults conditions anywhere on the Utility system. Documentation on the model(s) shall be provided. (OTHERWISE SEE ADDITIONAL TABS FOR REQUIRED INFORMATION TO MODEL INVERTER AS A GENERATOR OR A VOLTAGE CONTROLLED CURRENT SOURCE)	
8)	**For the main transformer and generator step-up transformers, please provide:**	
	a. Transformer voltage and MVA ratings, and available taps. Attach copy of transformer test report or data sheet	
	b. The tap settings used.	
	c. The LTC Control Scheme.	
	d. Transformer winding connections and grounding used. If the transformer is not solidly grounded, provide the impedance value for the grounding method.	
	e. Positive, negative, and zero sequence impedance values.	
9)	**For the circuit breakers and fault-clearing switching devices, including the generator breakers, please provide:**	
	a. The voltage, continuous current and interrupting capability ratings.	
	b. The trip speed (time to open).	

Project Interconnection - Data Request
FOR STORAGE
PROJECT: _____
DATE: _____
(Nonexclusive Preliminary List)
*****ALL ITEMS ARE REQUIRED AND ALL RESPONSES MUST BE FILLED UNLESS NOT APPLICABLE.*****

		Response
10)	**For the power fuses, please provide:**	
	a. The manufacturer, type, size, and interrupting capability.	
	b. The minimum melt and total clearing curves.	

11)	**For the protective relaying, please provide:**	
	a. Data for the CTs used with the relaying including the manufacturer, type of CT, accuracy class, and thermal rating factor.	
	b. Data for the PTs used with the relaying including the manufacturer, type of PT, voltage ratings, and quantity.	

Instructions:

Please fill in the data in the green blanks below

(Note: This does not include the internal isolation transformer, if used)

[1] Maximum rated output power = _____ kVA

[2] Impedances in **Per Unit** based on kVA from [1]

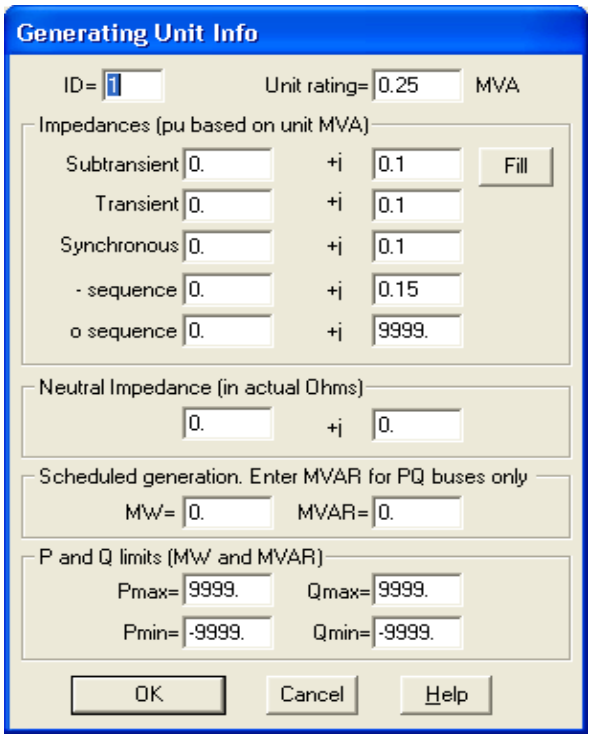
	R	X
Subtransient =		
Transient =		
Synchronous =		
Negative Sequence =		
Zero Sequence =		

[3] Neutral impedance (if any) in actual **Ohms**:

R	X

NOTE: These parameters should reflect the inverter response for all types of faults at any point on the electrical system to which the inverter is connected. This includes faults at the inverter output terminals, and also on the 138 kV transmission system. If the stated parameters do not cover this range, please state the adjustments needed to these parameters to accurately represent the inverter response across this range.

These parameters will be used to model the inverter in the Aspen Oneliner program as shown in the sample dialog box below:



Instructions:
Please fill in the data in the green blanks below

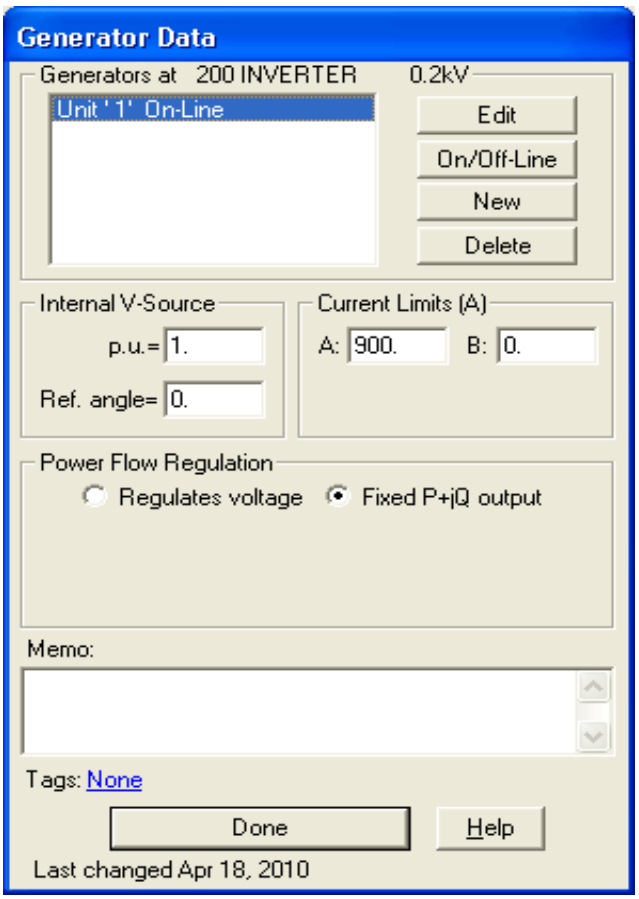
[1] Internal open circuit voltage

Magnitude = _____ Per Unit
Angle = _____ Degrees

[2] AC Output Current Limit = _____ Amps

NOTE: These parameters should reflect the inverter response for all types of faults at any point on the electrical system to which the inverter is connected. This includes faults at the inverter output terminals, and also on the 138 kV transmission system. If the stated parameters do not cover this range, please state the adjustments needed to these parameters to accurately represent the inverter response across this range.

These parameters will be used to model the inverter in the Aspen Oneliner program as shown in the sample dialog box below:



Instructions:
Please fill in the data in the green blanks below

[1] Inverter MVA Rating: _____ MVA

[2] Voltage-Current Characteristics:

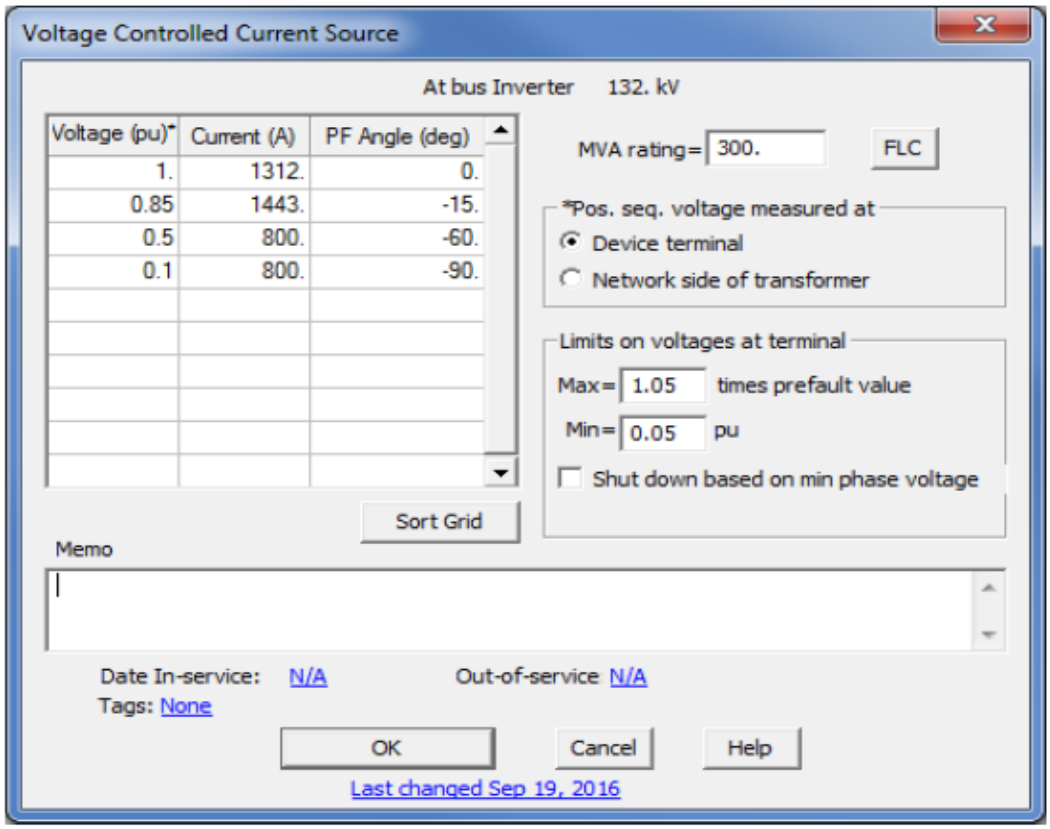
Voltage PU	Current (A)	PF Angle (deg)

[3] Location of Voltage Measurement: _____ Device Terminal OR Network side of Transformer

[4] Maximum Voltage: _____ Times prefault value

[5] Minimum Voltage _____ Per Unit

These parameters will be used to model the inverter in the Aspen Oneliner program as shown in the sample dialog box below:



Instructions:
Please fill in the data in the green blanks below
(Note: This is not required if an internal isolation transformer is not used)

[1] Transformer rated power = _____ kVA

[2] Winding Configuration

Inverter Side = _____ Delta/Wye
Customer Side = _____ Delta/Wye

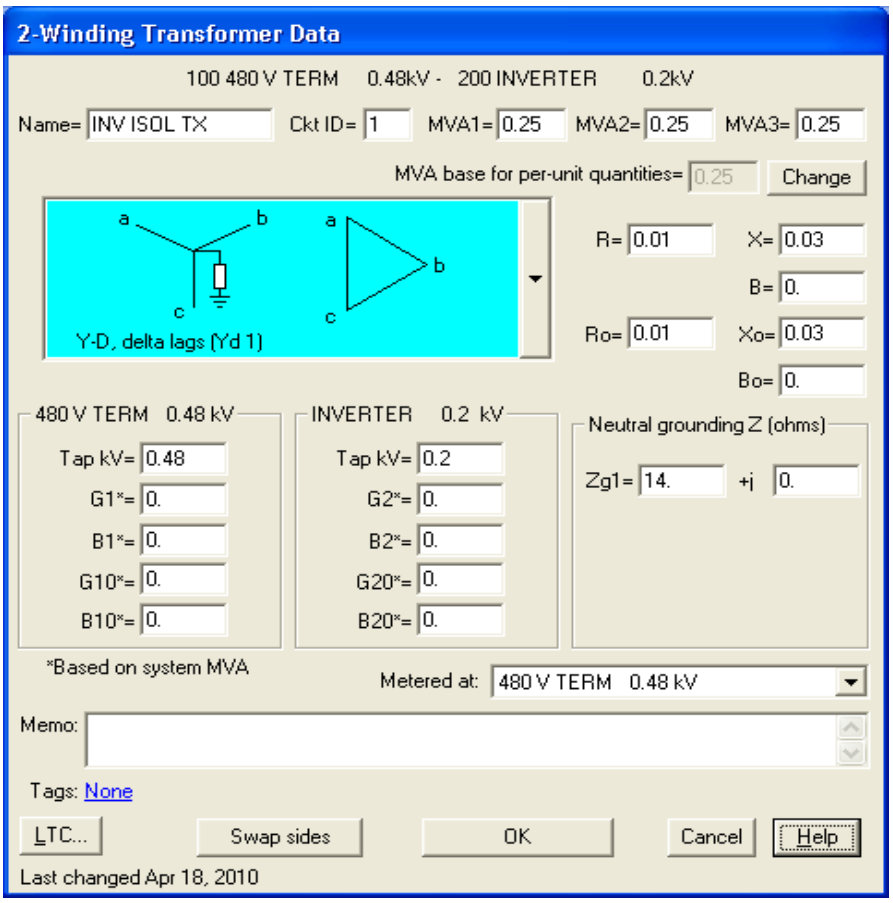
[2] Impedances in **Per Unit** based on kVA

	R	X
Positive Sequence =		
Zero Sequence =		

[3] Neutral impedance (if any) in actual **Ohms**:

R	X

These parameters will be used to model the inverter in the Aspen Oneliner program as shown in the sample dialog box below:



HAWAIIAN ELECTRIC FACILITY TECHNICAL MODEL REQUIREMENTS AND REVIEW PROCESS

August 23, 2021

Table of Contents

1 INTRODUCTION

This document summarizes requirements of generation facility technical model submittals for request for proposals for variable renewable dispatchable generation and energy storage and describes the review process for model submittals. The requirements and examples provided are based on the Company's current information as of the date of this document and are subject to change.

2 FACILITY TECHNICAL MODEL REQUIREMENTS

To fully investigate impacts of the proposed generation facility on Hawaiian Electric's system and correctly identify any mitigation measures, the proposed generation facility technical model, along with related technical documents, will need to be submitted for review prior to System Impact Study (SIS).

2.1 Overview of Submission

For all generation facility types, the technical model submittal shall include:

1. PSCAD model[1]
2. PSS/E power flow model
3. Standard Library PSS/E dynamic model
4. User defined PSS/E dynamic model, and
5. ASPEN Oneliner model

For generation facilities categorized as inverter-based resources, both Grid Following (GFL) and Grid Forming (GFM) Mode capability may be required from the project. In this case, for each project, two sets of models shall be submitted: one with the project in GFL mode, and the other with the project in GFM mode. The GFL mode technical model submittal shall follow the list above. The GFM mode technical model submittal shall include:

6. GFM PSCAD model
7. GFM User defined PSS/E dynamic model
8. GFM ASPEN Oneliner model if it differs from the GFL model

Subject to Hawaiian Electric's approval, if the manufacturer can certify current standard library dynamic models accurately represent their equipment, standard library dynamic models may be provided and used in lieu of user defined dynamic models. As an example, if the generation facility is a traditional synchronous machine, of which the technology is standardized and widely understood across the industry, it can generally be accurately represented with current standard library dynamic models and thus a user defined dynamic model will not be required.

Along with the technical models, the following documents shall also be submitted for review:

9. User manual for all technical models, including a description of GFM functionality if GFM is used.
10. Generation facility one-line diagram
11. Generation unit manufacturer datasheet(s)
12. Generation unit reactive power capability curve(s)
13. Overlaid generation facility technical model output data for three-phase fault and single-phase fault. (Sample plots are shown in Appendix A)

[1] For specific PSCAD model requirements, refer to http://www.electranix.com/wp-content/uploads/2021/02/Requirements-Rev.-10-Feb-3-2021.pdf

2.2 Background Functional Description of GFM and GFL

Grid Following and Grid Forming are terms with some ambiguity in current industrial usage. For the purpose of this document, the following definitions are provided as high level functional descriptions. For more detailed descriptions of what is required for each of these control modes, it is recommended to carefully review descriptions of the functional tests which will be performed.

Grid Following (GFL) Mode:

Grid Following is defined as follows: An inverter-based resource that relies on fast synchronization with the external grid in order to tightly control the inverter's active and reactive current outputs. If these inverters are unable to remain synchronized effectively during grid events or under challenging network conditions, they are unable to maintain controlled, stable output. Advanced versions of these devices (Advanced Inverters) can provide grid supporting functions such as: voltage and frequency ride-through, volt-VAR, frequency-Watt, volt-watt, etc.; when they are able to remain synchronized.

Grid Forming (GFM) Mode:

Grid Forming is defined as follows: GFM controls set an internal voltage waveform reference such that an inverter with the GFM control shall be able to synchronize with the grid and regulate active and reactive power generation appropriately, regardless of the grid's strength, or operate independently of other generation. An inverter with GFM control shall immediately respond to grid disturbances to support stability of the grid and maintain its own control stability during the system disturbances.

2.3 General requirements for all technical models

All technical models need to represent the whole generation facility, not only a generation unit such as one inverter or as separate files representing pieces of the facility. At minimum, the following equipment shall be included in the single whole generation facility model:

1. Generation unit, such as inverter with DC side model, or a rotating machine with model of exciter and governor.
2. Step up transformer, with correct impedances and winding configuration
3. Collection system, aggregated per WECC guidance[2]
4. Main interconnection transformer, or GSU, with its tap changer if applicable, including correct impedances and winding configuration
5. Grounding transformer if used
6. VAR compensation device, such as cap bank or STATCOM, if applicable
7. Power plant controller (not for ASPEN model)
8. Documentation
9. Gen-tie line (as applicable)

[2] https://www.wecc.org/Reliability/WECCWindPlantPowerFlowModelingGuide.pdf

Equivalent or aggregated representations of the collection system, generator step-up transformers, and inverter systems are acceptable if it can accurately represent the generation facility and its response characteristics.

2.4 Requirements for generation facility PSCAD model

In addition to the general requirements mentioned above, the generation facility PSCAD model shall satisfy requirements as described in the latest version of the PSCAD Model Requirements document from Electranix Corporation (https://www.electranix.com/the-electranix-library/) and provided by Hawaiian Electric.

The control implementation (e.g., turbine controls, inverter controls, protection and measurement algorithms, and plant-level controller) in the generation facility PSCAD model shall implement the actual control code from the equipment. The PSCAD model shall provide output channel of voltage and frequency measured by the Facility and used for Facility's control and protection.

For the generation facility with grid-forming control, a document which describes the general mechanism and implementation of the grid-forming control is required.

2.5 Requirements for generation facility PSS/E power flow model

The generation facility PSS/E power flow model shall be provided for PSS/E versions 33, 34 and 35 . Besides the general requirements mentioned above, the following modeling data shall be provided in the model:

1. Conductor
    a. Impedance, both positive sequence and zero sequence
    b. Rating: Rating A – normal rating, and Rating B – emergency rating
2. Transformer
    a. Nominal voltages of windings
    b. Impedance data: specified R and X
    c. Tap ratios
    d. Min and Max tap position limits
    e. Number of tap positions
    f. Regulated bus
    g. Ratings: Rate A – normal rating; Rate B – emergency rating
    h. Winding configuration
3. Reactive power compensation, if applicable
    a. Fixed Shunts: G-Shunt (MW), B-Shunt (MVAr)
    b. Switched Shunts: Voltage limits (Vhi and Vlow), mode of operation (fixed, discrete, continuous), regulated bus, Binit (MVAr), steps and step size (MVAr)
4. Generation unit
    a. Pmax
    b. Pmin
    c. Qmax
    d. Qmin
    e. Name plate MVA

f. Transformer data: R Tran, X Tran, and Gentap.
g. Voltage control point

2.6 Requirements for generation facility user defined PSS/E dynamic model

The submitted user defined PSS/E dynamic model shall meet the following requirements:

1. The generation facility PSS/E dynamic model shall be provided for PSS/E versions 33, 34 and 35.
2. The project shall be modeled at full output per the project's Interconnection Request.
3. User defined dynamic models must accurately model all the relevant control modes and characteristics of the equipment, such as:
    a. All available voltage/reactive power control modes
    b. Frequency/governor response control modes
    c. Voltage and frequency ride-through characteristics
    d. Power plant controller or group supervisory functionality
    e. Appropriate aggregate modeling capability
    f. Charging mode if applicable (e.g., for a battery energy storage device)
4. Dynamic model source code (.flx, .for, .f90, .f, etc.), or dynamic linked library (.dll), and PSS/E dyr file shall be provided.
5. User defined dynamic model plant-specific settings shall comply with requirements listed in the Power Purchase Agreement, including ride-through thresholds and other specified control settings if applicable.
6. User defined dynamic models related to individual units shall be editable in the PSS/E graphic user interface. All model parameters (CONS, ICONS, and VARS) shall be accessible and shall match the description in the model's accompanying documentation.
7. User defined dynamic models shall have all their data reportable in the "DOCU" listing of dynamics model data, including the range of CONS, ICONS, and VARS numbers. Models that apply to multiple elements (e.g., park controllers) shall also be fully formatted and reportable in DOCU.
8. User defined dynamic models shall be capable of correctly initializing and run through the simulation throughout the range of expected steady state starting conditions without additional manual adjustments.
9. User defined dynamic models shall be capable of allowing all documented (in the model documentation) modes of operation without error.
10. User defined dynamic model shall be accompanied by the following documentation:
    a. A user's guide for each model
    b. Appropriate procedures and considerations for using the model in dynamic simulations
    c. Technical description of characteristics of the model
    d. Block diagram for the model, including overall modular structure and block diagrams of any sub-modules
    e. List of plant-specific settings, which may include:
        i. Ride-through thresholds and parameters
        ii. Plant-level voltage controller settings
        iii. Power ramp rate settings
        iv. ICON flag parameters for specific control modes

v. Deadbands
vi. Initial State of Charge (SOC)

f. Values, names and detailed explanation for all model parameters
g. List of all state variables, including expected ranges of values for each variable

2.7 Requirements for generation facility generic PSS/E dynamic model

The submitted generic PSS/E dynamic model should meet the following requirements:

1. All generic PSS/E dynamic models must be standard library models in PSS/E.
2. The generation facility PSS/E dynamic model shall be provided for PSS/E versions 33, 34 and 35.
3. The project shall be modeled at full output per the project's Interconnection Request.
4. Generic dynamic models must accurately model all the relevant control modes and characteristics of the equipment, such as:
    a. All available voltage/reactive power control modes
    b. Frequency/governor response control modes
    c. Voltage and frequency ride-through characteristics
    d. Power plant controller or group supervisory functionality
    e. Appropriate aggregate modeling capability
    f. Charging mode if applicable (e.g., for a battery energy storage device)
5. PSS/E dyr file shall be provided.
6. Generic dynamic models' plant-specific settings should comply with requirements listed in the Power Purchase Agreement, including ride-through thresholds and other specified control settings if applicable.
7. Generic dynamic models shall be capable of correctly initializing and run through the simulation throughout the range of expected steady state starting conditions without additional manual adjustments.
8. Generic dynamic models shall be accompanied by the following documentation:
    a. A user's guide for each model
    b. Appropriate procedures and considerations for using the model in dynamic simulations
    c. Technical description of characteristics of the model
    d. List of plant-specific settings, which may include:
        i. Ride-through thresholds and parameters
        ii. Plant-level voltage controller settings
        iii. Power ramp rate settings
        iv. ICON flag parameters for specific control modes
        v. Deadbands
        vi. Initial State of Charge (SOC)

2.8 Requirements for generation facility ASPEN model

Besides the general requirements, validation results of three-phase fault current from the generation unit represented in the generation facility ASPEN Oneliner model shall be provided.

3 GENERATION FACILITY TECHNICAL MODEL REVIEW PROCESS

To review the generation facility technical model, the following procedures are performed in the PSCAD and PSS/E environment. A review of the results will be documented and provided to the Customer for confirmation of model acceptance or further model updates.

3.1 Model review in PSCAD

1) Review model data against latest version of the PSCAD Model Requirements document from Electranix Corporation (https://www.electranix.com/the-electranix-library/) provided by Hawaiian Electric. In this step, it will be determined whether the model is complete, generation facility settings are according to the Power Purchase Agreement, and if the model can be compiled and run without any error. Checklists are provided in this document which are useful for both preparing a model submission, and for reviewing a model submission.
2) Initialization test:
   In this step, the generation facility PSCAD model will be determined whether the model initialization is acceptable. Hawaiian Electric requires that:
   1) The PSCAD model shall initialize as quickly as possible (e.g. <1-3 seconds) to user defined terminal conditions.
   2) Project PSCAD model shall initialize properly and that the same power flow and voltage conditions shall be observed between the PSCAD and PSS/E models after initialization.
3) Voltage and frequency ride-through tests:
   In this step, the generation facility PSCAD model ride-through performance will be reviewed by performing voltage and frequency ride-through simulations in PSCAD. The review will focus on the generation facility model dynamic response during and after ride-through and generation facility trip time.
4) Fault simulation tests:
   Two types of fault tested at the Point of Interconnection bus of the generation facility will be performed in this step.
   i) 3-phase to ground fault with 6-cycle clearing time (same as the PSS/E ring down model test described in the following section).
   ii) 1-phase to ground fault simulation with 6-cycle clearing time.

   In this test, fault current contribution from the generation facility observed in the simulation will be reviewed by comparing it against the generation facility technical document.

3.2 Model review in PSS/E

1) Model data review:

Review model data based on the requirements for PSS/E power flow and dynamic model provided by Hawaiian Electric. In this step, the review determines whether the model is complete, generation facility settings is according to the PPA, and model can be compiled and run without any error.

a. Steady State Model Data Review

Review the ratings and impedances of all equipment in the ASPEN Oneliner, PSS/E and PSCAD models and check for discrepancies.

Table 1. Steady State Model Data Review

Equipment	Comments
Gen-Tie Line	PSS/E, PSCAD and ASPEN models should match
Main Power Transformer Impedance	PSS/E, PSCAD and ASPEN models should match
Main Power Transformer Impedance	PSCAD and ASPEN models should match
PV Collector System Data	PSS/E, PSCAD and ASPEN models should match
BESS Collector System Data	PSS/E, PSCAD and ASPEN models should match
Inverter Pad Mount Transformer Impedance	PSS/E, PSCAD and ASPEN models should match
Inverter Pad Mount Transformer Configuration	PSCAD and ASPEN models should match
Inverter Power Flow Data	PSS/E and PSCAD models should match
Voltage Control Point	PSS/E and PSCAD models should match

b. Dynamic Data Review

Compare the various dynamic model parameters and note any discrepancies.

Table 2. Dynamic Model Data Review

Equipment	Comments
Power Plant Controller (PPC)	Review number of PPCs. Should represent actual setup of plant when in service.
Control Flags	PSS/E and PSCAD control flags should match.
Control Bus/Point of Measurement	Control buses should match in PSS/E and PSCAD models.
Frequency Control Dead Band	The frequency thresholds for primary and secondary control should match in the PSCAD and PSS/E models.
Initial State of Charge (SOC)	Make sure the initial state of charge is set up correctly to prevent initialization issues.
Voltage and Frequency Ride Through	The voltage and frequency ride through settings should match in the PSS/E user-written, PSS/E generic and PSCAD models.
P/Q priority data	The P/Q priority flags should match in the PSS/E user-written, PSS/E generic and PSCAD models

2) Flat start test:

PSS/E models shall initialize correctly and be capable of successful “flat start” testing using the 20 Second No-Fault simulation: This test consists of a 20 second simulation with no disturbance applied. Flat run in a two-machine system (one machine is a synchronous machine, e.g., GENCLS model, and the other machine is a project’s model.)

3) **Ring down test:**

PSS/E models shall initialize correctly and be capable of successful "ring down" testing using the 60 Second Disturbance Simulation: This test consists of the application of a 3-phase fault for 6 cycles at POI bus, followed by removal of the fault without any lines being tripped. The simulation is run for 60 seconds to allow the dynamics to settle.

4) **Voltage and frequency ride-through tests:**

In this step, the generation facility PSS/E model ride-through performance will be reviewed by performing voltage and frequency ride-through simulation in PSS/E. The review will focus on the generation facility model dynamic response during and after ride-through and generation facility trip time. **The procedures and values listed in this section are illustrative and serve as examples only; ride-through durations shall be tested against the minimum requirements outlined in the respective PPA.**

a. Voltage Ride-Through

- In these simulations, the POI voltage is varied to test the facility's ride-through capabilities and responses to POI voltage excursions. In the PSS/E simulations, two sets of tests are performed: one for testing the ride-through capabilities and the other for testing the responses to voltage excursions. These two sets of tests are similar, except that the grid equivalent representation is different. For the ride-through tests, the grid equivalent is represented by a generator with a very large MVA, which connects to the POI bus directly.
    - *As an example, for the voltage excursion response tests, the grid equivalent may be represented by a 200 MVA generator (actual MVA rating dependent on POI, please consult the Company for representative values) which connects to the POI through a branch with a reactance of 0.1 p.u.*
- In the PSCAD simulations, the focus is on testing the facility's reactive power responses to POI voltage excursions, and not on testing the voltage ride-through capability.

Table 3 shows the voltage excursions that will be simulated in the PSCAD tests.

Table 3. Voltage	**Duration (s)**
1.20	0.8
1.10	2.0
0.88	2.0
0.70	2.0

Each of the above discussed tests were performed for the following three generation dispatches:

i. PV output only: In this dispatch, the PV unit is at maximum output and the BESS unit is online at 0 MW.

ii. BESS output only: In this dispatch, the BESS unit is discharging at maximum output and the PV unit is online at 0 MW.

iii. PV charging BESS: In this dispatch, the PV unit is at its maximum output and is charging the BESS at its minimum level.

b. Frequency Ride-Through

- In these simulations, the system frequency is varied to test the facility's responses to grid's frequency excursions. In the PSS/E tests, high and low frequency excursions are simulated to mimic the frequency ride through thresholds specified in the PPA and the response of the facility is observed. Both the frequency ride-through capability of the facility and its active power response to frequency excursions are tested in the PSS/E simulations.
- In the PSCAD simulations, the focus is on testing the facility's active power responses to frequency excursions, and not on testing the frequency ride-through capability. Table 4 and Table 5 show example frequency excursions that are simulated in the PSCAD tests.

Table 4. Frequency Excursions for PSCAD High Frequency Response Test

Frequency Level (Hz)	Duration (s)
60.1	2.0
63.0	2.0

Table 5. Frequency Excursions for PSCAD Low Frequency Response Test

Frequency Level (Hz)	Duration (s)
59.9	2.0
56.0	2.0

5) Expected Model Performance

a. Matching steady-state model parameters between the PSS/E user-written, generic models and the PSCAD model.
b. Matching control options between the three types of models.
c. Matching voltage and frequency ride-though parameters between the three types of models. The settings should meet the ride-through requirements specified in the PPA.
d. Flat run results do not show any movement for any of the three models.
e. Ring-down simulation results show stable and proper responses, and the responses from the three models should show reasonable matches.
f. Ride-through simulation results should show stable and proper responses, and the responses should show reasonable matches. The ride through performance should meet the PPA requirements.

3.3 GFM Model review in PSCAD and PSS/E

The tests described below will be performed in addition to the GFL model tests described in section 3.1.

Test notes:

- Applicable for generation facilities which have grid-forming control capability
- Assumption is that BESS has available energy and is dispatched suitably for the tests
- Each test will be repeated with three initial operating conditions, as applicable (PV output only, BESS output only, PV charging BESS)
- The project should be configured to be in GFM mode throughout these tests

1) **Able to black start and operate in an electrical island (applicable if project is providing black start capability):**
   Test sequence: energize main power transformer from project side, then connect project to a load, then apply a bus fault at the POI, then remove the fault. Expected results: voltage and frequency should be stable and settle back to close to their nominal values after the disturbances.
2) **Loss of the last synchronous machine:**
   Test system will be a three-machine system including: a synchronous machine modeled by GENROU with a simple excitation system model (e.g., SCRX) and a simple governor model (e.g., TGOV1), a load with both real and reactive components, and duplicates of a project's model. Duplicates of a project's model are utilized here to check if the project is able to share real and reactive power properly with other generators. Test event: trip the synchronous generator. Expected results: voltage and frequency should be stable and settle back to close to their nominal values after the disturbance, within the tolerance of the droop and deadband settings.
3) **Weak grid operation:**
   Test system is the project plant model and an equivalent voltage source behind an impedance connected at the POI. The test will be to gradually decrease MVA of the equivalent voltage source within a range and check if the project's model is able to work with the studied MVA range.
4) **Able to operate in harmony with other converter resources and synchronous machines:**
   Test system is the three-machine system including: a synchronous machine modeled by GENROU with a simple excitation system model and a simple governor model, a load with both real and reactive components, and duplicates of a project's model. Simulation tests to be performed may include load step up/down, ringdown, voltage ride through and frequency ride-through tests. Expected results: voltage and frequency should be stable and settle back to close to their nominal values after the disturbances.
   Particularly related to frequency control characteristics, we will test for configurable frequency droop control and configurable deadband characteristics. The frequency deadband should be settable in the range from +/- 0.01 Hz to +/- 1.0 Hz and the frequency droop shall be settable in the range of 0.1% to 10% with a typical value of 4%. A sample characteristic of frequency droop control with deadband is shown in Figure 1.

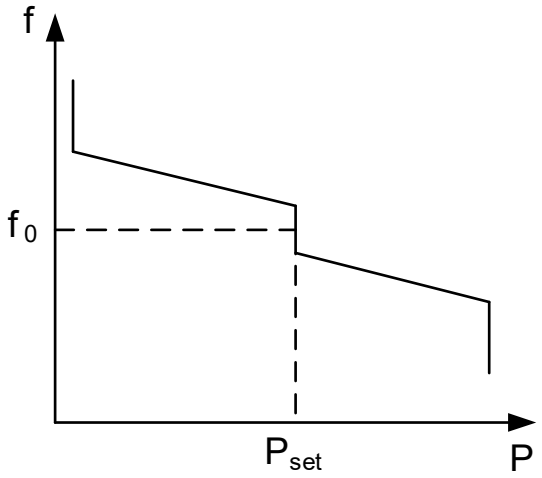


Figure 1 – Frequency Droop Control Characteristic with Deadband

5) **Switching from an electrical island to a grid-connected configuration while in GFM mode (dependent on specific project technology and controls)**
Test system is the two-machine system. Test sequence: energize main power transformer from project side, then connect project to a load (if project model does not have black-start capability, the plant will be initialized using a voltage source which will be switched out after initialization). At this point, the project will be operating in an island. Then switch in the synchronous generator. Expected results: voltage and frequency should be stable and settle back to close to their nominal values after the disturbances.

Tests to be performed for PSS/E models only

6) **Reduction in frequency deviation in GFM mode**
Test system will be a relevant HECO island system model. Test event is loss of a large generator. Project model will be in GFL mode and GFM mode. Result: less degree of frequency deviation is expected when project is in GFM mode than when the project is in GFL mode.

ASPEN Model Check

7) **A review of the ASPEN Oneliner generation models will be performed.**
As mentioned above, two models are expected for each project: one model for GFL mode, and the other for GFM mode. Documentation associated with the models should be provided. The model review will check if the components of a project are modeled properly, such as transformers, equivalent collector system, equivalent generator, etc., and that the model data are consistent to the PSS/E and PSCAD model data. A fault simulation test will also be performed in a two-machine system. Total current at the fault location and contribution from each machine will be reviewed and documented.

4 TYPICAL ISSUES IDENTIFIED FROM THE FACILITY MODEL SUBMITTALS DURING THE PAST RFP PROCESS

1. **Missing documentation**
   Only generation technical facility models are submitted, but no model user manual or any other documentation. Without model documentation, it is very difficult to know the correct procedures of using the technical models and identifying issues during the review.
2. **Model incompleteness**
   Often, the model of a single generation unit, such as an inverter, is submitted instead of model of the whole generation facility, which is insufficient. The model of the generation facility should include models for all equipment listed in the section of "General requirements for all technical models".
3. **Settings in the model**
   Type issues in this category are:
   - The PSCAD (GFL and/or GFM) and PSS/E model ride-through settings are not consistent with the minimum settings defined in the Power Purchase Agreement.
   - Generation MW is not set as defined.
   - Model is set for 50 Hz instead of 60 Hz
4. **Model function issues**
   Some models do not function as expected during different test scenarios. For example:
   - Fault current contribution from the generation facility is higher than what is described in the generation facility datasheet
   - Generation level is not stable with provided settings during the initialization test
   - Inadequately damped oscillations observed in the ringdown test
   - Ride-through performance does not reach minimum requirements defined in the Power Purchase Agreement
5. **Power Plant Controller (PPC)**
   Often, the PPC control had not yet been fully considered when models are submitted, which results in improperly configured PPC controls, or model submissions missing the PPC altogether. The PPC(s) included in the facility model should include coordination functionality between the plant components, and should represent the actual planned implementation.

REFERENCE

[1] New England Iso Planning procedure – Interconnection planning procedure for generation and elective transmission upgrades

[2] ERCOT Planning Guide, 2019

[3] PJM MOD-032 Steady State, Dynamics, and Short Circuit Modeling Data Requirements and Reporting Procedures Document

APPENDIX A: SAMPLE OVERLAID GENERATION FACILITY TECHNICAL MODEL OUTPUT PLOT FOR THREE-PHASE FAULT

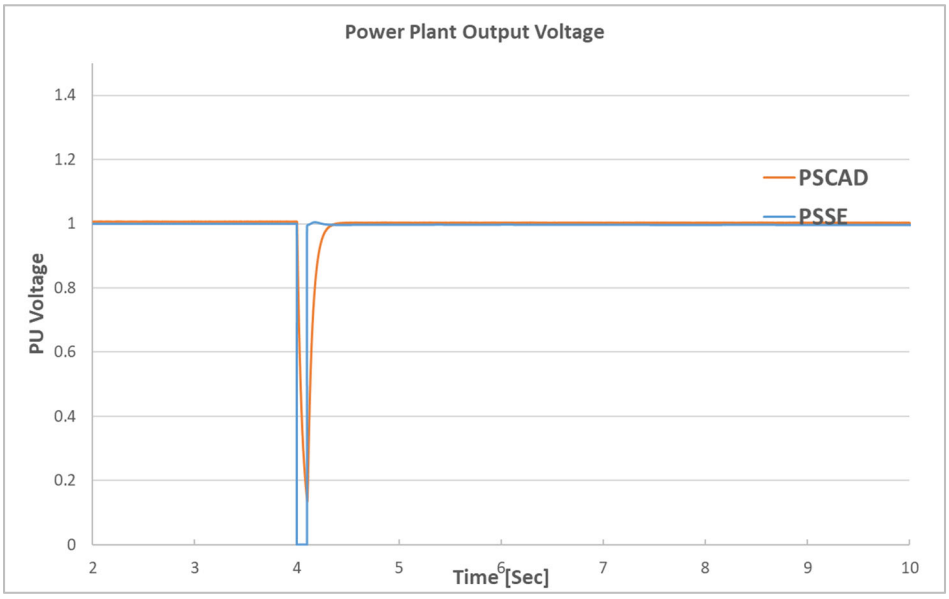


Figure 1: Overlaid plot for power plant voltage

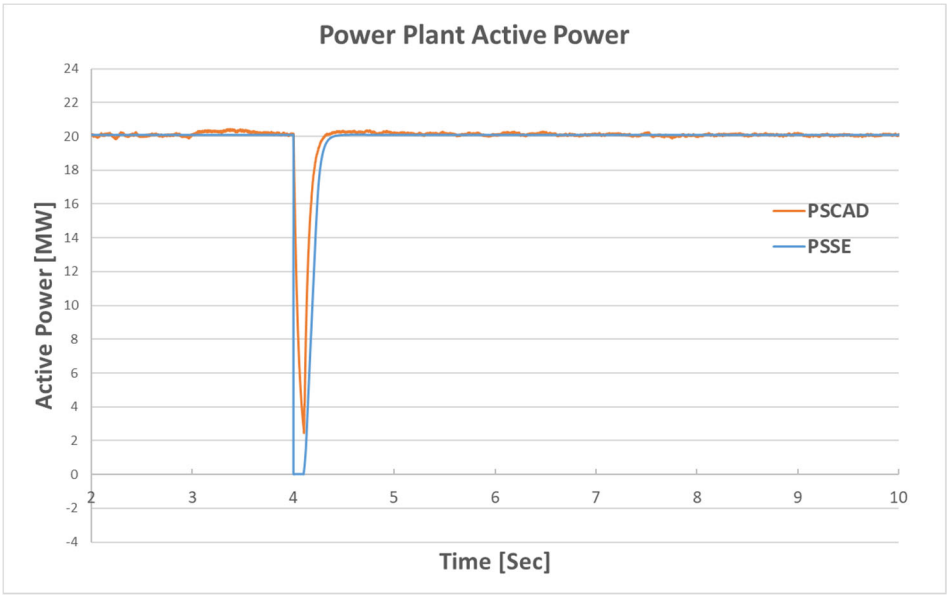


Figure 2: Overlaid plot for power plant active power generation

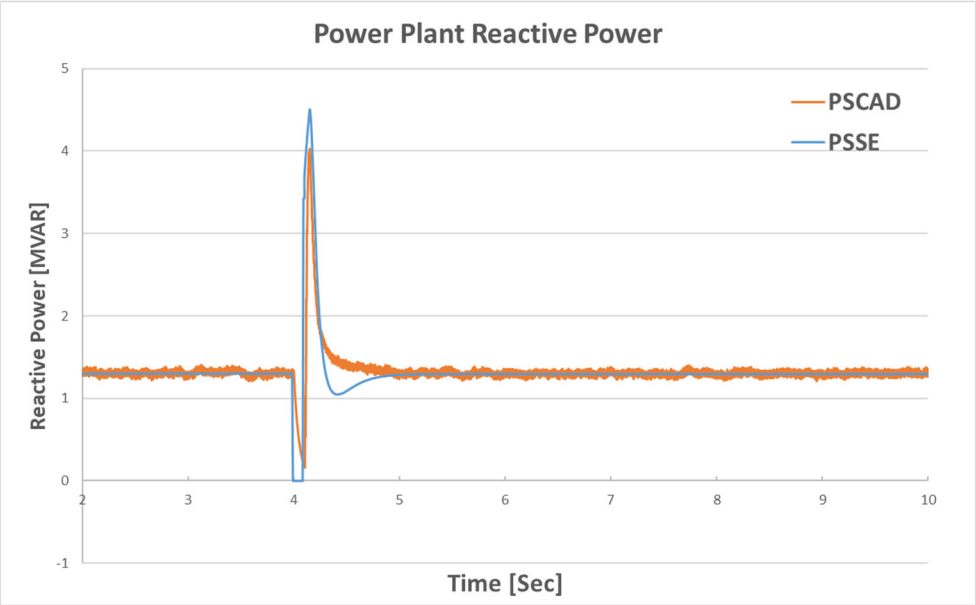


Figure 3: Overlaid plot for power plant reactive power generation

APPENDIX B: SAMPLE TEST SYSTEM TOPOLOGYINFORMATION

On weak grids such as island systems, it is important to test the models using a representative high Thevenin equivalent impedance.

A typical topology of testing circuit which represents Hawaiian Electric system for 46 kV project is shown in Figure 4. Sample 46 kV Thevenin equivalent impedance is available upon request for model testing.

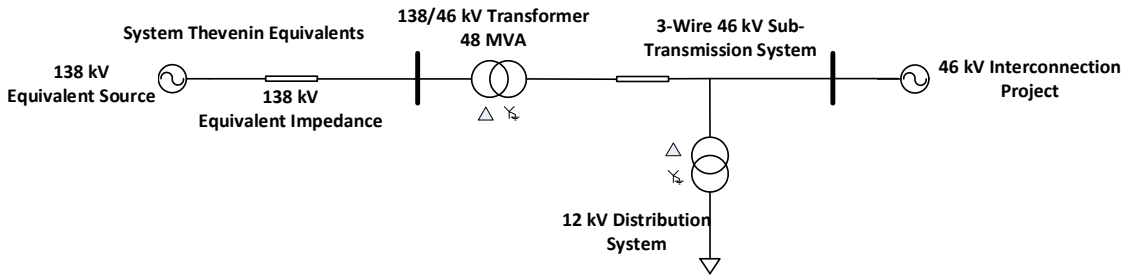


Figure 4: Testing circuit single line diagram for 46 kV project

A typical topology of testing circuit which represents Hawaiian Electric system for 138 kV project is shown in Figure 5. Sample 138 kV Thevenin equivalent impedance is available upon request for model testing.

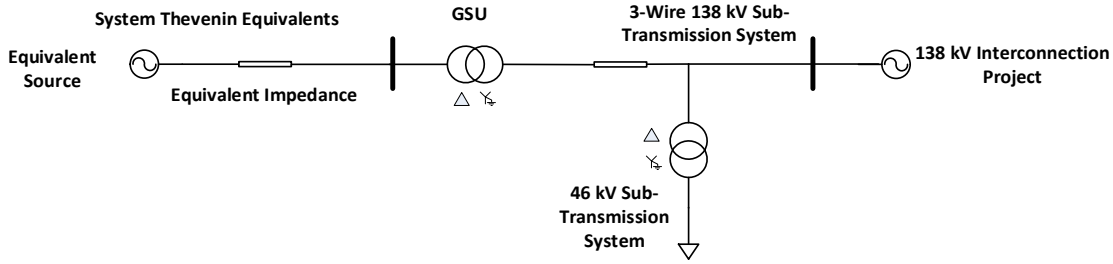


Figure 5: Testing circuit single line diagram for 138 kV project

North Kohala Model and Interconnection Requirements Study (IRS) Scope

<table>
<tr><td>Island</td><td>Hawai‘i</td></tr>
<tr><td>Size</td><td>Connecting to Hawi Substation
Single Project</td></tr>
<tr><td>Models</td><td>Grid Forming PSS®E User Defined, Grid Forming PSCAD, and Grid Forming ASPEN.

Note:
Grid Following PSS®E User Defined, Grid Following PSS®E Generic, Grid Following PSCAD, and Grid Following ASPEN may potentially be required if issues with Grid Forming performance are identified.</td></tr>
<tr><td>System Impact Study Scope</td><td>
<table>
<tr><th>Tasks
(Include selected tasks in the IRS. Exclude tasks that are unselected)</th></tr>
<tr><td>☒ Interconnection One-Line, Three-Line, and Equipment List</td></tr>
<tr><td>☒ Project Data Requirements and Facility Technical Model Review</td></tr>
<tr><td>☒ Review of Existing System Performance (Base-Case)</td></tr>
<tr><td>☒ Develop Project Model (IRS Case)</td></tr>
<tr><td>☒ Steady-State Power Flows
☒ Reverse Power Flow
☒ Reactive Power Requirements</td></tr>
<tr><td>☒ Protection Review</td></tr>
<tr><td>☒ Voltage Flicker</td></tr>
<tr><td>☒ Voltage Transients (In-Rush Current)</td></tr>
<tr><td>☒ System Stability
☒ PSSE Analyses
☒ PSCAD Analyses for Weak Grid Conditions
☒ Grid Forming Analyses</td></tr>
<tr><td>☒ Ride-Through Requirements</td></tr>
<tr><td>☒ Unintended Islands
☒ Transient Overvoltage (TrOV)
☒ Unintended Islands Fault Overvoltage (GFOV)</td></tr>
<tr><td>☐ Harmonics
☐ Harmonics Model Analysis
☐ Harmonics Monitoring Assessment</td></tr>
</table>
</td></tr>
<tr><td>Reference Single Line Diagram
(See Appendix H)</td><td>See Single Line Diagram for the site</td></tr>
</table>