(REVISED 5-17-2023)

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAI‘I

In The Matter of the Requests of	)	
	)	
HAWAIIAN ELECTRIC COMPANY, INC.,	)	DOCKET NO. 2017-0352
HAWAII ELECTRIC LIGHT COMPANY, INC.,	)	
AND MAUI ELECTRIC COMPANY, LIMITED	)	
	)	
To Instituting a Proceeding Relating to a	)	
Competitive Bidding Process to Acquire	)	
Dispatchable and Renewable Generation	)	
_____	)	

Hawaiian Electric Companies' Submission of the Final Maui Stage 3 Request for Proposal for Maui

Book 1 of 5 (Part 2 of 2)

Filed May 16, 2023

REQUEST FOR PROPOSALS

FOR

RENEWABLE DISPATCHABLE GENERATION

AND

ENERGY STORAGE

MAUI

MAY 19, 2023

Docket No. 2015-0389

Appendix F – Description of Company-Owned Site at Waena

Maui Electric

MAUI ELECTRIC
FIRM RENEWABLE DISPATCHABLE GENERATION RFP
DESCRIPTION OF AVAILABLE COMPANY-OWNED SITE AT WAENA

Company Owned Site – Waena Firm Site

Company-owned land at Waena, referred to as the New Central Maui Generation Site Subdivision (the "Waena Subdivision"), a portion of which is referred to herein as the "Waena Firm Site" and as the "Company-Owned Site" in the Firm PPA, is being offered to Proposers for their consideration to site a Firm Generation Facility.

The Waena Subdivision consists of 65.7 acres located along Pulehu and Upper Division Roads in central Maui (TMK 3-8-03:23 and 3-8-03:24). See Attachments 1 through 4[1] of this Appendix F. The site is zoned Heavy Industrial and is primarily vacant land except for the development of the Company's Waena Switchyard currently being constructed on approximately 1.8 acres of the Waena Subdivision. Approximately 3 acres is reserved for the Waena BESS project being developed by the Company (pending PUC approval – See Docket No. 2020-0132). The remainder of the parcel is available for Proposers to utilize for a proposed renewable firm generation facility sought in this RFP. The Company does not intend to issue a lease for the Waena Site. All rights for the use of the Waena Site will be granted through the Firm PPA (see Attachment CC of the Firm PPA). Such use rights will satisfy the Land Rights obligation in the Firm PPA for use of the Site for the Facility, provided, however, that Proposer would still be required to obtain any and all other Land Rights that may be necessary for the construction, operation and maintenance of the Facility. If selected, a Proposer shall only be permitted to use as much acreage as is necessary for its proposed 2roject. The Company only intends to select one project for the Waena site. Additional acreage shall not be available and the selected Proposer may only use the available land for its project and for no other uses. Proposers should not arbitrarily or unnecessarily expand the land needed for their proposed project to prevent the use of the land for other future uses. Because of County and State use restrictions imposed on the Waena Subdivision (described below) and the need to utilize the remainder of the Waena Subdivision in the most efficient manner possible, Company reserves the right to relocate the proposed site identified by the Proposer prior to the execution of the Firm PPA for use efficiencies, cost considerations, regulatory restrictions or other considerations in Company's sole discretion. Company will consult with the selected Proposer to minimize effects of any necessary relocation. For example, the Company does not want a Proposer to site a project in a manner that makes it difficult to utilize the rest of the Waena Subdivision such as siting a project in the middle of the Waena Subdivision or running a road through the middle of the Waena

[1] The Pole Yard and CMTD Yard in Attachment 4 are no longer occupied by the Company and such demarcated areas are also available for potential projects.

Subdivision that would make it difficult or impossible to site other future projects to comply with the County/State Conditions (defined below), such as the requirement that a minimum of approximately 33 acres be used for alternative energy projects. The selected Proposer shall be responsible, at its sole cost and expense, for all other site improvements, utilities, permits, and other required infrastructure and regulatory requirements necessary for use of the Waena Firm Site for Proposer's project (see Rule 19 Tariff).[2] Other than the Waena Switchyard and the Waena BESS project noted above, the Company currently does not have plans that identify land for specific future use at the Waena Subdivision. Additionally, the Company has not identified land on the Waena Subdivision that is unsuitable for a firm generation project. The Company will consult with the Independent Observer and Independent Engineer prior to initiating any relocation of a Proposer's proposed project site.

Any Proposer proposing to use a Waena Firm Site shall be required to agree to specific terms and conditions for such use as provided in Attachment CC (Company-Owned Site) to the Firm PPA (the "TCU"). Limited sections of the TCU, relating to use restrictions, security and infrastructure requirements, compliance with laws, lien restrictions, and end of term obligations, shall be non-negotiable. If necessary, an access easement or appropriate right of entry for access to the Waena Firm Site from Pulehu Road shall be provided.

The Waena Subdivision is subject to certain County Planning Department and State Land Use conditions and obligations[3] (the "County/State Conditions"). Some or all of the County/State Conditions may be applicable to the Proposer's facility and Proposers must review the County/State Conditions to determine the associated costs that may be required to comply with such conditions. Several of the conditions may be applicable only to a generation facility such as the Proposer's facility and a Proposer should expect to be responsible for all such costs to comply with such condition(s). By way of example only and not exhaustive, County obligations to monitor air and groundwater quality, provisions for non-potable water and wastewater disposal would be expected to be complied with by the Proposer only, including all costs associated thereto. Certain of the County/State Conditions, such as the landscape buffer required by the County, potential traffic mitigation improvements as may be required by the County and civil defense measures as may be required by the State and/or the County, may be shared on a pro rata or other equitable basis between Company, Proposer and other users of the Waena Subdivision.

Depending on the future uses of the Waena Subdivision, further subdivision of the Waena Subdivision may be necessary and if so, Proposer's TCU may be converted to a lease mutually

[2] The complete Maui Electric Rule 19 Tariff can be found at "https://www.hawaiianelectric.com/documents/billing_and_payment/rates/maui_electric_rules/19.pdf".

[3] See Unilateral Agreement and Declaration for Conditional Zoning dated June 16, 2000, recorded in the Bureau of Conveyances of the State of Hawaii as Document No. 2000-089696 (Appendix F Attachment 5), and Findings of Fact, Conclusions of Law, and Decision and Order, filed on June 22, 1998, in Docket No. A97-722, by the Land Use Commission of the State of Hawaii, as reflected in the Document Listing Conditions to Reclassification of Land dated July 23, 1998 and recorded in said Bureau as Document No. 98-112111 (Appendix F Attachment 6).

agreeable to the parties. Proposer shall be required to pay for its pro rata share of all expenses to subdivide the Waena Subdivision, if such subdivision affects the Waena Firm Site.

The Company will not charge any base rent for the use of the Waena Site. However, Proposer shall be required to pay all ongoing pro rata operating and maintenance and other charges for other infrastructure projects applicable to the Waena Subdivision, such as jointly used access roads, if any, stormwater and other drainage improvements, if necessary, and any other improvements and/or services that may be provided and reserved in the TCU, including but not limited to necessary insurance, security and other joint costs associated with the Waena Subdivision.

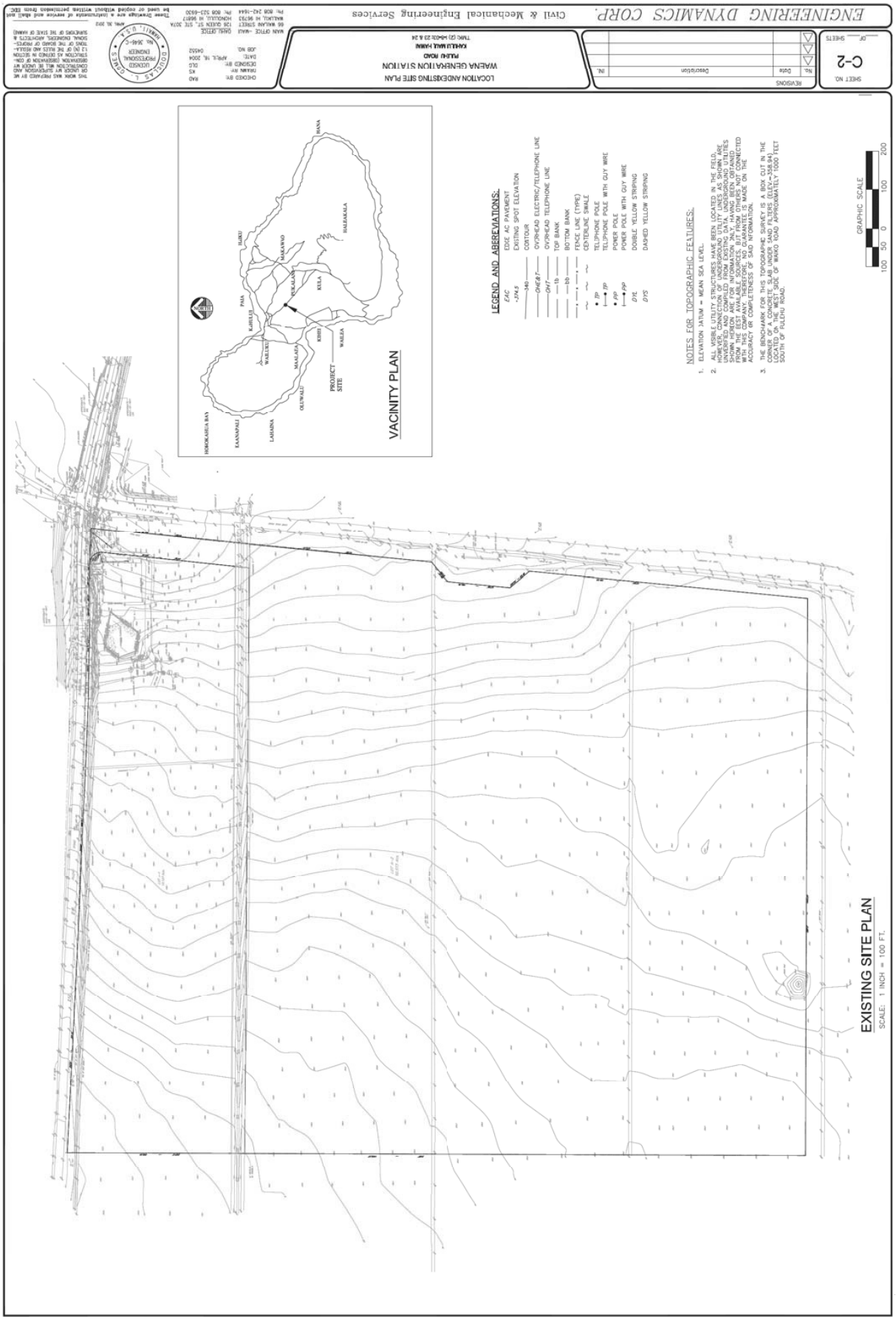
Other upfront costs to the Proposer associated with the Waena Firm Site include the following: (1) baseline assessments of the Waena Firm Site, either a Phase 1 or Phase 2 environmental assessment and/or archaeological study; and (2) applicable physical and data security requirements as may be required by the Company.

The specified costs above are not exhaustive, and the Proposer is encouraged to review the TCU and the required County and State conditions to determine all associated use costs. Proposers should perform their own evaluation and account for all possible costs and should not rely solely on the identified costs noted above. Proposer also shall be responsible, at its sole cost and expense, for all site improvements, utilities, permits, and other required infrastructure and regulatory requirements that are necessary for use of the Waena Firm Site for Proposer's Project.

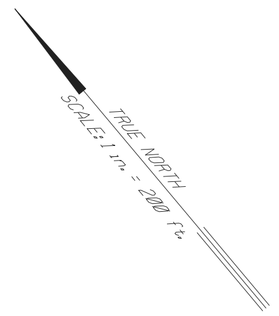
The Company is willing to share certain environmental, geotechnical and drainage reports concerning the Waena Subdivision with interested Proposers. These reports may not cover the exact area of the Waena Subdivision that is dedicated for a Waena Firm Site. Requests for copies of these reports must be sent to the RFP email address noted in RFP Section 1.6, and the reports will be made available to Proposers only after execution of a Non-Disclosure Agreement. Any drawings, environmental reports, geotechnical reports, drainage reports, or any other information or data relating to the Waena Subdivision ("Site Information") are being furnished for the Proposer's convenience only and the Company assumes no responsibility whatsoever in respect to the sufficiency or accuracy of such Waena Subdivision Information or of the interpretation thereof, and there is no guaranty, either expressed or implied, that the conditions indicated are representative of those existing throughout the Waena Subdivision. In addition, no assurance is given that conditions found at the time of any surface or subsurface explorations will be the conditions that prevail at the time of construction at the Waena Firm Site. The Proposer shall be solely responsible for all assumptions, deductions, or conclusions the Proposer may make or derive from the information furnished. Making such information available to the Proposer is not to be construed in any way as a waiver of the Proposer's responsibility to examine the Request for Proposals and a Waena Firm Site. Proposer must satisfy itself through its own investigation as to conditions to be encountered at the Waena Firm Site. Proposers are

not obligated to use the Site Information in the preparation of their Proposal, but are responsible for obtaining all necessary final investigations, design recommendations, and surveys (or similar) as applicable and required for the construction of their Project.

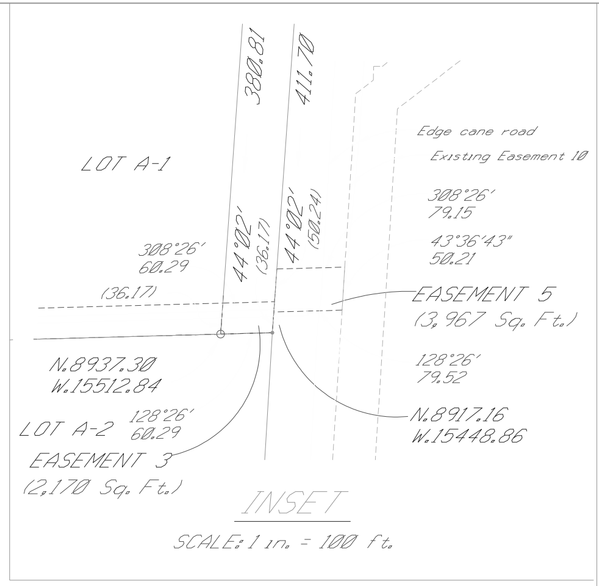
APPENDIX F
ATTACHMENT

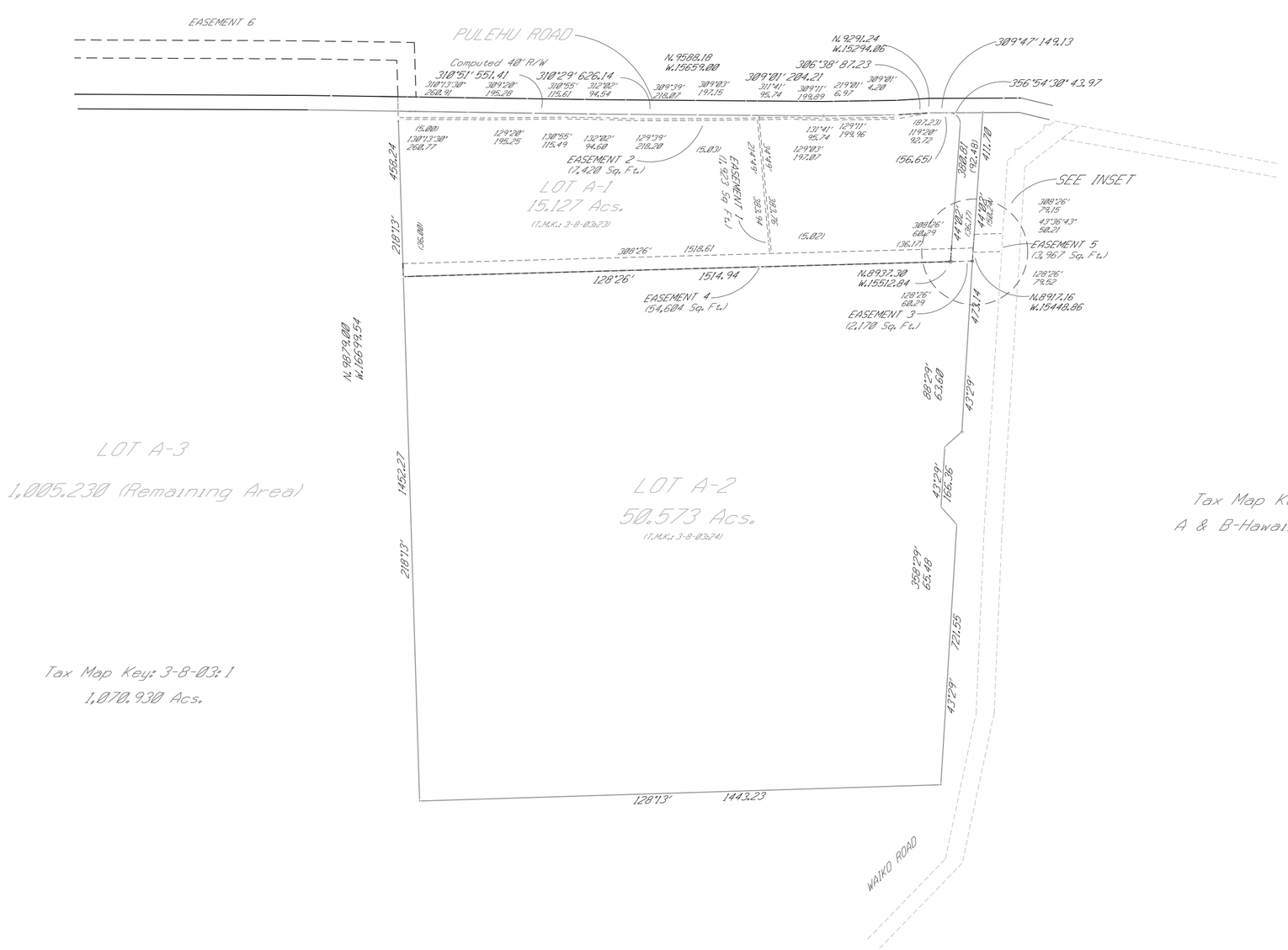


APPENDIX F
ATTACHMENT 2



Tax Map Key: 3-8-03: 4
A & B-Hawaii, Inc. - Owner





NOTES:
1. Azimuths and coordinates referred to Government Survey Triangulation Station "PUU O KOHA".
2. Origin of actual field survey from Government Survey Triangulation Station "FILTRATION".
3. Owners of adjoining parcels taken from Tax Map Records.
4. Boundary corners marked with ½ inch pipe unless noted otherwise.
5. Easements 1 and 2 are for waterline purposes in favor of Hawaiian Commercial and Sugar Company.
6. Easements 3 and 4 are for access and waterline purposes in favor of Hawaiian Commercial and Sugar Company.
7. Right-of-Way for Pulehu Road based on field location of existing centerline pavement and to be used only for this survey.
8. Easement 5 is for electrical transmission line purposes in favor of Maui Electric Company, Limited.

Tax Map Key: (2) 3-8-03: 1, 23 & 24

NEW CENTRAL MAUI GENERATION SITE SUBDIVISION

SUBDIVISION OF PARCEL 1 OF TAX MAP KEY: (2) 3-8-03
INTO LOTS A-1, A-2, AND A-3 AND DESIGNATION OF
EASEMENTS 1 TO 5, INCLUSIVE

Being a portion of Grant 3343 to Claus Spreckels

WAILUKU, MAUI, HAWAII

OWNER: A & B-Hawaii, Inc.

SCALE: 1 in. = 200 ft.

DATE: March 26, 1996
REVISED: August 6, 1996
REVISED: September 11, 1996

Prepared for: Maui Electric Company, Limited

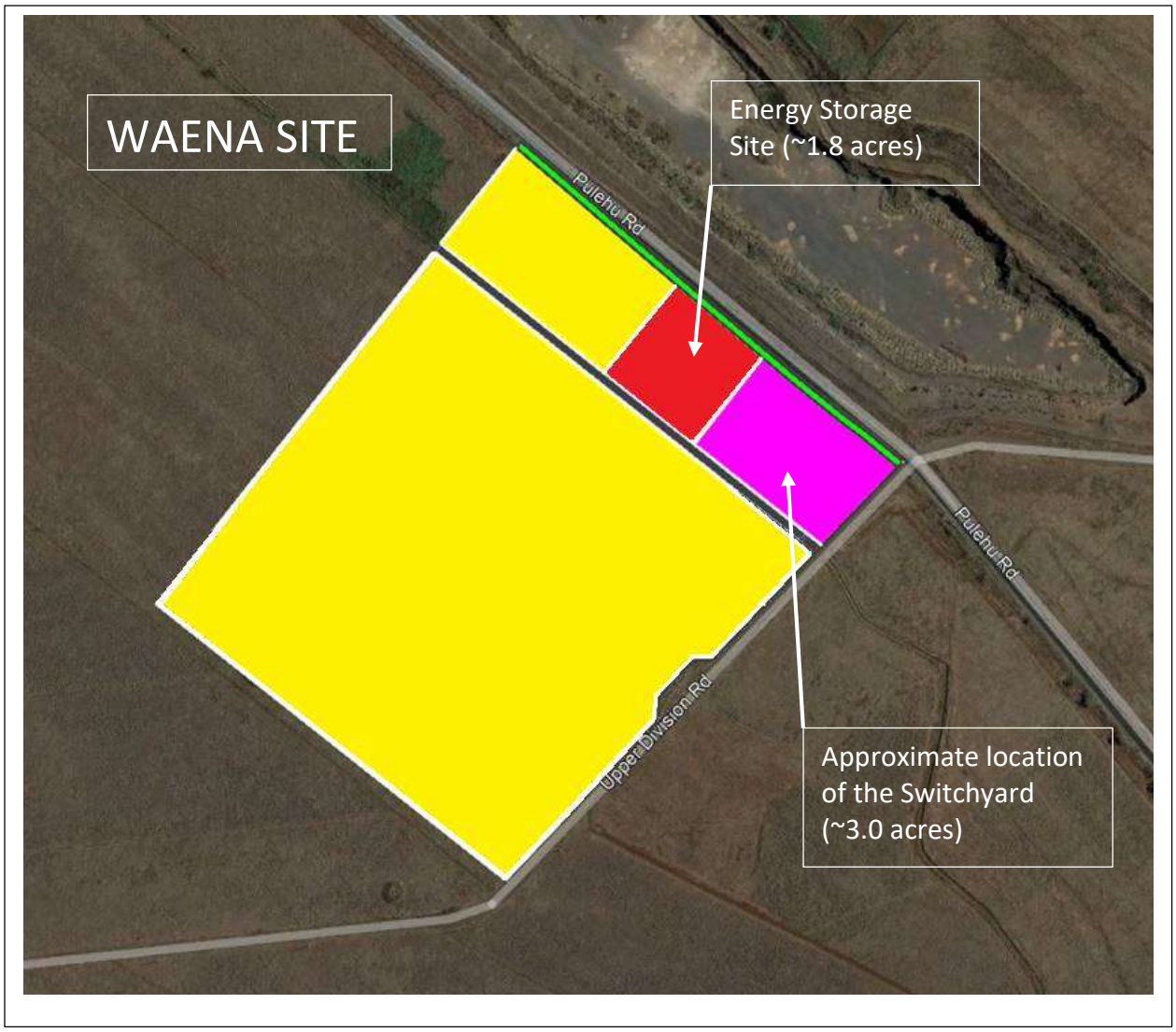
Prepared by: A & B Properties, Inc.
Kahului, Hawaii

This work was prepared by me or under my supervision.

Registered Professional Land Surveyor No. LS-7633

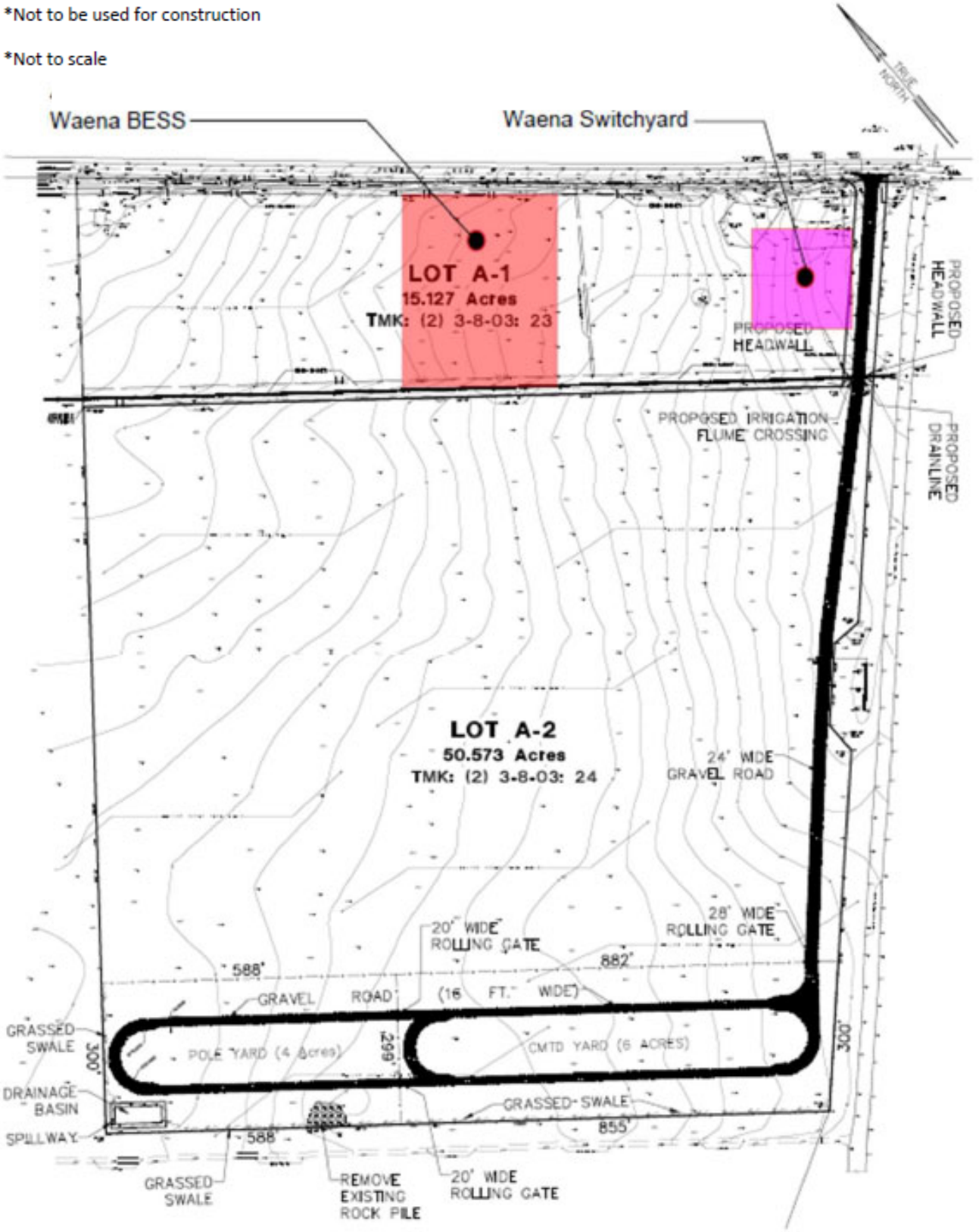
APPENDIX F
ATTACHMENT 3

Appendix F – Attachment 3



*Not to be used for construction

*Not to scale



SITE PLAN

Jul-05-00 01:17pm From-CARLSMITH BALL MAUI T-359 P.02/18 F-813

Filed

WAENA 1
GEUPP 1

THE ORIGINAL OF THIS DOCUMENT WAS RECORDED IN THE BUREAU OF CONVEYANCES STATE OF HAWAII

BUREAU OF CONVEYANCES
DATE JUN 29 2000 TIME 8:00
DOCUMENT NO. 2000-089696

LAND COURT SYSTEM | REGULAR SYSTEM

Return by Mail [X] Pickup [ ] To:
Office of the County Clerk
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

TITLE OF DOCUMENT:

UNILATERAL AGREEMENT AND DECLARATION FOR CONDITIONAL ZONING

PARTIES TO DOCUMENT:

Declarant: MAUI ELECTRIC COMPANY, LIMITED
P. O. Box 398
Kahului, Maui, Hawaii 96732

County of Maui: County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Affects Tax Map Key: (2) 3-8-03:23 and 24 (This document consists of 15 pages.)

UNILATERAL AGREEMENT AND DECLARATION FOR CONDITIONAL ZONING

THIS INDENTURE, made this 16th day of June, 2000, by MAUI ELECTRIC COMPANY, LIMITED, a Hawaii corporation, whose principal place of business is located in Kahului, Maui, Hawaii, and whose mailing address is P. O. Box 398, Kahului, Maui, Hawaii 96732, hereinafter referred to as "DECLARANT", and who is the owner of those certain parcels of land located at Wailuku and Makawao District, Island and County of Maui, State of Hawaii, comprised of approximately 65.7 acres, and identified for real property tax purposes by Tax Map Key Nos. (2) 3-8-03:23 and 24, hereinafter referred to jointly as "PARCELS", or individually as "Parcel",

WITNESSETH:

WHEREAS, the Council of the County of Maui, State of Hawaii, hereinafter referred to as "Council", is considering the establishment of zoning for the Parcels, comprised of approximately 65.7 acres, which are more particularly described in Exhibit "1", attached hereto and made a part hereof, and more particularly identified in Land Zoning Map No. L-209, which is on file in the Office of the County Clerk of the County of Maui; and

WHEREAS, the Council recommends through its Land Use Committee, Committee Report No. 00-99, that said establishment of zoning be approved for passage on first reading subject to certain conditions pursuant to Section 19.510.050, Maui County Code; and

WHEREAS, the Declarant has agreed to execute this instrument pursuant to the conditional zoning provisions of Section 19.510.050, Maui County Code;

NOW, THEREFORE, the Declarant makes the following Declaration:

1. That this Declaration is made pursuant to the provisions of Section 19.510.050, Maui County Code relating to conditional zoning;

2. That until written release by the County of Maui, hereinafter referred to as the "County", the Parcels, and all parts thereof, are and shall be held subject to covenants, conditions and restrictions which shall be effective as to and shall run with the land as to the Parcels, from and after the recording of this Declaration with the Bureau of Conveyances or the Land Court of the State of Hawaii, without the execution, delivery or recordation of any further deed, instrument, document, agreement, declaration, covenant or the like with respect thereto by the Declarant, the County, or any heir, devisee, executor, administrator, personal

representative, successor, and assign; that the acquisition of any right, title or interest in or with respect to the Parcels by any person or persons, entity or entities, whomsoever, shall be deemed to constitute the acceptance of all of the covenants, conditions and restrictions of this Declaration by such person or persons, entity or entities; and that upon any transfer of any right, title or interest in or with respect to the Parcels the same shall be subject to, and the transferee shall assume and be bound and obligated to observe and perform all of the covenants, conditions and restrictions of this Declaration;

3. That this Declaration and all of the covenants, conditions and restrictions contained herein shall continue to be effective as to and run with the land in perpetuity, or until the Declarant notifies the appropriate County Department that any said covenants, conditions and restrictions are satisfied by the Declarant, and the appropriate County Department verifies the satisfaction and provides a written release of the covenant, condition or restriction;

4. That the term "Declarant" and any pronoun in reference thereto, wherever used herein, shall be construed to mean the singular or the plural, the masculine or the feminine, or the neuter, and vice versa, and shall include any corporation, and shall be held to mean and include the "Declarant", the Declarant's heirs, devisees, executors, administrators, personal representatives, successors, and assigns;

5. That the Declaration shall become fully effective on the effective date of the zoning ordinance approving the establishment of M-2 Heavy Industrial District Zoning and this Declaration shall be recorded in the Bureau of Conveyances or Land Court of the State of Hawaii;

6. That the Declarant agrees to develop said Parcels in conformance with the conditions set forth in Exhibit "2", which is attached hereto and made a part hereof and which shall be made a part of the zoning ordinance;

7. That the conditions imposed are reasonable and rationally relate to the objective of preserving the public health, safety and general welfare and such conditions fulfill the need for the public service demands created by the proposed use.

AND IT IS EXPRESSLY UNDERSTOOD AND AGREED that until released in writing by the County, the conditions imposed in this Declaration shall run with the land identified hereinabove and shall bind and constitute notice to all subsequent lessees, grantees, assignees, mortgagees, lienors and any other persons who claim an interest in said land, and the County of Maui shall have the right to enforce this Declaration by appropriate action at law or suit in equity against all such persons, provided that the Declarant or its successors and assigns may at any time file a petition for the removal of the conditions and terminate this Unilateral Agreement, such petition to be processed in the same manner as petitions for change in zoning.

IN WITNESS WHEREOF, the undersigned has executed this Declaration the day and year first above written.

DECLARANT:

MAUI ELECTRIC COMPANY, LIMITED

By _____
Type/Stamp
Name: William A. Bonnet
Its PRESIDENT

APPROVED AS TO FORM AND LEGALITY:

_____

Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 16th day of June, 2000, before me appeared WILLIAM A. BONNET, to me personally known/proved to me on the basis of satisfactory evidence, who, being by me duly sworn, did say that he is the President of MAUI ELECTRIC COMPANY, LIMITED, a Hawaii corporation, and that such person executed the foregoing instrument as the free act and deed of such person, and if applicable in the capacity shown, having been duly authorized to execute such instrument in such capacity.

Mary E. Ah Sam
Type/Stamp Name: MARY E. AH SAM

Notary Public, State of Hawaii

My commission expires: 4-24-2003

DESCRIPTION

LOT A-1
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION

All of that certain parcel of land, being a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a 1/2-inch pipe at the southwesterly corner of this lot, said pipe being also the northerly corner of Lot A-2 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,879.00 feet North and 16,699.54 feet West and running by azimuths measured clockwise from True South:

1.	218° 13'	458.24	feet along Lot A-3 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
2.	310° 51'	551.41	feet along the southwesterly side of Pulehu Road to a pipe;
3.	310° 29'	626.14	feet along same to a pipe;
4.	309° 01'	204.21	feet along same to a pipe;
5.	306° 38'	87.23	feet along same to a pipe;
6.	309° 47'	56.65	feet along same to a pipe;

7. Thence along Lot A-2 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels on a curve to the right with a radius of 30.00 feet, the chord azimuth and distance being:
356° 54' 30" 43.97 feet to a pipe;

EXHIBIT "1"

8.	44° 02'	380.81	feet along same to a pipe;
9.	128° 26'	1,514.94	feet along same to the point of beginning and containing an Area of 15.127 Acres.

SUBJECT, HOWEVER to the following easements:

A) EASEMENT 1

Being an easement for waterline purposes over, under and across a portion of Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a point at the northeasterly corner of this easement, on the southwesterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,588.18 feet North and 15,659.00 feet West and running by azimuths measured clockwise from True South:

1.	34° 49'	383.76	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	128° 26'	5.02	feet over and across same to a point;
3.	214° 49'	383.94	feet over and across same to a point;
4.	310° 29'	5.03	feet along the southwesterly side of Pulehu Road to the point of beginning and containing an Area of 1,923 Square Feet.

B) EASEMENT 2

Being an easement for waterline purposes over, under and across Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a pipe at the southeasterly corner of this easement, on the southwesterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,291.24 feet North and 15,294.06 feet West and running by azimuths measured clockwise from True South:

1:	119°	20'	92.72	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	129°	11'	199.96	feet over and across same to a point;
3.	131°	41'	95.74	feet over and across same to a point;
4.	129°	03'	197.07	feet over and across same to a point;
5.	129°	39'	218.20	feet over and across same to a point;
6.	132°	02'	94.60	feet over and across same to a point;
7.	130°	55'	115.49	feet over and across same to a point;
8.	129°	20'	195.25	feet over and across same to a point;
9.	130°	13' 30"	260.77	feet over and across same to a point;
10.	218°	13'	5.00	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
11.	310°	13' 30"	260.91	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
12.	309°	20'	195.28	feet over and across same to a point;

13.	310° 55'	115.61	feet over and across same to a point;
14.	312° 02'	94.54	feet over and across same to a point;
15.	309° 39'	218.07	feet over and across same to a point;
16.	309° 03'	197.15	feet over and across same to a point;
17.	311° 41'	95.74	feet over and across same to a point;
18.	309° 11'	199.89	feet over and across same to a point;
19.	219° 01'	6.97	feet over and across same to a point;
20.	309° 01'	4.20	feet along the southwesterly side of Pulehu Road to a pipe;
21.	306° 38'	87.23	feet along same to the point of beginning and containing an Area of 7,420 Square Feet.

C) EASEMENT 4

Being an easement for access and waterline purposes over, under and across Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a pipe at the southeasterly corner of this easement, said pipe being also the southeasterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,937.30 feet North and 15,512.84 feet West and running by azimuths measured clockwise from True South:

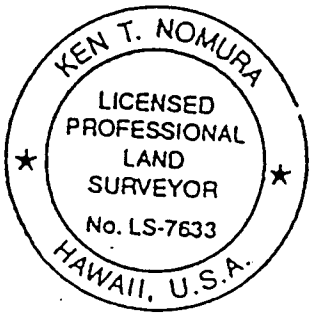
1.	128° 26'	1,514.94	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to a pipe;

2.	218° 13'	36.00	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
3.	308° 26'	1,518.61	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
4.	44° 02"	36.17	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to the point of beginning and containing an Area of 54,604 Square Feet.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

September 11, 1996

This work was prepared by me or under my supervision.



Registered Professional Land Surveyor No. LS-7633

ME
43/6-t

DESCRIPTION

LOT A-2
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION

All of that certain parcel of land, being a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a 1/2-inch pipe at the northerly corner of this lot, said pipe being also the southwesterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,879.00 feet North and 16,699.54 feet West and running by azimuths measured clockwise from True South:

1.	308° 26'	1,514.94	feet along Lot A-1 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
2.	224° 02'	380.81	feet along same to a pipe;
3.	Thence along same on a curve to the left with a radius of 30.00 feet, the chord azimuth and distance being: 176° 54' 30"	43.97	feet to a pipe;
4.	309° 47'	92.48	feet along the southwesterly side of Pulehu Road to a pipe;
5.	44° 02'	411.70	feet along Lot A-3 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
6.	43° 29'	473.14	feet along same to a pipe;
7.	88° 29'	63.60	feet along same to a pipe;

8.	43° 29'	166.36	feet along same to a pipe;
9.	358° 29'	65.48	feet along same to a pipe;
10.	43° 29'	721.55	feet along same to a pipe;
11.	128° 13'	1,443.23	feet along same to a pipe;
12.	218° 13'	1,452.27	feet along same to the point of beginning and containing an Area of 50.573 Acres.

SUBJECT, HOWEVER to Easement 3 for access and waterline purposes over, under and across a Portion of Lot A-2 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

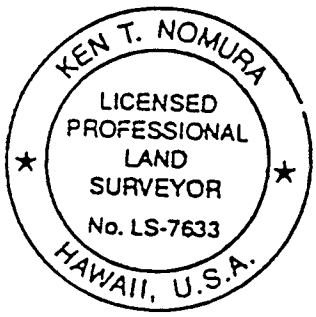
Beginning at a pipe at the northwesterly corner of this easement, said pipe being also the southeasterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,937.30 feet North and 15,512.84 feet West and running by azimuths measured clockwise from True South:

1.	224° 02'	36.17	feet along Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	308° 26'	60.29	feet over and across Lot A-2 of the New Central Maui Generation Site Subdivision to a point;
3.	44° 02'	36.17	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
4,	128° 26'	60.29	feet over and across Lot A-2 of the New Central Maui Generation Site Subdivision to the point of beginning and containing an Area of 2,170 Square Feet.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

August 6, 1996

This work was prepared by me or under my supervision.



Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/6-u

DESCRIPTION

EASEMENT 5
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
Affecting Lot A-3
(TMK: (2)3-8-03:Por. 1)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

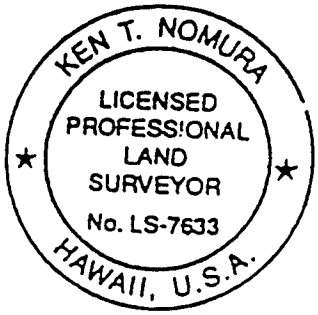
Beginning at a point at the northwesterly corner of this easement, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,917.16 feet North and 15,448.86 feet West and running by azimuths measured clockwise from True South:

1.	224° 02'	50.24	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to a point;
2.	308° 26'	79.15	feet over and across Grant 3343 to Claus Spreckels to a point;
3.	43° 36' 43"	50.21	feet over and across same to a point;
4.	128° 26'	79.52	feet over and across same to the point of beginning and containing an Area of 3,967 Square Feet.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

September 11, 1996

This work was prepared by me or under my supervision.



Registered Professional Land Surveyor No. LS-7633

ME
43/6-x

EXHIBIT "2"

Conditions

Pursuant to Section 19.510.050 of the Maui County Code, the zoning established for the Parcels described herein shall be subject to the following conditions:

1. That the use of the property shall be limited to power generation, transmission, distribution and ancillary facilities, and alternative energy facilities.

2. That a 15-foot wide strip along the north boundary of Lot A-1 (Tax Map Key: 3-8-003:023) shall be retained as a landscape buffer area to visually screen the power generating station and that no structures shall be constructed within this area except for the proposed leach fields, access driveways, transmission corridors and signage. The final landscape planting and irrigation plans shall be submitted to the Maui Planning Department ("Department") for review and approval.

3. That the final color scheme of the power generating station shall be similar to the existing Maalaea facility color scheme and shall be reviewed and approved by the Department in order to reduce the visual impact of the facility.

4. That as the first component of each of the ensuing dual train phases of the power generating station is submitted for building permit approval, Maui Electric Company, Limited (MECo) shall update its Traffic Impact Analysis of project-related impacts. MECo shall participate in the funding and construction of project-related traffic mitigation measures that are deemed necessary by the Department of Public Works and Waste Management and the State Department of Transportation.

5. That as the first component of each of the ensuing three dual train phases of the power generating station is developed, MECo shall consult with the State Department of Health (DOH) and, if necessary, MECo shall participate in a groundwater quality monitoring program, in consultation with the County Department of Water Supply and approved by DOH, to monitor groundwater quality impacts directly attributable to the operations of the Waena Power Generating Station.

6. That MECo shall annually update the Maui Planning Department, Maui Planning Commission, Maui County Council and Mayor of its status in developing the power-generating needs of the Island of Maui, including but not limited to, the Waena Power Generating Station, Maalaea Power Plant, and Kahului Power Plant. Further, MECo shall provide an update of the feasibility of alternative energy sources besides the use of fossil fuels and its ongoing conservation measures by submitting copies of the Integrated Resource Plan, following its acceptance by the Public Utilities Commission.

7. That MECo shall implement to the extent possible appropriate lighting recommendations of the "International Dark Sky Association" at the Waena Power Generating Station.

8. That MECo shall incorporate into its 24-hour Trouble Call hotline a plan to address complaints from the public regarding emission control.

9. That MECo shall incorporate Best Management Practices (BMPs) for ammonia, sludge and other potentially hazardous materials/wastes to be used or produced at the Waena Power Generating Station site.

10. That MECo shall use no more than 32.5 acres for conventional fossil fuel burning energy production and ancillary facilities. The remaining 33.2 acres shall be used for alternative energy (i.e., research, demonstration and/or production projects) and ancillary facilities.

11. That MECo shall limit its conventional fossil fuel burning energy production on said 32.5 acres to no more than 66 megawatts of net electrical output. Any increase in said conventional energy production or number of acres used for said conventional energy production shall require an amendment of the zoning conditions pursuant to Maui County Code Section 19.510.050.

12. That MECo must notify the Council as soon as practicable of any public agency meetings where the operations of the Waena Power Generating Station are under review, including but not limited to the Public Utilities Commission, the Department of Health and the Department of Land and Natural Resources.

5024077.5.015787-5

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI'I

In the Matter of the Petition of MAUI ELECTRIC COMPANY, LIMITED, a Hawai'i corporation To Amend the Agricultural Land Use District Boundary into the Urban Land Use District for Approximately 65.7 Acres of Land at Wailuku and Makawao Districts, Island of Maui, State of Hawai'i, Tax Map Key No. 3-8-03: 23 and 24	DOCKET NO. A97-722 FINDINGS OF FACT, CONCLUSIONS OF LAW, AND DECISION AND ORDER

FINDINGS OF FACT,
CONCLUSIONS OF LAW, AND DECISION AND ORDER

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FINDINGS OF FACT,
CONCLUSIONS OF LAW, AND DECISION AND ORDER

Maui Electric Company, Limited, a Hawai'i corporation ("Petitioner"), filed a Petition for Land Use District Boundary Amendment on October 24, 1997, pursuant to chapter 205, Hawai'i Revised Statutes ("HRS"), and chapter 15-15, Hawai'i Administrative Rules ("HAR"), to amend the State land use district boundary by reclassifying approximately 65.7 acres of land situated in the Wailuku and Makawao Districts, island of Maui, State of Hawai'i, Tax Map Key No. 3-8-03: 23 and 24 ("Property"), from the State Land Use Agricultural District to the State Land Use Urban District to permit the construction of the Waena Generating Station.

The Land Use Commission ("Commission"), having heard and examined the testimony and evidence presented during the hearing; the Proposed Findings of Fact, Conclusions of Law, and Decision and Order of Petitioner, the Office of Planning ("OP"),

and Maui Tomorrow ("Intervenor"); and the responses filed by Petitioner, the County of Maui Planning Department ("Planning Department"), and Intervenor, hereby makes the following findings of fact, conclusions of law, and decision and order:

FINDINGS OF FACT

PROCEDURAL MATTERS

1. On October 24, 1997, Petitioner filed a Petition for Land Use District Boundary Amendment ("Petition").

2. Petitioner Maui Electric Company, Limited, is a Hawai'i corporation whose business and mailing address is P.O. Box 398, Kahului, Maui, Hawai'i, 96733-6898.

3. By letter dated November 3, 1997, the Executive Officer of the Commission ("Executive Officer") deemed the Petition defective pursuant to section 15-15-50(f), HAR.

4. By letter dated November 18, 1997, the Executive Officer deemed the Petition a proper filing as of November 7, 1997, upon review of the additional information submitted by Petitioner.

5. On December 4, 1997, the County of Maui filed the Position of the Maui Planning Department in support of the Petition.

6. On December 8, 1997, OP filed a Statement of Position of the Office of Planning in Support of the Petition.

7. On December 22, 1997, Mr. Mark Sheehan, President, Maui Tomorrow, filed an application for leave to intervene ("Petition for Intervention").

8. On January 22, 1998, and by a written Order dated March 3, 1998, the Commission granted Maui Tomorrow's Petition for Intervention, provided that the scope of its intervention be limited to (i) air quality impacts of the proposed project; (ii) alternative sources, fuels, and processes; (iii) the cumulative impact of industrialization of the central valley area of Maui; and (iv) visual/aesthetic impacts of the proposed project from the surrounding roads.

9. On February 3, 1998, the Commission held a prehearing conference on the Petition which was attended by all parties.

10. On February 4, 1998, the Commission issued a Prehearing Order pursuant to section 15-15-57, HAR, which set forth the dates by which the parties were to file amended exhibit lists, exhibits, witness lists, memoranda, or other documentary information with the Commission.

11. On February 20, 1998, the Planning Department filed Objections of the Maui Planning Department to Intervenor Maui Tomorrow's Witness and Exhibit List.

12. On February 20, 1998, the parties filed a stipulation regarding Petitioner's witnesses. That stipulation set forth that all the witnesses for Petitioner listed on its witness list were accepted as expert witnesses and were deemed qualified to provide expert opinions in their respective fields.

13. On February 20, 1998, the parties filed a stipulation regarding non-contested issues. That stipulation set forth that Intervenor Maui Tomorrow did not contest the testimony

of Petitioner's following expert witnesses, and that the testimony of such experts could be submitted in written testimony/reports that would be accepted into evidence: Glen Lau on geotechnical resources, natural hazards, geology, and soils; Amy Dunn on archaeological and cultural resources; Dr. Evangeline Funk on biological resources; and J. Michael Silva on electric and magnetic field analysis. Each of the foregoing individuals was later made available by Petitioner for examination at the hearings before the Commission.

14. On February 24, 1998, Petitioner filed a Statement of Objections and Joinder in the Objections of the Maui Planning Department to Intervenor Maui Tomorrow's Witness and Exhibit List Dated February 18, 1998.

15. On February 26 and 27, 1998, the Commission conducted a hearing on the Petition pursuant to public notices published on December 5, 1997, in the Maui News and the Honolulu Star-Bulletin.

16. At the February 26, 1998, hearing, the following individuals provided written public testimonies, which were admitted into evidence: G. Stephen Holaday; Harry H.K. Kameenui; Clyde Murashige; Terryl Vencl; Michael H. Lyons, II, and Robert T. Johnson; Lynne Woods; Warren Watanabe and Kenneth Okamura; and Richard Heede. The Commission also admitted into evidence as LUC Exhibit No. 1 a memorandum dated December 10, 1997, from Rae M. Loui, Deputy Director, Commission on Water Resource Management ("CWRM"), to Richard Egged, Jr., Director, OP.

17. At the February 26, 1998, hearing, the following individuals appeared and testified as public witnesses and submitted written testimonies: Jeffrey Parker, Lucienne de Naie, and Daniel Grantham. In addition, the following individuals appeared and testified as public witnesses: Madelyn D'Enbeau, Diana Dahl, Glen Shepherd, David Patton, Tom Ulick, Scott Crawford, Marc Drehsen, and Constance Palmore.

18. On February 26, 1998, the Commission took a field trip to the Property in the afternoon.

19. On March 25, 1998, Petitioner filed a Motion to: (1) Preclude Intervenor Maui Tomorrow From Submitting Exhibits or Presenting Witnesses Not Identified by the Deadlines Established in the Commission's Prehearing Order (Filed February 4, 1998); (2) Limit the Testimony of Intervenor Maui Tomorrow's Expert Witnesses to the Subject Matter and Material Disclosed Pursuant to the Commission's Prehearing Order; and 3) Restrict Intervenor Maui Tomorrow From Engaging in Repetitious and Duplicative Cross-Examination ("Motion"). On April 23, 1998, the Commission denied Petitioner's Motion.

20. The Commission continued the hearing on the Petition on April 8 and 9, and 23 and 24, 1998. The hearing on the Petition was completed on April 24, 1998.

21. At the April 8, 1998, hearing, the Commission admitted into evidence as LUC Exhibit No. 2 a memorandum from Don Hibbard, Administrator, Department of Land and Natural Resources, State Historic Preservation Division ("DLNR-SHPD"), to Esther Ueda, Executive Officer, Commission, dated February 9, 1998. At

the April 9, 1998, hearing, the Commission admitted into evidence a letter from Rory Frampton, dated April 3, 1998.

22. On April 20, 1998, Petitioner filed Applicant's Motion in Limine #1: To Preclude Admission of Maui Tomorrow's Exhibits 4 & 5 ("Motion in Limine #1"). On April 23, 1998, the Commission denied Petitioner's Motion in Limine #1.

23. On April 20, 1998, Petitioner filed Applicant's Motion in Limine #2: To Preclude Testimony of Roy Smith and Erik Frye as Experts in Air Quality and Air Impacts ("Motion in Limine #2"). Petitioner orally moved to withdraw its Motion in Limine #2 on April 24, 1998, at which time the Commission granted Petitioner's oral motion.

24. On April 20, 1998, Petitioner filed Applicant's Motion in Limine #3: To Preclude Testimony of Steven Moser as an Expert in Air Quality and Air Impacts ("Motion in Limine #3"). On April 23, 1998, the Commission granted Petitioner's Motion in Limine #3.

25. On April 20, 1998, Petitioner filed Applicant's Motion in Limine #4: To Preclude Testimony of James Williamson as an Expert ("Motion in Limine #4"). Petitioner orally moved to withdraw its Motion in Limine #4 on April 24, 1998, at which time the Commission granted Petitioner's oral motion.

26. On April 20, 1998, Petitioner filed Applicant's Motion in Limine #5: To Preclude Testimony of Dick Mayer and Ian Chan-Hodges as Experts ("Motion in Limine #5"). Petitioner orally moved to withdraw its Motion in Limine #5 on April 24,

1998, at which time the Commission granted Petitioner's oral motion.

27. On April 23, 1998, Petitioner filed Applicant's Motion in Limine to Preclude Admission of Maui Tomorrow's Exhibits 2, 3 & 12 ("Motion in Limine"). On April 23, 1998, the Commission denied Petitioner's Motion in Limine.

28. At the April 23, 1998, hearing, the Commission admitted into evidence letters from Julie Higa, dated March 4, 1998; Mike Trotto, dated April 15, 1998; Tom C. Leuteneker, dated April 15, 1998; Michael J. Singlehurst, dated April 16, 1998; Fernando Ribao, Jr., dated April 16, 1998; and Tom Reed, dated April 20, 1998.

29. On April 24, 1998, Petitioner requested the Commission to strike any and all references to Mr. Paull and Mr. Schroeder's positions with the University of Hawai'i contained in the record, including Petitioner's witness lists. On April 24, 1998, the Commission granted Petitioner's request.

30. On May 1, 1998, the Commission filed:

- An Order Granting Request To Strike Any and All References To Mr. Paull and Mr. Schroeder's Positions with the University of Hawai'i Contained in the Record, Including MECO's Witness Lists;

- An Order Denying Maui Electric Company, Limited's Motion To:

    1) Preclude Intervenor Maui Tomorrow From Submitting Exhibits or Presenting Witnesses Not Identified by the Deadlines Established

in the Commission's Prehearing Order (Filed February 4, 1998);

2) Limit the Testimony of Intervenor Maui Tomorrow's Expert Witnesses to the Subject Matter and Material Disclosed Pursuant to the Commission's Prehearing Order; and

3) Restrict Intervenor Maui Tomorrow From Engaging in Repetitious and Duplicative Cross-Examination.

- An Order Denying Applicant's Motion in Limine to Preclude Admission of Maui Tomorrow's Exhibits 2, 3 & 12;
- An Order Denying Applicant's Motion in Limine #1: To Preclude Admission of Maui Tomorrow's Exhibits 4 & 5;
- An Order Granting Oral Motion to Withdraw Applicant's Motion in Limine #2: To Preclude Testimony of Roy Smith and Erik Frye as Experts in Air Quality and Air Impacts;
- An Order Granting Applicant's Motion in Limine #3: To Preclude Testimony of Steven Moser as an Expert in Air Quality and Air Impacts;
- An Order Granting Oral Motion to Withdraw Applicant's Motion in Limine #4: To Preclude Testimony of James Williamson as an Expert; and
- An Order Granting Oral Motion to Withdraw Applicant's Motion in Limine #5: To Preclude Testimony of Dick Mayer and Ian Chan-Hodges as Experts.

DESCRIPTION OF THE PROPERTY

31. The Property encompasses lands owned in fee by Petitioner, a subsidiary of Hawaiian Electric Company ("HECO"), which in turn is a wholly owned subsidiary of Hawaiian Electric Industries ("HEI"), a holding company with publicly traded stock. Petitioner is regulated by the Public Utilities Commission ("PUC").

32. The Property is situated in the Wailuku and Makawao Districts, north of Waiko Road at its intersection with Pulehu Road, approximately one quarter mile above the Central Maui Sanitary Landfill and the Ameron HC&D Quarry on the island of Maui, State of Hawai'i.

33. The Property is identified by Tax Map Key No. 3-8-03:23 and 24, consisting of 65.7 acres, inclusive of all existing easements identified as Easements 1-11.

34. The Property encompasses two adjacent parcels totaling approximately 65.7 acres. Parcel 23 is the smaller of the two parcels with a total acreage of 15.127 acres. Parcel 24 encompasses approximately 50.573 acres.

35. The Property has 11 easements. Hawaiian Commercial & Sugar Company ("HC&S") holds 4 easements, identified as easements 1-4, within the Property for the maintenance and use of its irrigation ditch. Petitioner holds easements 5-11 for transmission line use.

36. The Property is currently leased to HC&S for sugarcane cultivation. The Property has been in sugarcane cultivation for the past 2 years.

37. According to the letter of agreement, Petitioner agreed to lease the Property to HC&S on a month-to-month basis at no rent for sugarcane cultivation until the Property is required for development by Petitioner for utility purposes or until December 31, 2004, whichever comes first, or if cultivation of crops on the premises is no longer permissible by law. HC&S must use the Property solely for crop cultivation and ancillary agricultural activities.

38. Lands immediately surrounding the site are owned by Alexander & Baldwin-Hawaii and are used for sugarcane cultivation.

39. Elevations on the Property range from approximately 335 feet above mean sea level ("MSL") on the western side nearer Pu'unene to approximately 365 feet above MSL on the eastern side near the intersection of Waiko and Pulehu Roads. The Property has a gently sloping topography, with an average slope from the southeast to northwest across the site of about one degree.

40. Surface water in the area is comprised of reservoirs, irrigation ditches, and intermittent natural streams within Kalialinui Gulch and Pulehu Gulch. Surface water runoff generated from the Property and adjacent areas is generally through a series of gulches extending from the upper slopes of Haleakala towards the central isthmus area. The Property is drained by Kalialinui Gulch, located a quarter mile to the north, and by Pulehu Gulch, located a mile to the south of the Property. The proposed Waena Generating Station will be located

approximately 1,000 feet from Kalialinui Gulch and 5,000 feet from Pulehu Gulch.

41. The mountainous topography of both East Maui (Haleakala) and West Maui tend to channel prevailing winds through the central valley area. The sloping terrain from the shoreline to the higher elevation at the Property also tends to escalate the wind speeds.

42. The Property is underlain by a thin cover of topsoil lying on top of andesitic lava flows of the Kula Volcanic Series, which in turn overlie the main shield-building, predominantly tholeiitic lavas of the Honomanu Volcanic Series. These series erupted from Haleakala Volcano.

43. Subsurface conditions along the preferred and alternative line corridors are anticipated to generally consist of clays and clayey silts underlain by hard andesitic bedrock. The corridor along most of Pulehu Road extends across the youngest lava a'a flows in the study area and hard bedrock is anticipated to be present within about 3 feet below the existing ground surface. The remainder of the corridors cross over soils consisting of alluvium derived from surrounding a'a flows and weathered volcanic ash. Hard bedrock is anticipated to be present at depths greater than 5 to 6 feet below the existing ground surface.

44. The Property is located in a dry area, with the median rainfall amounting to only 17 to 20 inches a year. Rainfall in the Central Maui isthmus is evenly distributed, averaging approximately 28 inches a year over an area of

approximately 200 square miles. The dry and windy conditions allow only a small percentage of rainfall to percolate deep enough below the ground surface to become groundwater recharge.

45. The U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, identifies the soils within the Property as belonging to the Waiakoa Series, silty clay loam occurring on 3 to 7 percent slopes. Waiakoa Series, silty clay loam is composed of generally stony soil, grading to hard bedrock within a depth of approximately 5 feet. Lava flows over the Property are a'a. Due to the undulating nature of the surface a'a flows, the depth of a'a bedrock will vary across the site and can range from 25 to 35 feet thick and consist of clinker zones above and below a massive, highly to moderately fractured a'a core. Runoff potential of this type of soil is slow to medium and the erosion hazard is slight to medium.

46. Surface soils along the preferred and alternate transmission line corridors have been classified as the Molokai Series (M), Paia Series (Pc), Waiakoa Series (W), Ewa Series (E), Iao Series (I), Alae Series (A), Pulehu Series (Ps), and Rockland (R). The Molokai and Paia soils evolved from weathered a'a lavas and volcanic ash. At the ground surface, they consist of silty clay loam, grading to saprolite then to soft, highly weathered rock at a depth of approximately six feet. The Ewa, Iao, Alae, and Pulehu Series consist of alluvial soils derived from the weathered a'a flows. The soils reach depths of greater than 5 feet, and range from loams to clays with varying amounts of

sands, stones, and cobbles. The Alae soils also contain weathered volcanic ash.

47. The University of Hawai'i Land Study Bureau's Detailed Land Classification rates the productivity rating of soils. Productivity ratings range from "A" lands which are very productive to "E" lands which are considered unproductive for cultivated agriculture. The Land Study Bureau Detailed Land Classification (productivity rating) for the Property is "A." A rating of "A" means that the condition of the soil is very good for agricultural operations.

48. The Property contains land classified as Prime Agricultural Land according to the Agricultural Lands of Importance to the State of Hawaii map.

49. According to the Flood Insurance Rate Map, the Property has been classified as Zone C, indicating areas that experience minimal flooding, and not considered to be in a flood plain area.

PROPOSAL FOR RECLASSIFICATION

50. The proposed reclassification will allow Petitioner to construct a new power generating facility in Central Maui which will: maintain an adequate system margin-of-reserve generating capacity; increase overall system reliability; replace older generation facilities scheduled for retirement; and provide additional capacity to meet projected demand for electric service. Petitioner proposes to develop the 232-megawatt ("MW") electrical generating station in four 58-MW phases.

51. At full buildout, the major components required to operate a 232-MW electrical generating station will include:

- Four diesel oil-fired 58-MW dual-train, combined-cycle ("DTCC") units, exhausted to four two-flue 150-foot-tall stacks
- Four steam turbines ("STs")
- Four steam condensers
- Four control houses
- A control room, including control equipment, offices, file room, kitchen, restrooms, showers, lockers, and meeting room.
- Fire protection system
- Supply wells
- Water treatment facility
- Injection wells
- Water and air laboratory
- Maintenance shop
- Warehouse and storage areas
- Relay building
- Switch yard
- Fuel storage tanks
- Fuel storage tank berms
- Fuel unloading area
- Administration building
- Leach field
- Related 69-kilovolt ("kV") transmission line corridors

- Possible 12-kV distribution line corridors
- Possible gasoline storage area
- Possible transmission and distribution warehouse offices
- Possible transmission and distribution storage and parking area

52. In each of the station's four 58-MW phases, a DTCC unit would be added to the station. Each DTCC unit would consist of two 20-MW combustion turbine ("CT") generators fitted with two heat recovery steam generators ("HRSGs") and one 18-MW ST generator.

53. The first of two 20-MW CT generators is planned to be installed at the Waena Generating Station in calendar year 2004.

54. The second CT unit will be installed in 2005. The HRSGs and an 18-MW ST generator will be added to the station in calendar year 2006 to complete the Phase I installation of the first of three DTCC units. The three remaining DTCC units to be installed, each comprised of similar CT, HRSG, and ST modules, are planned to be added to the station in the calendar years 2010 (Phase II) and 2016 (Phase III), and beyond 2020 (Phase IV).

55. The existing Ma'alaea-Kealahou and Kanaha-Pukalani 69-kV transmission lines will be reconfigured through the proposed Waena Switchyard. As demand for more power increases, two new 69-kV transmission lines from the Property will be constructed to connect with the Pu'unene and Pa'ia Sugar Mill substations to support any growth in demand for additional

electricity. Pending demand requirements, two proposed 12-kV distribution lines from the Property to the Pu'unene area may also be added to these corridors.

56. In Petitioner's Application and Certificate of Service submitted to the PUC in February 1996, Petitioner requested approval to commit funds in excess of $500,000 to purchase the Property for the construction of the proposed Waena Generating Station.

57. In its Decision and Order No. 14674, the PUC approved Petitioner's request to commit funds for the acquisition of the Property and related easements and determined that said acquisition was reasonable and in the public interest.

58. Petitioner purchased the site in November 1996, at a cost of $1,847,648. The estimated cost for construction of the initial Phase I is approximately $105,370,000. Construction cost for the entire Waena Generation Station is estimated at approximately $417,559,668. Petitioner has estimated that the cost to rate payers will be an additional 1.76 cents per kilowatt-hour in 1997 dollars for the first DTCC unit.

59. The following table describes development timetable and costs for the project.

Project Cost and Schedule
(1997 Dollars)

Project Component	Acreage	Cost	Construction Start	Operation Date
Land Costs	65.7	$1,847,648	n/a	1997
DTCC 1/ Site Development	65.7	$105,370,000	2002	2006
DTCC 2	0	$96,857,000	2005	2010
Transmission Lines	n/a	$10,419,000	2003	2004-2020
Transmission & Distribution Facility	0	$5,900,000	2014	2016
DTCC 3	0	$100,318,000	2009	2016
DTCC 4	0	$96,848,000	2013	2020
Total Project Cost		**$417,559,668**		

60. The costs for the project do not include the costs for obtaining the diesel fuel, trucking the diesel fuel, and operating the Waena Generating Station.

PETITIONER'S FINANCIAL CAPABILITY TO UNDERTAKE THE PROPOSED DEVELOPMENT

61. As a subsidiary of HECO which itself is a subsidiary of HEI, a publicly traded company, Petitioner has access to sufficient economic resources required to develop the project. Petitioner is also able to issue bonds and stock to finance the project.

62. Petitioner's net income for the month of August 1997 was $1,525,414, with an accumulated year to date net income of $9,213,872. Petitioner's accumulated net income for the 12 months from August 1996 to August 1997 was $15,016,036.

63. Petitioner must request authority from the PUC to make expenditures for construction of the proposed generating station and recapture costs through the electricity rate paid by Petitioner's customers.

64. The proposed Waena Generating Station project will be funded through Petitioner's customer base and will not require expenditures by either the State of Hawai'i or the County of Maui.

STATE AND COUNTY PLANS AND PROGRAMS

65. The Property is designated within the State Land Use Agricultural District, as reflected on the Commission's official map, M-7 (Pa'ia).

66. The Property is currently designated as "Interim" under Maui County's Zoning Code. Use of the Property for the proposed generating station project will require a change in the current County zoning classification from "Interim" to "Heavy Industrial." On November 20, 1997, Petitioner filed an application with the Planning Department for a change in zoning.

67. The Wailuku-Kahului Community Plan designation for the Property is "Agricultural." The proposal to construct and operate a generating facility will require a change in the existing Community Plan designation to "Heavy Industrial." On November 20, 1997, Petitioner filed an application with the Planning Department for a Community Plan Amendment.

68. Petitioner prepared and submitted a Final Environmental Impact Statement ("FEIS") for the proposed project

as a requirement for the Community Plan Amendment for the County of Maui.

69. The project's FEIS was accepted by the Planning Department on November 24, 1997.

70. Although the Planning Department recommended approval of Petitioner's Community Plan Amendment and Change in Zoning request, the Planning Commission on March 10, 1998, voted to make no recommendation to the Maui County Council.

71. The County Planning Commission raised the following nine concerns that they wanted the County Council to consider.

- Address greater demand-side management and make efforts to cut demand through conservation.
- Re-review growth demand estimates and projections.
- Address rate control as an incentive to diversify from dependency on fossil fuels.
- Close the Ma'alaea and Kahului generating plants.
- Adhere to lighting standards by "night skies."
- Commit to renewable fuel technology or other alternatives by a certain time frame.
- Establish emission control monitoring so public has 24-hour access to inform authorities, especially Department of Health ("DOH").
- Further investigate Best Management Practices of Ammonia, sludge, and other potentially hazardous materials and wastes.

- Get involved in a county-wide energy symposium in order to get feedback from the public on energy resources.

72. The Property is not located within the County of Maui Special Management Area.

NEED FOR THE PROPOSED DEVELOPMENT

Petitioner's Existing Service Area

73. Petitioner provides nearly all the electrical service to the residents and businesses of the County of Maui. The islands of Maui, Moloka'i, and Lana'i each have their own generation and transmission systems.

74. On the island of Maui, Petitioner serves over 91,000 residents with approximately 43,940 metered accounts. Maui County is the fastest growing County in the State.

75. From 1970 to 1980, Maui's population grew by 62.4 percent and increased by 45.4 percent during the period from 1980 to 1990.

Petitioner's Existing Generating Resources

76. Petitioner operates and maintains a diverse variety of generating units of various capacities from 2.2 MW to 28 MW on Maui. These include ST generators, diesel engine generators, and CT generators.

77. Petitioner presently owns and operates 22 generating units on Maui: 4 at Kahului and 18 at Ma'alaea.

Transmission and Distribution Resources

78. As power is generated on Maui, transformers boost the voltage to either 23 kV or 69 kV. The power is then

transmitted through the 23-kV and 69-kV transmissions grids. When the power reaches the substations, the voltage is reduced from 69 kV and 23 kV to Petitioner's 12-kV and 4-kV. The power proceeds from the substations along streets and roads through overhead, or where necessary, underground distribution feeders, to small step-down distribution transformers. These transformers are located on poles or pads near the facilities they serve and are sized for the particular load and voltage required by the customer. The 69-kV system consists of approximately 96 miles of overhead lines, and the 23-kV system consists of approximately 137 circuit miles of overhead lines.

79. The proposed Waena Generating Station is required as a facility to: maintain an adequate system margin-of-reserve generating capacity; provide a system that meets the projected electrical demand; increase system reliability; replace older generation facilities scheduled for retirement; and provide dependable electrical service to its customers.

80. The need for additional generating capacity was identified by Petitioner through the integrated resource planning ("IRP") process.

81. IRP is a PUC process, adopted in 1992, that governs all of the energy utilities in the State of Hawai'i. IRP is an ongoing process which results in a 20-year master plan for the near and long-term energy needs of all the utilities on all of the islands.

82. IRP is intended to bring together representatives from Petitioner, government agencies, public groups, and

individuals concerned with the environment, culture, businesses, and communities to participate in the energy planning process.

83. Petitioner's goal in the IRP process is to identify the resources or the mix of resources needed to meet near and long-term consumer energy needs in an efficient and reliable manner at the lowest reasonable cost.

84. IRP revolves around a three-year cycle to allow for resubmissions of the comprehensive plan with annual and updates such as status reports every year.

85. Petitioner's IRP was a very comprehensive process.

86. The IRP process evaluated the following issues:

- existing and forecasted demand for energy and capacity;
- existing and forecasted fuel prices;
- impacts of Demand-Side Management ("DSM") and conservation and energy efficiency programs on the demand for energy;
- existing firm capacity;
- maintenance and retirement schedules of generating units;
- existing Purchase Power Agreements ("PPAs") from independent power producers ("IPPs");
- proposals for future PPAs from IPPs.

87. Peak power demand by Petitioner's customers has increased an average of 5 percent per year between 1983 and 1996, from 95.4 MW to 174.8 MW. Peak power demand on the island of Maui is forecasted to increase steadily over the next 20 years at

approximately 2.6 percent per year. It is anticipated that there will be a shortfall in Petitioner's system reserve margin by the year 2004, and that additional generation will be required through the year 2016.

88. DSM programs, which are a component of the IRP, were designed to influence customer consumption of electricity in a manner that will produce changes in the utility's demand.

89. DSM is energy conservation to which Petitioner gives strong preference to energy conservation as a first resource option to meet energy needs of its customers.

90. Petitioner formed four DSM resource programs based upon the common end-uses and market segments that they address. These programs include the: Commercial and Industrial Energy Efficiency Program, Commercial and Industrial Customized Rebate Program, Commercial and Industrial New Construction Program, and Residential Efficient Water Heating Program. Potential programs include conservation, energy efficiency, load management, and fuel substitution.

91. Petitioner's total firm capacity for the island of Maui, after completion of its second 58-MW expansion at Ma'alaea in the year 2001, will be 254 MW from Petitioner-owned plants and will enable Petitioner to meet demand forecasted through 2003.

92. After completion of the three additional units at Ma'alaea, the plant will have expanded to its full land capacity. The Kahului plant is also built to land capacity.

93. Replacing or repowering existing units at the Kahului and Ma'alaea Power Plant is not feasible due to the high costs involved.

94. Petitioner considers unit retirement dates as the unit approaches the end of a normal life expectancy. For different technologies, there are different retirement life expectancies. For STs, the life expectancy is 50 years; CTs, 35 years; and depending upon the size of the unit and operating speed, the life expectancy for diesel engines is 25 to 30 years.

95. Petitioner considers three major factors when making unit retirement determinations: availability of parts for the units, service reliability, and operating and maintenance costs.

96. Petitioner's resource plan identifies the retirement of 17 older generating units producing a gross 112.64 MW of power over the next 20 years.

97. Power produced by IPP is classified as either firm capacity or as-available capacity. Petitioner's resource planning can only evaluate producers of firm capacity.

98. The power provided by HC&S is classified firm capacity. The firm power contract with HC&S expires at the end of 1999 and its renewal is uncertain. Beginning in 2000, Petitioner has removed the 16 MW provided by HC&S from Petitioner's resource plan since Petitioner needs to pursue parallel planning in the event the PPA with HC&S is not renewed.

99. The power provided by Pioneer Mill Company is classified as-available capacity. Petitioner cannot rely on this

source of power since the power is available only when the mill is producing electricity in excess of its own needs. Therefore, as-available capacity power is not included in Petitioner's resource plan.

100. Petitioner is an isolated utility; therefore planning criteria requires higher levels of reliability than would mainland utilities that have interconnected grids and can rely on their neighbors to support those contingencies.

101. The proposed Waena Generating Station is designed to meet the increasing demand for electricity on the island of Maui and to improve system reliability. Based upon Petitioner's existing generation resources, resource planning, and planned addition of generation capacity over the next 20-30 years, the Waena Generation Station can accommodate changing public demands and allow for the flexibility of future designs and technologies.

102. Resources Planning has identified the need for additional units to the system beginning in the year 2004.

103. Development of DSM energy programs will not offset the need for unit additions beginning in the year 2004.

104. The scheduled retirement of older generation equipment can be deferred for a short time in order to accommodate permitting delays; however, this action does not ensure continued operating reliability nor offset the identified need for additional units beginning in the year 2004.

Alternate Energy Resources

105. Petitioner examined and evaluated the feasibility of employing biomass conversion, geothermal, hydroelectric, solar, wind, ocean thermal energy conversion ("OTEC"), and coal as alternatives to diesel fuel, and determined that these technologies had not reached a stage in either their development or commercial availability to provide cost-efficient firm generating capacity for the island of Maui.

106. Petitioner will continue to monitor these technologies for possible use should they become cost-effective.

107. Petitioner is currently negotiating with a wind developer for a large MW-scale wind farm installation on Maui.

108. As a part of the IRP process, Petitioner fully evaluated the alternative of a 10-MW wind farm in the Central Maui region near Ma'alaea. Cost of the 10-MW system was estimated at approximately $13.3 million.

Alternative Fuels

109. The CTs will be fueled by No. 2 diesel fuel. Petitioner, through its IRP process, also examined the feasibility of using alternative fuels other than diesel and coal for use with its conventional generation resources, such as propane, ethanol, methanol, orimulsion, coal slurries, municipal solid waste, naphtha, A-21, and landfill gas and digester gas. These alternative fuels are not feasible at this time for several reasons, including but not limited to: high costs, availability, and safety and design concerns.

110. The generating units planned for the Waena Generating Station will have the capability to burn not only diesel fuel, but other gaseous fuels as well, should the technical feasibility and economics of alternative fuels be demonstrated in the future. The planned installation of units over a 30-year span will also allow Petitioner to take advantage of new technologies for power generation at such times as they may be appropriate.

Site Selection

111. To determine the optimal location for the proposed Waena Generating Station, several siting studies and site assessments were conducted between 1989 and 1995. The first island-wide study, Site Selection Study, Maui Electric Company, Ltd. (Stone & Webster, 1989), assessed ten candidate sites and identified three viable sites out of the ten for future generation expansion. These three were the Kahului Power Plant, Pu'unene Sugar Mill, and the Ma'alaea Power Plant.

112. The second study, Candidate Sites Report and Preferred Alternative Site/Technology Report (Black & Veatch, 1991), screened the island of Maui for areas suitable for power plant development and identified the Central Maui isthmus as the most appropriate location for a new, stand-alone electrical generation facility. The assessment was based on compatible land uses, topographic slope, suitable land area, water availability, air shed availability, fuels logistics, transmission line integration, land uses, permitability, community acceptance, socioeconomics, and archaeology.

113. The Ameron Quarry, Pu'unene Airport, and Ma'alaea sites were identified as feasible locations for a power plant. After evaluating these sites with several technologies (atmospheric fluidized bed combustion (coal), coal gasification, and combined-cycle CTs) and an evaluation of 20 technical and environmental criteria, a combined-cycle CT arrangement at the quarry site was determined to be most suitable for Petitioner's future baseload power generation station, with the Pu'unene Airport site as an alternate.

114. When Petitioner further evaluated the quarry and Pu'unene Airport sites, the owner for both sites, Alexander & Baldwin-Hawaii, raised concerns which resulted in the identification of an alternate site approximately two miles southeast of Pu'unene Airport. This site was previously identified in the Candidate Sites Report and Preferred Alternative Site/Technology Report completed in 1991. Based on the findings of the environmental assessment prepared by Belt Collins (1992), the site, identified as Site C-3, was a viable candidate for further consideration as a potential site for a Maui baseload generating station.

115. Further site evaluations in 1993 found Site C-3 to be an acceptable location based on evaluations of several issues including those related to hazardous materials and groundwater issues. An air quality analysis study (Trinity Consultants, 1993) found the Central Maui area an acceptable location for a large baseload generating station. The air quality study also identified areas within the isthmus by the

level of difficulty ascertained in obtaining air quality permits. Areas north of the quarry were discovered to have the highest level of difficulty.

116. The MECO Central Maui Siting Study (Belt Collins, 1994) identified ten 50-acre candidate sites for evaluation. The identification of these sites was based on environmental and technical factors, such as air quality impacts, site soils, agricultural potential, visibility, and fuel transportation requirements.

117. Six of the ten sites were selected as "finalist" sites and analyzed further. The remaining four were rejected because they were either inferior or so similar to one of the six that individual analyses would not have been meaningful.

118. Three sites identified as Sites A-1, A-2, and D-1 ranked highest among the six "finalist" sites and were recommended for further analyses. After further evaluations and discussions with the DOH, Petitioner identified the region surrounding Sites A-1, A-2, and D-1 as primary areas of interest. The Central Maui Siting Study Air Quality Analysis by Trinity Consultants identified Site D-1 as having the best air quality.

119. The Environmental Screening and Siting Report for the Central Maui Generation Project (Dames and Moore, 1995) evaluated Sites A-1, A-2, and D-1 against several environmental factors, including: air quality, topography, soils, ground and surface water, aesthetics, noise, traffic, cultural resources, hazardous materials, botany, engineering considerations, and natural hazards. Baseline studies were conducted on each site

and reports were prepared that outlined anticipated impacts of a 232-MW baseload generating station located on each of the three sites. As a result of the analysis, Site A-2 was identified as the most preferred of the three candidate sites.

120. The MECO Generation Siting Study (Stone and Webster, 1995) conducted a final site evaluation of Sites A-2, C-3, and D-1. The evaluation was based upon more technical issues, including but not limited to: constructability, modeled impacts to air quality, proximity to wells, need for infrastructure improvements to adjacent roadways, overall project schedule, and costs. Site A-1 was eliminated from further consideration because Sites A-1 and A-2 were in the same air quality area and Site A-2 ranked higher. Site D-1 was retained as a final candidate, because although it was found to be the least environmentally desirable site in the Pulehu area, it had been found to have the best air quality in previous analyses (Trinity Consultants, 1993). Site C-3 was included as one of the final sites since it was not being used for sugarcane, and the owner said it was available.

121. As the result of this site analysis, Site A-2 was considered the preferred site for the proposed Waena Generating Station.

122. Of the three sites under consideration, Site A-2 had the least impact on: air quality, biological resources, area traffic and transportation, and infrastructure costs.

123. Air quality constituted one of the more important environmental screening factors in the site selection

process. Air quality modeling data, predicted air emissions, national ambient air quality standards, and the Federal Prevention of Significant Deterioration ("PSD") increment limits were utilized to screen the candidate sites.

124. For air quality and health base standards, the recommendations are based on protecting the most sensitive individuals. The standards are based on protecting people with bronchial asthma.

125. Other factors were also considered by Petitioner in the site selection process for the proposed generation facility, including the compatibility of the proposed use of the site with the quarry, landfill, and the surrounding agricultural uses; its distance from more sensitive urban uses; and its centralized location within Petitioner's existing generation and transmission systems.

126. The site for the proposed Waena Generating Station, Site A-2, is central for Petitioner's transmission grid and populated areas.

SOCIO-ECONOMIC IMPACTS

127. Upon full buildout of the plant, there will be approximately 20 shift personnel. In addition, there will be 26 non-operating personnel, for a total of 46 new employees.

128. Petitioner plans to move the transmission and distribution facilities to Waena, which will include approximately 195 employees working on a 7 to 3:30 shift. The grand total of employees at full buildout will be about 241 people.

129. The proposed facility will require between 80 to 100 construction workers during the initial installation.

130. The electricity provided by the proposed generating facility will support continued economic expansion for the island and provide the necessary energy to support housing developments.

131. Construction of the Waena Generating Station will not have a significant impact on property values.

132. There would be no significant impacts on the value of the property immediately surrounding the Waena Generating Station. The only discernable impact to the property immediately surrounding the project would be the minor effect on sugarcane production operations, such as crop dusting and harvesting activities caused by the physical presence of the structure on the Property and the erection of utility lines.

133. There may be a small effect on residential property values in the immediate vicinity of the facility, but the effect on property values diminishes to relatively minimal and becomes nonexistent as you proceed approximately one-half mile away from the facility. The residential development closest to the Property is located approximately 2½ miles away.

IMPACTS UPON RESOURCES OF THE AREA

Agricultural Resources

134. Maui County has approximately 360,000 acres of land classified as farmland. Of this acreage, approximately 89,000 acres of land are considered cropland, of which 36,500 acres are cultivated by HC&S and 11,000 are cultivated by Maui

Land and Pine Co., Ltd. The Property represents approximately 0.02 percent of Maui County's total farmland, 0.07 percent of Maui County's total cropland, and 0.18 percent of HC&S total acreage.

135. The proposed reclassification of the Property from the State Land Use Agricultural District to the State Land Use Urban District will remove approximately 65.7 acres of prime agricultural land from sugarcane cultivation.

136. Although the proposed Waena Generating Station will remove 65.7 acres of prime agricultural land from active production, the power generated from this facility will support further expansion and diversification of agricultural activities on Maui.

137. HC&S is undergoing expansion plans and will offset the loss of 65.7 acres of sugarcane land by expanding their acreage by 280 acres near Kuihelani Highway and adding another 1,100 acres of land formerly cultivated by Wailuku Agribusiness.

138. A study entitled Potential Ethylene and Sulfuric Acid Impacts of Proposed Waena Generating Station was prepared by Robert E. Paull ("Paull") to evaluate the potential impact of ethylene and sulfuric acid ("H_2SO_4") emissions from the proposed generating station on surrounding agricultural areas.

139. The Paull study used models from the study prepared by Dr. Thomas A. Schroeder and Jim Clary & Associates on the Maui Vortex, a cyclonic eddy that is formed by winds flowing through the Central Maui isthmus that travel along the coast and

encounter upwardly flowing winds along the slopes of Haleakala. The vortex is generally present during periods of regular tradewinds. With all four DTCC units operating, it would take 1,363 days of continuous vortex, with no loss of ethylene from the vortex, to reach a plant response threshold concentration of 0.01 microliters per liter.

140. Given ethylene's normal lifetime of only 0.4 to 4 days and the highly unlikely event of experiencing 1,363 days of uninterrupted tradewinds to produce a continuous vortex, the ethylene impacts from the proposed generating station are not expected to have any adverse impact upon the surrounding agricultural environment.

141. Sulfur dioxide ("SO_2") is commonly produced as the result of fossil fuel burning. SO_2 is the main sulfur compound emitted into the atmosphere. This is oxidized to SO_3 that forms H_2SO_4 when hydrated. A major source of SO_2 in Hawai'i is volcanism. Symptoms of adverse impacts of high concentrations of SO_2 on plants includes bleached brownish or yellowish spots or blotches with areas of dead tissue.

142. Plant sensitivity to SO_2 varies. Some plant species (beans) are very sensitive, while others (celery, corn, potatoes) are quite tolerant.

143. The SO_2 level anticipated from the proposed generating station is less than the U.S. Environmental Protection Agency ("EPA") significance level of 5 micrograms per meter cubed.

144. Exposure of plants to H_2SO_4 can cause damage with a threshold for growth reduction being 0.5 parts per million ("ppm"). Assuming 100 percent of the SO_2 is converted into H_2SO_4, and that no H_2SO_4 decay occurs, the time required to reach an H_2SO_4 concentration of 0.01 ppm is 274 days, and that such infrequent and very low concentration is below the projected thresholds for plant chronic injury and concentrations would never reach acute plant injury concentrations. Other sources of H_2SO_4, which include sea spray, plants, algae, and bacteria, may be expected to have a more significant impact.

145. Based on the findings of the Maui Vortex study by Schroeder and Clary Associates, a persistent vortex would not result in significant concentrations of SO_2, nitrogen dioxide ("NO_2"), particulate matter less than 10 microns in diameter ("PM_{10}"), H_2SO_4, and ethylene.

146. The Maui County Farm Bureau concurs with the assessment that SO_2 and ethylene emissions from the proposed Waena Generating Station will not result in any harmful effects on new and existing crops grown commercially on Maui.

147. Haleakala National Park, approximately 12 miles southeast, is the closest area to the proposed Waena Generating Station having a Class I designation.

148. At the request of the U.S. Department of the Interior, National Park Service ("NPS"), deposition values were calculated for the amount of chemical concentrations which may be deposited on plants and in the soil thereby impacting sensitive plant species. The deposition levels for SO_2 and nitric acid

were calculated based on the procedure contained in the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I Report: Interim Recommendation for Modeling Long Range Transport and Impacts on Regional Visibility (EPA, 1993). However, the NPS does not have any data on what deposition levels would adversely affect Haleakala National Park. The NPS will need to assess the potential impact on plant species by conducting detailed threshold analyses for specific plant species and soil conditions within the park.

Flora and Fauna

149. A biological survey, prepared by Botanical Consultants, surveyed the Property and the preferred and alternative transmission line corridors. No rare or endangered species of plants or animals, or species listed as candidate for such status, were found either on the Property or within the preferred or alternative transmission line corridors.

150. Neither the Hawaiian hoary bat or the Hawaiian owl was observed during the survey. Hawaiian hoary bats are known to roost at higher elevations. Although the Hawaiian hoary bat was not observed during the survey periods, they have been recorded at elevations as low as 400 feet and within gulches, and it is likely that they utilize the air space above the Property. However, no habitat conducive to bat roosting or forging exists on the Property.

151. Three reservoirs in the area (designated by HC&S as 80, 84, and 52), in addition to being integral to sugarcane

production, also serve as wildlife habitats. Two Hawaiian stilts were observed during a site reconnaissance at reservoir 80.

152. The nearest HC&S reservoir is approximately 2,000 feet from the boundary of the Property.

153. The proposed Waena Generating Plant is not expected to have a significant negative impact on flora or fauna communities because construction and operation of the plant will occur on lands presently under sugar cultivation. Further, the Property has almost no value as native bird habitat. None of the species observed on the Property are listed as threatened or endangered, or candidates for the threatened or endangered species list.

Archaeological Resources

154. The documentary research provided no evidence of prehistoric sites or utilization of the area. An archaeological inventory survey of the Property and the proposed and alternative transmission line routes was conducted by Scientific Consultant Services, Inc., dated April 1997. No archaeological resources were identified in any of the proposed transmission line corridors or at the Property.

155. In a letter dated August 29, 1997, the DLNR-SHPD provided the following comments: "We concur with the findings that no significant historic sites are located on the subject property. Historic to modern sugarcane production and access road construction have destroyed all previous vestiges of the landscape, making it unlikely that significant historic sites survive. We therefore find the proposed construction of the

power line to have 'no effect' on known historic resources."

Groundwater Resources

156. The Property is located in the Pa'ia Aquifer System, one of four aquifer systems within the Central Maui Hydrologic Sector of the Central Maui isthmus. Rainfall in Central Maui averages approximately 28 inches per year, over an area of approximately 200 square miles. Due to dry and windy conditions, only a small percentage of rain infiltrates deep enough to become groundwater recharge. The Property is located in a dry area with the median rainfall amounting to 17 inches a year.

157. The Pa'ia Aquifer System covers an area of 61 square miles and has a sustainable yield of 8 million gallons per day ("mgd"). Significant amounts of water recharge around the Property results from excess sugarcane irrigation in the area. The sustainable yield of 8 mgd represents only natural recharge from rainfall and does not include the large amounts of artificial recharge resulting from drip irrigation of the surrounding sugarcane fields.

158. The lands surrounding the Property are irrigated with surface waters collected from various streams on the windward slopes of East Maui by an elaborate irrigation ditch system operated by HC&S. Water from this system is distributed throughout the Pa'ia Aquifer System by the Haiku, Lowrie, Kauhikoa, and Hamakua Ditches. The system extends 4 miles inland, 1 mile seaward, and more than 2 miles on either side of the Property.

159. Groundwater with chloride levels higher than 250 milligrams per liter ("mg/l") is classified as non-potable. The basal groundwater throughout the central isthmus generally contains chloride levels higher than 250 mg/l and is classified as non-potable.

160. Certain areas, such as near the Property, contain significantly lower chloride levels because the irrigation ditch system contributes to a significant amount of artificial recharge in the area, which dilutes the chloride and significantly lowers the chloride content of the groundwater. The ditch system distributes approximately 164 mgd of surface water to the Pa'ia Aquifer and contributes a significant but undetermined amount of fresh irrigation water recharge in the area, resulting in lower chloride levels.

161. The CWRM provided the following comments:

"The CWRM is currently in the process of assessing recharge from irrigation and other sources and assessing the effect on the net sustainable yield. Furthermore, while estimates of drawdown and water quality appear to be reasonable, these issues will be further addressed, and possibly validated via pump tests during the well construction and pump installation permitting phase."

162. Groundwater on the Property is developed from a dozen or more wells and shafts. Most of the water is used for sugarcane irrigation, with small amounts used for landscape irrigation and industrial purposes.

163. The Property is surrounded by five large capacity wells within a 3-mile radius. These wells produce 80.6 mgd of non-potable water for irrigation. Other wells within the 3-mile radius include 3 monitor wells in the Central Maui Landfill. These wells provided data on groundwater quality expected on the Property.

164. The wells nearest the Property are in the existing Central Maui Landfill. The nearest producing well is HC&S' Pu'unene Pump 6 located 1.5 miles downslope of the Property and has a chloride content reported at between 335 to 490 mg/l.

165. There are no existing municipal wells near the Property or elsewhere in the Central Hydrologic Sector.

Scenic/Visual Resources

166. The Property is situated within an area of gently sloping terrain which extends to the slopes of Haleakala. There are few significant topographic barriers to limit views. The area surrounding the Property is in active sugarcane production.

167. The proposed 232-MW Waena Generating Station will constitute a relatively large industrial complex. The structures housing the generating machinery, support equipment, and offices will be between 15 and 70 feet high and will cover approximately 25 acres. The four stacks will be 150 feet high and 24 feet in diameter.

168. Petitioner analyzed the visual impacts of the proposed project in terms of distance, screening (vegetation), and backdrop (mountains), and provided computer generated

photographic simulations to access the impact of the proposed facility on surrounding scenic features. The facility would not have an adverse impact upon the area's visual resources because of the proposed facility's large distance from sensitive viewer locations. The generation station and exhaust stacks will represent only a co-dominant feature within the landscape up to 3 miles distance, and only a subordinate feature within the landscape beyond 3 miles. Large distances from viewing locations will make the apparent size of the facility small to the viewer and should not become a focus of attention.

169. Haleakala National Park is classified as Class I under the Clean Air Act. To determine the impact of the plume from the four 58-MW units in the generating plant on the visibility in Haleakala National Park, Petitioner used the EPA VISCREEN model recommended by the NPS. The VISCREEN model assesses the visibility of a plume, not whether the plume contributes to reductions in general visibility.

170. When the level-1 analysis was performed for the proposed Waena Generating Station, potentially significant impacts were identified. Therefore, a level-2 analysis was performed. The onsite meteorological data were used for this visibility analysis. The Haleakala National Park is downwind from the Property only when wind directions are between 290° and 315°. Therefore, wind vector data in sectors to the east-southeast, southeast, and south-southeast were used in the analysis. The worst-case plume dispersion conditions were determined following the EPA guidance. The proposed Waena

Generating Station is not anticipated to exceed the Class I Area Screening Criteria inside Haleakala National Park.

171. The NPS provided the following comments on potential visible plume impacts inside Haleakala National Park:

> "The Level 2 VISCREEN visibility analysis indicates that the Waena project will not impact the park with a coherent plume."

172. Lighting used within the plant for nighttime security and operations will be visible to residents located upslope of the Property due to the absence of other urban uses surrounding it and the overall size of the proposed facility. Some night glow impacts will be noticeable to Upcountry residents from reflective lighting and general multiple light sources at the facility. These impacts will lessen with the distance and will diffuse into the ambient background within the 4 miles to the nearest Upcountry residents.

173. Impacts from night lighting at the plant will be mitigated by properly shielding all outside lighting to direct light downward and pavement will be made as non-reflective as possible. Petitioner will avoid the use of halogen or intense white lights. The project will not have a negative impact on the visual character of its immediate environs and will not have an adverse impact to scenic views or vistas related to coastal areas within the Central Maui region.

174. Visual impacts will be mitigated through landscaping and choices of paint colors appropriate to the area. The color of the facility and its exhaust stacks will be blended

with the tones of the background landscape to minimize the visible impact of the facility on the surrounding environs. A landscaping plan is being developed to assist in the overall visual mitigation. Landscaping will be installed during Phase I to allow for full maturation of vegetation by the installation of the final phase.

175. The landscape buffer will be outside of the security fence. The fence is needed for security and the landscaping will screen the industrial feeling the fence might have.

176. The fence will be around 12 feet tall. Many of the trees Petitioner is proposing for the screening will have a mature height of 40 feet. The mass (of trees) would be between 10 to 20 feet high.

177. It is anticipated that any visual impact from the proposed generating plant will be obscured within a year to a year and a half.

ENVIRONMENTAL QUALITY

Noise

178. Two different noise level regulations are available for assessing noise impacts from the proposed Waena Generating Station: DOH noise regulations under Title 11, Chapter 46 Community Noise Control; and the U.S. Department of Housing and Urban Development ("HUD") noise regulations.

179. DOH noise regulations under Title 11, Chapter 46 Community Noise Control, are expressed in maximum allowable property line noise limits, which cannot be exceeded for more

than 2 minutes in any 20-minute time period. For properties zoned for agricultural use, the noise limits are 70 dBA for both the daytime and nighttime periods.

180. HUD noise regulations indicate that an exterior day-night noise level of 65 Ldn or less is considered normally acceptable for residential housing developments. Because there are no housing developments located in the vicinity of the Property that was constructed using federal funds, the HUD noise regulations do not apply. Therefore, the HUD regulations can only be used as a guideline.

181. Studies prepared by Dames and Moore, 1995, and Belt Collins, 1992, measured short-term daytime background ambient noise levels in the vicinity of the Property with average values ranging from 54 to 60 dB, well below the 70 dBA DOH property line noise limit for agricultural and industrial uses.

182. An acoustic study of existing and anticipated noise conditions at and adjacent to the proposed Waena Generating Station was prepared by Y. Ebisu & Associates in May 1997.

183. Ebisu & Associates used the hourly average (Leq(h)) and Ldn noise descriptors to describe existing and future noise levels on the Property and to evaluate the risks of exceeding the 70 dBA DOH noise limit along the Property boundary lines of the proposed generating plant.

184. The study analyzed existing background ambient noise levels at several locations: 50 feet from Dairy Road, areas removed from existing developments, and areas closest and normally downwind of the Property to measure varying noise

levels. At 50 feet from the roadway centerline of Dairy Road, average daily traffic noise level was estimated to be 68 Ldn, and considered to be typical for major roadways in the area, such as Hana Highway and Haleakala Highway. The results of the measurements in the areas removed from the major roadways demonstrated that existing background ambient noise levels are very low, and ranged from 35 to 44 Leq. Existing background noise levels in the communities closest to the Property are believed to be very low and similar to those measured at the other locations, particularly if they are removed from major roadways.

185. Anticipated future noise emission levels from the proposed Waena Generating Station were evaluated for the four phases of planned station expansion. The closest noise sensitive properties to the proposed generating station are day-care and social services facilities located in Pu'unene, beyond 2 miles from the Property. Residences in the other closest communities of Kahului, Pukalani, Pa'ia, Spreckelsville, and Waiakoa are located beyond 3 miles from the station.

186. Using a Linear-Weighting filter (instead of the A-weighting filter), the predicted noise levels from the proposed generating station at the communities of Pu'unene, Kahului, Pukalani, Pa'ia, Spreckelsville, and Waiakoa ranged from 19.7 to 36.2 dBL for Phase I; 22.7 to 39.2 dBL for Phase II; 24.5 to 41.0 dBL for Phase III of the development; and 25.7 to 42.2 dBL for Phase IV of the development. Due to the large separation distances between the Property and the nearest communities, the

predicted dBA levels are approximately 28 dB units less than the dBL values measured in these communities and should not be audible at the levels computed with the Linear-Weighting filter. Even with the added 12 dB of reduced attenuation due to sound ducting (worst case scenario), predicted noise from the proposed generating station should not be audible.

187. Measured background ambient noise levels at the surrounding communities also indicate that the predicted sound levels from the proposed Waena Generating Station probably will be inaudible during even the nighttime and early morning hours.

188. The noise levels generated by the generating station at full buildout would exceed the DOH 45 dBA night time Class A residential and preservation zone noise limits at locations up to 4,600 feet from the station boundaries. Therefore, future development of lands for residential/ preservation uses within 4,600 feet and for commercial/multi-family uses within 2,500 feet should be discouraged unless it can be demonstrated that local shielding effects from buildings, tanks, etc. on the Property allow for shorter buffer areas.

189. Compliance with the DOH 70 dBA standard along the station's property lines is expected following completion and operation of all four DTCC units.

190. No special noise mitigation measures will be required from Petitioner for the operation of the proposed generating station.

191. When measured 600 feet from the source, noise levels associated with the operation of diesel equipment

typically range from about 57 to 67 dBA. Predicted noise levels for the nearest noise sensitive properties (day-care and social services facilities) located in Pu'unene are not expected to exceed 24 dBA, below the existing ambient noise levels, during construction and well drilling activities. Also, twenty-four-hour well drilling operations should be possible without causing adverse noise impacts because of the Property's distance from noise sensitive properties.

192. No adverse noise impacts to the closest noise sensitive properties at Pu'unene are expected from construction noise due to the very low noise levels anticipated, due to the temporary nature of the work, and due to the administrative controls available for its regulation.

193. The intensity of the louder construction noise sources and the exterior nature of the work make it impractical to mitigate construction noise along the Property to levels less than 70 dBA. The use of properly muffled construction equipment and adherence to construction noise limits and curfew times are mitigation measures which can be applied to this project. A construction noise variance may also be requested from DOH prior to construction and well-drilling activities.

Air Quality

194. Existing air quality on Maui is heavily influenced by agriculture, the airport, and motor vehicles. Air pollutants include particulate matter, carbon monoxide ("CO"), and hydrocarbon emissions.

195. There are several significant industrial sources of air emissions located within a few miles of the Property. These include:

- Pu'unene Sugar Mill, approximately 2.5 miles to the northwest
- Kahului Airport, approximately 3 miles to the north
- Kahului Power Plant, approximately 4 miles to the northwest
- Pa'ia Sugar Mill, approximately 4.5 miles to the northeast
- Ma'alaea Power Plant, approximately 5 miles to the southwest

196. An air quality monitoring station was operated at Ma'alaea Monitoring Station 235 between August 1993 and July 1994.

197. Data from Station 235 provided a conservative estimate of the existing air quality at the Property because the station is a post-construction site located close to the Ma'alaea Power Plant. The concentrations of SO_2, PM_{10}, ozone, NO_2, and CO measured at Station 235 are expected to be found in less concentrations at the Property, which is approximately 6 miles upwind from Ma'alaea.

198. The Best Available Control Technology ("BACT") is defined by the Clean Air Act as "an emissions limitation..based on the maximum degree of reduction for each pollutant..which the review authority, on a case by case basis, taking into account energy, environmental, and economic impacts and other costs,

determines is achievable..through the application of production processes or available methods, systems, and techniques...."

199. The application of BACT cannot result in the emissions of any pollutant that would exceed the level allowed by an applicable New Source Performance Standard or National Emissions Standard for Hazardous Air Pollutants.

200. The BACT for the proposed Waena Generating Plant has yet to be determined by Petitioner. The BACT cannot be determined until the DOH and the EPA review the design-specific elements and modeled air emissions through the air quality permit process. When the appropriate technologies have been determined by the DOH and EPA, the final design for the generating station will reflect the necessary BACT requirements.

201. The four combined cycle units for the proposed Waena Generating Station will be installed over 20 to 30 years. At the time of permitting for each of these units, Petitioner will have to do a new BACT analysis.

202. The EPA guidelines state that the background air quality data used in an application has to be no older than three years.

203. Emissions of air pollutants are regulated at the Federal level pursuant to the Clean Air Act.

204. To determine if there could be any emissions impact from the proposed project due to the interaction of the Maui Vortex, a streamline analysis and a simple box model were conducted using a worst-case scenario of one month of continuously steady tradewinds with no nocturnal vortex

dissipation. In addition, it was assumed that any emission entering the vortex would not leave the vortex, circulating within the vortex for the entire month. The results of these models showed the worst case concentrations of the significant criteria pollutants SO_2, PM_{10}, and NO_2 to be insignificant, well below the EPA's 24-hour significance levels concentrations. Major factors for these low concentrations are: (1) the small portion of the plant's plume that would actually be entrained into the vortex, and (2) the large vortex volume. In analyzing the predicted plume dispersion in relationship to the existing vortex, only 0.35 percent of the entire plume would enter the vortex winds. This small amount of emissions would then mix within a vortex whose volume approached 40 billion cubic yards.

205. During construction, vehicle and equipment exhaust emissions will be small, localized, and transient. Dust emissions generated during site excavation and equipment movement will be elevated due to large-scale grading. As long as precautions are taken to water the Property during dry or windy periods, construction emissions are not expected to be significant.

206. Under certain emergency situations, steam from the combined cycle system currently in operation at Ma'alaea is vented to the atmosphere via pressure relief valves.

207. Since 1993, when the combined cycle system went into operation at Ma'alaea, steam is vented from the system on the average of once a year.

Electric and Magnetic Levels

208. The proposed transmission lines will pass through undeveloped land used for sugarcane cultivation. No residential areas or other sensitive receptors are located within 250 feet of any of the proposed transmission lines, and no development exists around the Property proposed for the Waena Generating Station.

209. Enertech Consultants calculated the Electric and Magnetic levels for the proposed generating station and transmission lines in May 1997. Their computer modeled calculations were based on five different overhead powerline configurations--the two 69-kV existing transmission lines running adjacent to the Property and the three proposed transmission lines.

210. The generating station equipment, due to its location near the center of the station, and the switchyard equipment will not contribute significantly to the magnetic field levels at the perimeter of the station. The major source of magnetic fields at the proposed station's boundaries and beyond is due primarily to the 69-kV and 12-kV overhead transmission lines which enter and leave the station along Pulehu and Waiko Roads. Although the proposed generating station will represent an increase in the magnetic field levels found along Pulehu Road and North Firebreak Road, studies to date have been inconclusive as to the health impacts from electric and magnetic fields.

ADEQUACY OF PUBLIC SERVICES AND FACILITIES

Roadway and Highway Services and Facilities

211. A traffic impact analysis was prepared for Petitioner in May 1997 by Austin Tsutsumi & Associates, Inc. Trip generation estimates were developed for 2016, following Petitioner's installation of Phase III of the project when the plant is expected to have its full complement of employees (46). The estimates included the number of employees per shift, service and delivery trips, and the number of fuel haul trucks to the plant on a daily basis.

212. The project will generate approximately 210 vehicle trips during the morning peak hour, 145 entering the site, and 65 exiting the site. Approximately 192 vehicle trips were estimated during the afternoon peak hour, 56 entering the site and 136 exiting the site.

213. Using a qualitative measure identified as Level of Service ("LOS") to describe the conditions of traffic flow, ranging from LOS A (free flow conditions) to LOS F (congested conditions), analyses were conducted at major intersections near the Property. To these, Petitioner added plant generated traffic data to estimated future traffic volumes.

214. Although a small number of individual approaches and turning movements will experience drops in LOS, no significant adverse impacts in the level-of-service for the area's roadways are anticipated. No intersection is expected to experience an approach or turning movement greater than LOS E,

and the vehicle to capacity ratio for the signalized intersections will not increase by any significant amount.

215. Future traffic improvements, currently in the environmental processing or design stage, are planned for completion by 1999. These improvements, including the construction of new roadways and traffic signals, will be implemented prior to the operation of the Waena Generating Station. Some of these improvements include the Department of Transportation's ("DOT") installation of traffic signals at the intersection of Hana Highway, Kamehameha Avenue, and Hobron Avenue. DOT is also proposing modifications to the present road network in the vicinity of the Property, including the construction of a new four-lane Airport Access Road as part of the Kahului Airport Master Plan. These modifications are anticipated to result in the diversion of regional and airport traffic from Dairy Road to the Airport Access Road, leaving Dairy Road to serve local traffic.

216. At full buildout, the operation of four DTCC units (eight CTs) will require approximately 44 truckloads of No. 2 diesel fuel daily, with deliveries averaging about 9,000 gallons of fuel.

217. The daily supply of diesel fuel (44 fuel trips) will be transported from Kahului Harbor in tanker trucks traveling along Hobron Avenue, Hana Highway, and Pulehu Road to the Property.

218. The DOT offered the following comments:

"Our State transportation facilities can adequately accommodate the subject project. We do not anticipate an adverse impact to our systems."

Water Service

219. No existing potable water service from the County of Maui exists near the Property. The only existing municipal well source in the Central Maui Sector is located approximately 4.5 miles northwest of the Property outside of Kahului. Potable bottled water will be delivered by truck to the proposed Waena Generating Station. Petitioner anticipates no extension of the County water delivery system.

220. Four wells are proposed to provide the non-potable water needs for the generating plant. One well will be required for each of the four DTCC units planned and consequently their construction will be phased along with the proposed installation of each DTCC unit (2006, 2010, 2014, and 2017 or later).

221. Non-potable water needs for the proposed Waena Generating Station can be met by drilling and developing wells onsite without impacting basal groundwater quality. A net loss of 0.15 mgd of irrigation recharge to the aquifer would result from the withdrawal of 65.7 acres of land from active sugarcane cultivation. Half of the groundwater withdrawn (0.44 mgd) will be returned to the aquifer by means of injection wells,

representing a net loss of approximately 0.6 mgd from the underlying aquifer.

222. The estimated water use for one DTCC unit is approximately 220,000 gallons per day ("gpd"). The projected average daily water requirements for the four DTCC units proposed for the Waena Generating Plant would be 880,000 gpd.

223. The four brackish groundwater supply wells with pump capacities of 225 gallons per minute ("gpm") will be developed on the Property to meet water requirements of 880,000 gpd for the operation of the CTs and related facilities. Well water will be desalinated or treated as required and stored onsite.

224. Firewater tanks, pumps, piping, and hydrants will be installed to store and disburse water for the sole purpose of fire control.

225. Two separate 240,000-gallon storage tanks will be constructed to meet Maui County Water Systems Standards for a fire flow requirement of 2,000 gpm for 2 hours.

226. The CWRM indicated that a Well Construction Permit and a Pump Installation Permit from the CWRM would be required before groundwater is developed as a source of water supply for the project. The CWRM further recommended coordination with the County to incorporate the project into the County's Water Use and Development Plan.

Wastewater

227. Development of the 232-MW generating station will generate an average of 440,000 to 480,000 gallons of

wastewater per day, which will be disposed of by means of injection wells.

228. The principal source of wastewater will be from a process designed to produce relatively pure water from brackish groundwater. Brackish well water will be run through a dual media filter to take out particles not removed by filtration. The water will be processed further to clean out more of the constituents. Identified as reverse osmosis, this process will produce a concentrated solution of salts and minerals.

229. The treated water will be used for nitrogen oxide control and steam generation.

230. Another source of wastewater will be from the backwashing of cation and anion resin beds used to remove minerals from process water during demineralization. Demineralization results in a fairly clean water source for use in power plant operations. The wastewater from backwashing will contain minerals removed from the water, acid and caustic solutions used for neutralization, and traces of the resin chemicals.

231. The disposal of wastewater from the generating station is not expected to have any hydrologic impact on existing wells or the basal aquifer because the Property lies makai of the DOH's Underground Injection Control ("UIC") line. Any potential impact from the use of injection wells will be mitigated by appropriate well design and testing. Further, the injection wells will be constructed and operated in full compliance with

DOH UIC regulations. The disposal of 0.44 mgd of wastewater will not negatively impact the aquifer for the following reasons:

- The rate of the wastewater injection is extremely small when compared to the rate of groundwater movement indicated by the large withdrawals of groundwater in the area;
- The quality of the wastewater is estimated to be similar to the existing groundwater quality; and
- The wastewater plume will be diluted by mixing and diffusion and is not expected to be detectable at any existing well or coastal area as the plume becomes dispersed and diluted to ambient groundwater quality.

232. The DOH commented that a National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;
b. Storm water discharge from industrial activities;
c. Construction dewatering activities;
d. Noncontact cooling water discharge less than one million gallons per day;
e. Treated groundwater from underground storage; and

f. Hydrotesting water.

233. The CWRM recommended that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality. A Well Construction Permit and a Pump Installation Permit from the CWRM would be required before ground water is developed as a source of supply for the project.

234. Petitioner's Groundwater Resource Assessment recommended that an onsite test well should be drilled to provide more detailed information on aquifer parameters and potential impacts.

235. There is no existing domestic sewer service from the County of Maui near the Property. Sanitary wastewater facilities will be constructed on the Property.

236. Petitioner will use a septic tank and a leach field to treat effluent from sanitary facilities. Detailed plans for the domestic wastewater treatment system will be submitted to the DOH for review and approval as part of a treatment work approval application.

237. Petitioner does not anticipate extension of the county wastewater system.

Drainage

238. Drainage in the area is generally through a series of gulches extending radially from the upper slopes of Haleakala towards the central isthmus area. Slopes on the Property are minimal at approximately one degree. The Property

is drained by Kalialinui Gulch and by Pulehu Gulch. The flow from the Property is directed to the northwest, away from both gulches.

239. The development of the Property for the installation of the first 58-MW unit of generation by the year 2006 will include full grading of the Property and the installation of necessary infrastructure, such as drainage improvements, domestic wastewater systems, and roads to support all four DTCC generating units. At full buildout, approximately 50 acres will consist of both impervious, asphalt areas, and more pervious gravel-covered areas.

240. The proposed project is anticipated to increase stormwater runoff from approximately 45.5 cubic feet per second ("cfs") to approximately 215.4 cfs. Stormwater over the developed 50 acres is anticipated to increase from approximately 34 cfs to 204 cfs.

241. To avoid project specific runoff from reaching adjoining sugarcane lands, the proposed project will include stormwater runoff and infiltration ponds to collect and contain stormwater onsite. A 15-foot landscape buffer around the facility will also aid in stormwater percolation. Runoff ponds will have special sumps with oil/water separators to remove any oil before disposal of the storm runoff into an infiltration pond. An alternative disposal method of water from the runoff ponds could be through a shallow injection well (dry well).

242. Stormwater impacts and erosion to the onsite irrigation ditch are possible during the construction phase of

the proposed generating station. However, use of best engineering practices to prevent runoff into the ditch can minimize these temporary impacts. No significant adverse impacts to the HC&S irrigation system are anticipated from construction-related activities.

243. The proposed drainage improvements will be designed to produce no adverse impacts, due to stormwater runoff, on adjacent properties. All drainage improvements will conform to County of Maui standards.

Solid Waste Disposal

244. Solid waste disposal systems on Maui consist of the Central Maui Landfill and the Hana Landfill. The Central Maui Landfill accepts commercial, industrial, and residential waste.

245. The Central Maui Landfill does not accept hazardous materials or construction materials. Construction materials and waste from the project will be disposed of by the construction contractor into the Maui Demolition and Construction Landfill. The Waena Generating Station will salvage or recycle parts, materials, and equipment to the fullest extent possible in order to reduce the anticipated minimal amount of solid waste which will be generated during operation of the plant. The remaining waste will be disposed of at the Central Maui Landfill. Solids from the sanitary septic system will be disposed of periodically at a County wastewater treatment facility.

246. Solid waste generated by the proposed Waena Generating Station will consist of the following:

- Construction waste;
- Materials associated with plant operation, administration, housekeeping, and maintenance operations; and
- Parts, material, and equipment replaced during maintenance.

247. Hazardous materials which will be stored and used on a regular basis on the Property will be the No. 2 diesel fuel, caustic soda, H_2SO_4, and cleaning solvent.

248. The fuel storage tanks will be placed on impervious surfaces which will be constructed within berms equipped with oil/water separators to remove oil before disposal and specially designed to contain fuel leakage or spills. These containment areas will have the capacity to contain the entire contents of the storage tank within its area. Each storage tank will be equipped with fuel level alarms to prevent overfills.

249. Caustic soda and H_2SO_4 will be added to the wastewater to adjust the pH level to within UIC permit limits prior to discharge to the ground via the underground injection wells.

250. Cleaning solvent is used for cleaning parts and equipment during routine maintenance and operations. The solvent is used at portable wash stations and recycled by vendors when it is spent and no longer useful.

251. If Selective Catalytic Reduction ("SCR") is required as BACT as a condition of the PSD permit, the wastewater will pass through additional steps which will remove excess

metals, adjust the pH level of the water, and air strip out the ammonia used in the SCR process.

252. Delivery of fuel, acids, and caustic materials used in production operations will be conducted through an independent contractor who will be responsible for all handling from the tanker into the bulk storage areas at the Property.

253. All transport contractors are required to file spill prevention and control and containment plans with the State which outline procedures to be carried out in the event of a spill incident.

254. Petitioner has a fuel oil pipeline operating manual that addresses fuel spills at the Kahului Harbor. The plan is required by the U.S. Coast Guard under Title 33 of the Code of Federal Register.

255. In the event of a spill, the first responders will be the transport contractor, county fire department, and Petitioner's safety personnel. Immediate priorities will include isolating the area for public safety and securing and containing the source of the spill. Qualified hazardous material clean-up organizations will immediately be contacted to restore the affected area to its previous condition.

Schools

256. The project will not directly result in any increase in school population, and therefore it will not adversely impact area school capacities.

Police and Fire Protection

257. The Maui County Police Department provides police protection for the Wailuku-Kahului, Kihei, and Upcountry areas. Development of the Property is expected to have minimal impact on any requirement for police protection.

258. Petitioner will develop onsite security procedures. Petitioner will also construct a fence around the Property, with full-time security manning, and install checkpoints at the access driveways.

259. Petitioner will install video monitoring and a remote control main gate.

260. Fire prevention, suppression, and protection services for the Wailuku-Kahului region are provided by the County Department of Fire Control. The nearest fire station to the Property is the Kahului Station, approximately 4 miles away. Other fire protection facilities in the Central Maui area include a fire station in Pa'ia and another in Wailuku.

261. Petitioner currently has fire control plans for its existing generation facilities. A fire control plan will be designed specifically for the proposed Waena Generating Station. Emergency plans detailing the procedures to be followed when there is a fire or fuel spill will be coordinated with the district fire department and health care facilities. All Federal and State regulations regarding the operation of a generating station and worker safety will be followed.

Civil Defense

262. There is no siren coverage in the area. The State Department of Civil Defense recommends that a siren simulator be purchased and installed inside the facility. Petitioner agrees with the recommendation.

Power and Communications/Electrical and Telephone Service

263. The Property is undeveloped and has no telephone or communications service.

264. Petitioner has two 69-kV transmission lines running adjacent to the Property. The first transmission line (Ma'alaea-Kealahou 69-kV) runs along Waiko Road to the intersection of Pulehu Road, then turns south and extends along Pulehu Road towards Kealahou. The second transmission line (Kanaha-Pukalani) runs from Kanaha Substation along Pulehu Road past the Property to the intersection of Waiko Road, crosses Pulehu Road diagonally and continues across cane lands towards Pukalani. In addition to Petitioner's transmission system, HC&S has some smaller distribution lines which run through cane land to service irrigation and water pumps.

Recreation Facilities and Public Access

265. Recreational and ocean-related facilities occur along the coastline from Kahului Harbor to Spreckelsville Beach. Existing facilities include Kahului Harbor Park and Kahului Beach, Kanaha Beach Park, and Spreckelsville Beach. The proposed generating plant will not have an adverse impact on the public's access and use of the shoreline area, and there will be no

adverse impact to nearshore waters from point and non-point sources of pollution.

266. The electricity generated by the proposed Waena Generating Station will provide the energy required for existing and planned recreational facilities throughout the entire island of Maui.

COMMITMENT OF STATE FUNDS AND RESOURCES

267. The proposed Waena Generating Station project will be funded through Petitioner's customer base and will not require expenditures by either the State of Hawai'i or the County of Maui.

CONFORMANCE TO URBAN DISTRICT STANDARDS

268. The proposed reclassification is in general conformance to §15-15-18 of the Commission rules regarding standards for determining "U" the Urban District boundaries. The Property will be zoned and developed for heavy industrial use and is located close to other industrial uses in the area, such as the Central Maui Landfill and the Ameron HC&D Quarry. The four-phased planned construction and operation of the proposed Waena Generating Station will be compatible with the existing and planned expansion of current heavy industrial uses in the area.

CONFORMANCE WITH THE GOALS, OBJECTIVE AND POLICIES OF THE HAWAI'I STATE PLAN; RELATIONSHIP WITH APPLICABLE PRIORITY GUIDELINES AND FUNCTIONAL PLANS

269. The proposed reclassification of the Property is in general conformance with the following objectives and policies of the State Plan:

§226-14 - Objectives and policies for facility systems-in general.

a. Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.

b. To achieve the general facility system objective, it shall be the policy of this State to:

1. Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

2. Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

3. Ensure that required facility systems can be supported within the resource capacities and at reasonable cost to the user.

4. Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning,

construction, and maintenance of facility systems.

The proposed Waena Generating Station is designed to meet the increasing demand for electricity on the island of Maui and to improve system reliability. As a result of its planned addition of generation capacity over the next 20-30 years, the Waena Generating Station can accommodate changing public demands and allow for the flexibility of future designs and technologies. Currently, a 58-MW dual-train, combined-cycle unit is the least-cost option in terms of both initial and long-term costs.

§226-18 - Objectives and policies for facility systems - energy.

a. Planning for the State's facility systems with regard to energy shall be directed towards the achievement of the following objectives:

   1. Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;

   2. Increased self-sufficiency where the ratio of indigenous to imported energy use is increased; and

   3. Greater energy security in the face of threat to Hawaii's energy supplies and systems.

b. To achieve the energy objectives, it shall be the policy of this State to ensure the provision

of adequate, reasonably priced, and dependable energy services to accommodate demand.

c. To further achieve the energy objectives, it shall be the policy of this State to:

1. Support research and development as well as promote the use of renewable energy sources;

2. Ensure that the combination of energy supplies and energy-saving systems are sufficient to support the demands of growth;

3. Base decisions of least-cost supply-side and demand side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;

4. Promote all cost-effective conservation of power and fuel supplies through conservation measures including:

A. Development of cost-effective demand-side management programs;

B. Education; and

C. Adoption of energy-efficient practices and technologies; and

5. Ensure to the extent that the new supply-side resources are needed, that the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies;

6. Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies; and

7. Promote alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure.

The proposed project, in the context of Petitioner's integrated approach to energy production and conservation, conforms with these objectives and policies. The purpose of the proposed Waena Generating Station is to provide a system that meets the projected electrical demand, increases system reliability, and provides dependable electrical service to its customers.

Resource limitations and environmental, public health, and safety concerns were considered in selecting the site and appropriate technology for the generating facility. During the

development of Petitioner's IRP, a comparison of costs and benefits for both alternative fuels and alternative technologies was performed. At this time, alternative fuels and technologies do not represent the least-cost energy supply option or the maximum efficient technology. Diesel-fueled dual-train, combined-cycle units currently will be used while other renewable energy projects are being developed.

Petitioner is actively participating in education and research programs to further develop alternative fuels and technologies in Hawai'i, as is evident through their cooperation with the Pacific International Center for High Technology Research, the County of Maui, and the State of Hawai'i in examining biomass to electricity applications for Hawai'i and through Petitioner's continued installation of small photovoltaic systems on public schools through Petitioner's "Sun Power for Schools" project.

State Energy Functional Plan

270. The policy of the action items of the State Energy Functional Plan pertaining to Petitioner are as follows:

Policy A(1): Promote and Stimulate Greater Energy Efficiency and Conservation in Non-Transportation Sectors

Action A(1)(a): Provide Technical Support and Assistance to the State Government, County Governments, the PUC, and The Energy Utilities in Developing the Integrated Resource Planning (IRP) Process and Carrying Out Demand-Side Management (DSM) Assessments.

Action A(1)(b): Advance the Use of Demand-Side Management (DSM) by Creating Pilot Programs and Promoting Education of Local Energy Producers and Users.

Petitioner is a participant in IRP. Through the IRP process, Petitioner has developed a long-range energy plan for the island of Maui by considering not only the traditional supply-side resources but also the customer (demand-side) resources that are available.

IRP has brought about significant changes in the way utilities conduct their business, not only by including demand-side options as a resource but also by having the public participate in the planning process through advisory groups.

As a result of the IRP process, Petitioner formed four DSM resource programs based upon the common end-uses and market segments that they address. In addition, two service programs were included in the DSM action plan.

Altogether, these programs are projected to provide peak-demand saving of 1.5 MW in their first year of implementation and 14.6 MW of energy savings by the year 2004. However, because energy efficiency and peak capacity reductions have not been comprehensively pursued by any organization in Hawai'i to date, there is considerable uncertainty about how to structure the DSM programs. Therefore, monitoring of the implementation process will be important. Programs will need to be adjusted as the implementation process moves forward. Petitioner expects to update its DSM program plans annually to optimize program implementation and energy savings.

The State is encouraging development of alternative and renewable energy sources as Hawai'i primary energy source. These resources include geothermal, OTEC, solar photovoltaic, biomass,

wind, and hydropower. Although the State has made progress in alternative energy technologies, only geothermal currently provides a potential for firm, reliable electricity. It is the only commercially mature, indigenous resource available in large quantities that can be converted to baseload (24-hour-per-day) electricity. Other alternative energy resources, such as solar and wind technologies, do not provide firm, baseload power and are not economically feasible at this time.

Petitioner has contributed to and constructed facilities for alternative and renewable energy resources, such as wind and hydroelectric power. It also has PPAs with IPPs. These PPAs are based on alternative and renewable technologies. Examples include sugarcane bagasse and biomass-fueled ST generators. While extensive dependence on such contracts can increase supply risks, Petitioner has evaluated and continues to evaluate IPP alternatives and renewable energy power supply offers.

After examining the alternative to this project (including coal, non-firm renewable energy sources such as wind or hydropower, increased DSM programs, and IPP proposals), Petitioner has determined that the proposed Waena Generating Station is the only reasonable way to meet its PUC obligations of providing high-quality, reliable service at the least cost to the customer within the necessary timeframe.

Petitioner acknowledges that, in making the decision to expand with additional oil-fired units, it is contradicting the objective of energy self-sufficiency. As the project comes on-

line, however, it will be possible to retire less fuel efficient units, and the overall ratio of fuel consumption to megawatts produced should improve. In addition, Petitioner continues to pursue long-term conservation measures and alternative fuel sources that will lessen the dependency on imported fossil fuels.

CONFORMANCE WITH COASTAL ZONE MANAGEMENT OBJECTIVES AND POLICIES

271. The proposed reclassification of the Property is in general conformance with the Coastal Zone Management Program, chapter 205A, HRS, in the areas of recreational resources, historical/cultural resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources.

CONFORMANCE WITH THE COUNTY OF MAUI GENERAL PLAN AND THE WAILUKU-KAHULUI COMMUNITY PLAN

272. The following objectives and policies of the County of Maui General Plan pertain specifically to the proposed Waena Generating Station:

B. Land Use

Objective 1 To preserve existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land.

Policy b Provide and maintain a range of land use districts sufficient to meet the social, physical, environmental and economic needs of the community.

Objective 2 To use the land within the County for the social and economic benefit of all the County's residents

Objective 3 To preserve lands that are well suited for agricultural pursuits

Policy a. Protect prime or productive agricultural lands from competing non-agricultural land use.

Policy d. Discourage the conversion of productive or potentially productive agricultural lands to non-agricultural uses.

The proposed Waena Generating Station will remove approximately 65.7 acres of prime agricultural land from active production. However, this amount represents only a small portion of the over 36,000 acres of land that HC&S has in production on the island of Maui. In selecting the Property for the proposed project, Petitioner examined several different areas which were not on prime agricultural lands. However, the results of the various environmental analyses and discussions with landowners determined that the Property was the most feasible for construction and operation of the generating station.

Conversion of the land from agricultural use to power generation will have no discernible impact upon the overall agricultural production on the island of Maui. In addition, providing the appropriate land use for the proposed project will ensure the provision of sufficient electricity to meet the social and economic needs of the community.

E. Public Utilities and Facilities

Objective 1 To anticipate and provide public utilities which will meet community needs in a timely manner.

Policy a. Maintain all power and utility systems so as to meet public health and safety standards.

Policy b. Encourage new and expanded power generation facilities to be

community planned based on sound land use and environmental planning principles.

Policy c. Assure the availability of power systems and sources that meet public health and safety standards.

Policy d. Locate energy producing plants in areas where they will not create health hazards.

The selection of the Property for the proposed Waena Generating Station was made only after careful consideration of all environmental and community concerns. Due to its distance from major sensitive receptors, the construction and operation of the proposed facility is not anticipated to have significant environmental impacts nor will it create a health hazard. In addition, all aspects of the plant's design, construction, and operation will follow applicable health and safety standards. The construction and operation of the proposed Waena Generating Station will meet the objective by allowing the timely provision of electrical power to meet community needs.

273. Because the purpose and need for the proposed Waena Generating Station is to provide for the increasing demand for energy forecast on the island of Maui, the energy the facility provides will allow the County of Maui to implement many of the objectives and recommendations of the Wailuku-Kahului Community Plan, specifically those pertaining to supporting economic growth and the provision of health and safety services.

RULING OF PROPOSED FINDINGS OF FACT

Any of the proposed findings of fact submitted by Petitioner or other parties not already ruled upon by the

Commission by adoption herein, or rejected by clearly contrary findings of fact herein, are hereby denied and rejected.

Any conclusions of law herein improperly designated as a finding of fact should be deemed or construed as a conclusion of law; any finding of fact herein improperly designated as a conclusion of law should be deemed or construed as a finding of fact.

CONCLUSIONS OF LAW

Pursuant to chapter 205, HRS, and the Hawai'i Land Use Commission Rules under chapter 15-15, HAR, and upon consideration of the Land Use Commission decision-making criteria under section 205-17, HRS, this Commission finds upon a clear preponderance of the evidence that the reclassification of the Property, consisting of approximately 65.7 acres of land in the State Land Use Agricultural District situated in the Wailuku and Makawao Districts, island of Maui, State of Hawai'i, identified as Tax Map Key No. 3-8-03: 23 and 24, into the State Land Use Urban District, is reasonable, is not violative of section 205-2, HRS, and is consistent with the policies and criteria established pursuant to sections 205-16 and 205-17, HRS.

DECISION AND ORDER

IT IS HEREBY ORDERED that the Property, which is the subject of this Docket No. A97-722 filed by Petitioner Maui Electric Company, Limited, a Hawai'i corporation, consisting of approximately 65.7 acres of land, situated in the Wailuku and Makawao Districts, island of Maui, State of Hawai'i, identified as Tax Map Key No. 3-8-03: 23 and 24, and approximately shown on

Exhibit "A" attached hereto and incorporated by reference herein, is hereby reclassified from the State Land Use Agricultural District to the State Land Use Urban District, and the State land use district boundary is hereby amended accordingly, subject to the following conditions:

1. Petitioner shall participate in an air quality monitoring program, coordinated with and approved by the State Department of Health (DOH) to monitor air quality impacts attributable to the operations of the Waena Generating Station. Mitigation measures for air quality impacts attributable to the operations of the Waena Generating Station shall be implemented by Petitioner if, based on applicable State and Federal air quality standards, the results of the monitoring program warrant them. Mitigation measures shall be developed in coordination with the DOH and implemented by Petitioner.

2. Petitioner shall consult with the State Department of Health (DOH) and, if necessary, Petitioner shall participate in a groundwater quality monitoring program in consultation with the County Department of Water and approved by DOH to monitor groundwater quality impacts directly attributable to the operations of the Waena Generating Station. Petitioner shall implement mitigation measures should the results of the monitoring program warrant them based on applicable State and Federal water quality standards. Mitigation measures shall be developed in coordination with the DOH and implemented by Petitioner.

3. Petitioner shall provide at its own expense, adequate non-potable water source, storage, and transmission facilities and improvements to accommodate the proposed project. The non-potable water improvements shall meet all applicable County, State, and Federal standards and shall be consistent with the County of Maui adopted water use and development plan.

4. Petitioner shall consult with the State Department of Health (DOH) and, if necessary, prepare a wastewater disposal plan subject to review and approval by the DOH. Petitioner shall provide at its own expense adequate wastewater treatment, transmission and disposal facilities for wastewater directly attributable to the operations of the Waena Generating Station.

5. Petitioner shall establish appropriate systems to contain spills and prevent materials associated with heavy industrial uses attributable to the operations of the Waena Generating Station, such as petroleum products, chemicals or other pollutants, from leaching or draining into above ground or subsurface storm drainage collection areas. Based on applicable State and Federal standards, Petitioner shall use best management practices to minimize non-point source pollution into irrigation ditches. Petitioner shall consult with the State Department of Health and County Department of Public Works and Waste Management and obtain any permits required or construct improvements required for storm water discharge on the Property.

6. Petitioner shall consult with the State Department of Health (DOH) regarding hazardous waste storage and, if necessary, prepare a hazardous waste storage plan.

7. Petitioner shall participate in the funding and construction of local and regional transportation improvements and programs attributable to the operations of the Waena Generating Station as determined by the State Department of Transportation (DOT) and the County of Maui.

8. Petitioner shall coordinate with the surrounding property owner to ensure that the proposed project will not adversely impact the use of cane haul roads and irrigation ditches or adversely impact the continued agricultural operation of adjoining sugarcane cultivation areas.

9. Petitioner shall participate in the pro rata funding and construction of adequate civil defense measures as determined by the State of Hawai'i and County of Maui civil defense agencies.

10. Petitioner shall implement effective soil erosion and dust control measures during and after construction in compliance with the applicable rules and regulations of the State Department of Health and the County of Maui.

11. Should any human burials or any historic artifacts, such as charcoal deposits, stone platforms, pavings or walls be found, Petitioner shall stop work in the immediate vicinity and contact the State Historic Preservation Division (SHPD). The significance of these finds shall then be determined and approved by the SHPD and, if applicable, an acceptable mitigation plan shall be approved by the SHPD. The SHPD must verify that the fieldwork portion of the mitigation plan has been successfully executed prior to work proceeding in the immediate

vicinity of the find. Burials must be treated under specific provisions of Chapter 6E, HRS.

12. Petitioner shall develop the Property in substantial compliance with the representations made to the Commission. Failure to so develop the Property may result in reversion of the Property to its former classification, or change to a more appropriate classification.

13. Petitioner shall give notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Property, prior to development of the Property.

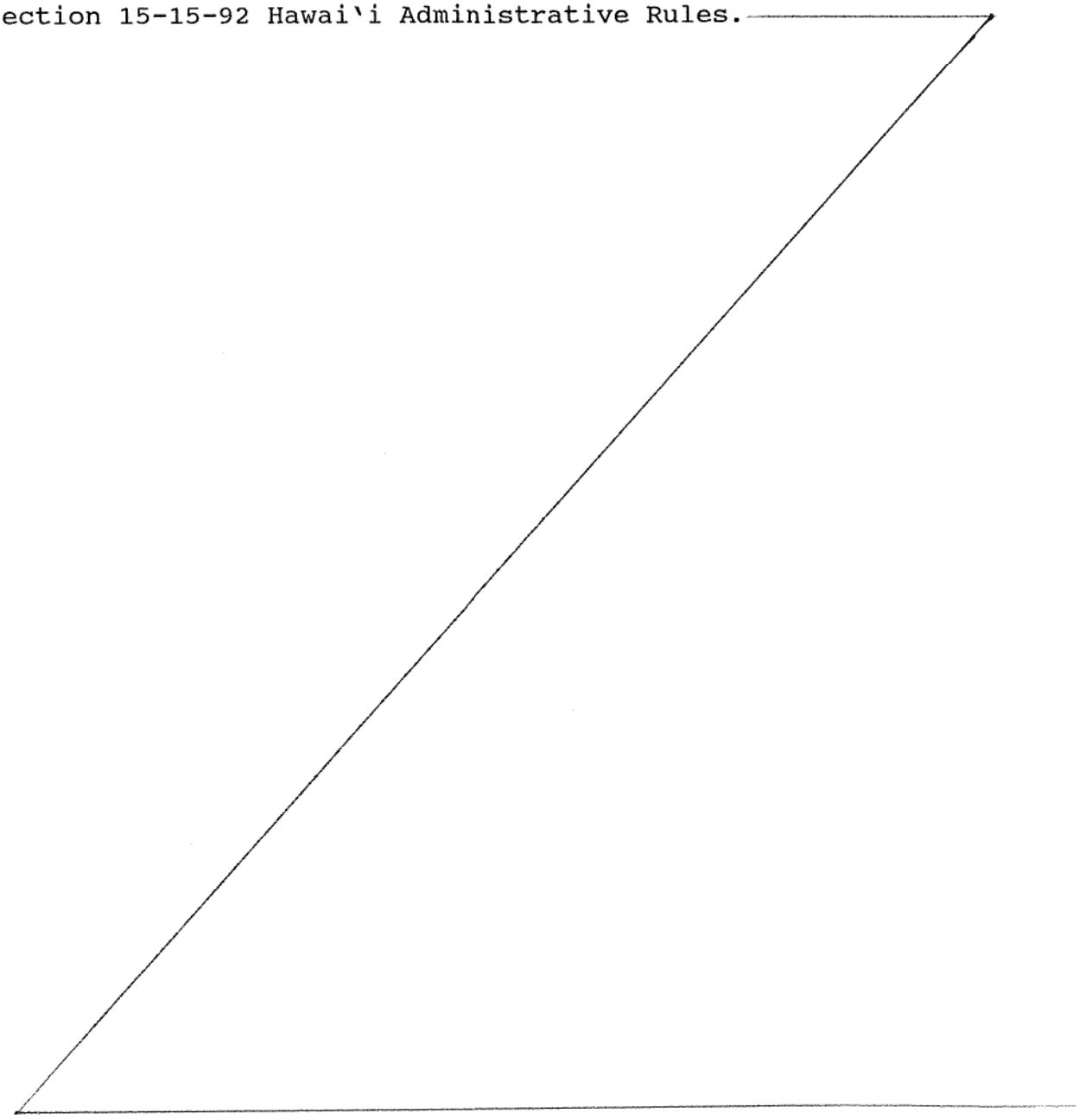
14. Petitioner shall timely provide without any prior notice, annual reports to the Commission, the Office of Planning, and the County of Maui Planning Department in connection with the status of the subject project and Petitioner's progress in complying with the conditions imposed herein. The annual report shall be submitted in a form prescribed by the Executive Officer of the Commission.

15. The Commission may fully or partially release the conditions provided herein as to all or any portion of the Property upon timely motion and upon the provision of adequate assurance of satisfaction of these conditions by Petitioner.

16. Within 7 days of the issuance of the Commission's Decision and Order for the subject reclassification, Petitioner shall (a) record with the Bureau of Conveyances a statement that the Property is subject to conditions imposed herein by the Land Use Commission in the reclassification of the Property, and

(b) shall file a copy of such recorded statement with the Commission.

17. Petitioner shall record the conditions imposed herein by the Commission with the Bureau of Conveyances pursuant to Section 15-15-92 Hawai'i Administrative Rules.



Done at Honolulu, Hawai'i, this 22nd day of June 1998, per motion on June 18, 1998.

LAND USE COMMISSION
STATE OF HAWAI'I

By _____
RUPERT K. CHUN
Chairperson and Commissioner

By (opposed)
M. CASEY JARMAN
Vice Chairperson and Commissioner

By _____
LAWRENCE N.C. ING
Vice Chairperson and Commissioner

By (absent)
P. ROY CATALANI
Commissioner

By _____
ISAAC FIESTA, JR.
Commissioner

By (absent)
HERBERT S.K. KAOPUA, SR.
Commissioner

By _____
MERLE A. K. KELAI
Commissioner

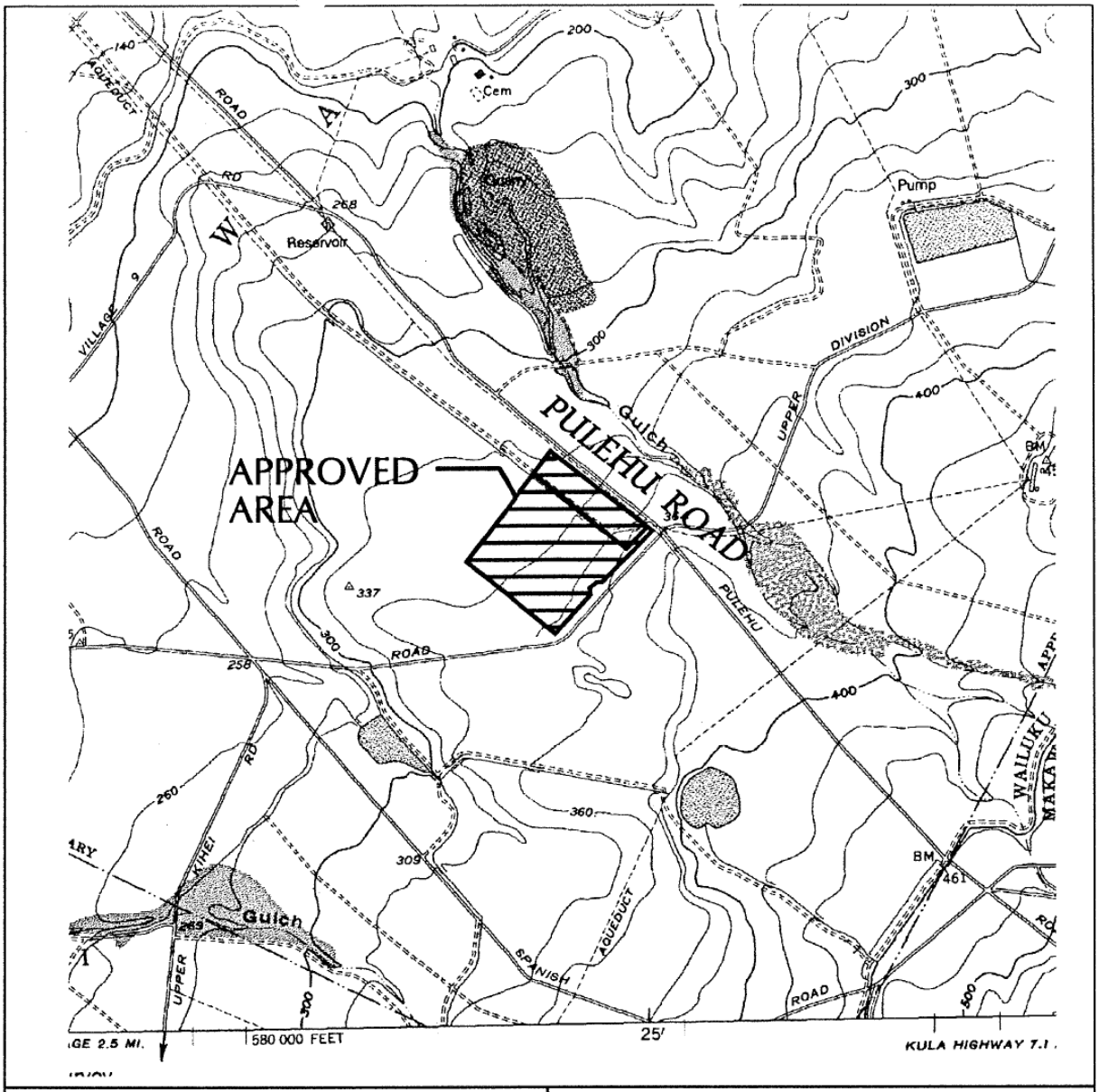
Filed and effective on
June 22, 1998

Certified by:

_____
Executive Officer

By _____
JOANN N. MATTSON
Commissioner

By _____
PETER YUKIMURA
Commissioner

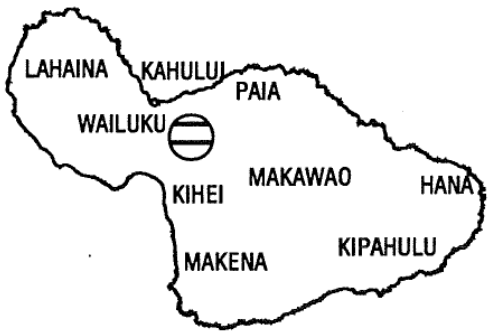


A97-722 / MAUI ELECTRIC COMPANY, LTD., a Hawai`i Corporation

LOCATION MAP

TAX MAP KEY NO.: 3-8-03: 23 & 24
WAILUKU AND MAKAWAO DISTRICTS, ISLAND OF MAUI, STATE OF HAWAI`I

EXHIBIT "A"



BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI'I

In the Matter of the Petition of MAUI ELECTRIC COMPANY, LIMITED, a Hawai'i corporation To Amend the Agricultural Land Use District Boundary into the Urban Land Use District for Approximately 65.7 Acres of Land at Wailuku and Makawao Districts, Island of Maui, State of Hawai'i, Tax Map Key No. 3-8-03: 23 and 24	DOCKET NO. A97-722 CERTIFICATE OF SERVICE

CERTIFICATE OF SERVICE

I hereby certify that a copy of the Findings of Fact, Conclusions of Law, and Decision and Order was served upon the following by either hand delivery or depositing the same in the U. S. Postal Service by certified mail:

DEL. RICK EGGED, Director
Office of Planning
P. O. Box 2359
Honolulu, Hawaii 96804-2359

CERT. DAVID W. BLANE, Director of Planning
Planning Department, County of Maui
250 South High Street
Wailuku, Hawaii 96793

CERT. JEFFREY SCHMIDT, ESQ.
Corporation Counsel
Office of the Corporation Counsel
County of Maui
200 South High Street
Wailuku, Hawaii 96793

CERT. B. MARTIN LUNA, ESQ., Attorney for Petitioner
Carlsmith Ball Wichman Case & Ichiki
One Main Plaza, Suite 400
2200 Main Street
Wailuku, Hawaii 96793-1086

MARK SHEEHAN, Representing Intervenor
CERT. President, Maui Tomorrow
P. O. Box 429
Makawao, Hawaii 96768

DATED: Honolulu, Hawaii, this 22nd day of June 1998.

ESTHER UEDA
Executive Officer

REQUEST FOR PROPOSALS

FOR

RENEWABLE DISPATCHABLE GENERATION

AND

ENERGY STORAGE

MAUI

MAY 19, 2023

Docket No. 2017-0352

Appendix G – Hawaiian Electric Development Team Certification Form

Maui Electric

Appendix G – Hawaiian Electric Proposal

Overview

To the extent that there are Hawaiian Electric Proposals to the RFP, the Company will endeavor to evaluate these Hawaiian Electric Proposals on a fair basis compared to third party Proposals. As described in Section 1.9.1 of the RFP, "[t]he Competitive Bidding Framework allows the Company the option to offer a Self-Build Proposal in response to this RFP ("Hawaiian Electric Proposal"). Accordingly, the Company must follow certain requirements and procedures designed to safeguard against and address concerns associated with: (1) preferential treatment of the Hawaiian Electric Proposal or members, agents or consultants of the Company formulating the Hawaiian Electric Development Team; and (2) preferential access to proprietary information to the Hawaiian Electric Development Team." A Hawaiian Electric Proposal will be required to comply with the provisions in the Framework for Competitive Bidding ("Framework") as well as this RFP.

In addition to its Proposal, the Hawaiian Electric Development Team will be required to submit Attachment 1 to this Appendix G, Hawaiian Electric Development Team Certification Form, acknowledging it has followed the rules and requirements of the RFP to the best of its ability and has not engaged in any collusive actions or received any preferential treatment or information providing an impermissible competitive advantage to the Hawaiian Electric Development Team over other proposers responding to this RFP, as well as adherence to PPA terms and milestones required of all proposers and the Hawaiian Electric Proposal's proposed cost protection measures.

Pursuant to the Framework and as set forth in the RFP Schedule, the Company will require that the Hawaiian Electric Proposal be submitted electronically through the Electronic Procurement Platform a minimum of one (1) day before other Proposals are due.

Except where specifically noted, a Hawaiian Electric Proposal must adhere to the same price and non-price Proposal requirements as required of all Proposers.

As described in Section 3.8.4 of the RFP, if selected, a Hawaiian Electric Proposer will not be required to enter into a Stage 3 Contract with the Company. However, the Hawaiian Electric Proposer will be held to the proposed modifications to the Stage 3 Contract, if any, it submits as part of the Hawaiian Electric Proposal in accordance with Section 3.8.7 of the RFP. Moreover, the Hawaiian Electric Proposal will be held to the same performance metrics and milestones set forth in the Stage 3 Contract to the same extent as all Proposers, as attested to in the Hawaiian Electric Development Team Certification submittal. If liquidated damages are assessed, they will be paid from shareholder funds and returned to customers through the Purchased Power Adjustment Clause or other appropriate rate adjustment mechanisms.

In lieu of price components, the Hawaiian Electric Proposal will need to provide their total project capital costs, any associated annual O&M costs, as well as annual revenue requirements by year (see Appendix B, Section 2.0). The Hawaiian Electric Proposal shall submit revenue requirement

worksheets with their Proposal that support their annual revenue requirements estimates. (See Appendix B, Section 2.1.) A starter revenue requirements template example can be requested by the Hawaiian Electric Development Team via email to the RFP Email Address once the RFP event opens. The revenue requirements worksheets submitted will be customized by the Hawaiian Electric Development Team to reflect the details of the Project's Proposal. All assumptions used will be reflected in an assumptions input tab.

Hawaiian Electric Proposal Total Project Capital Cost

The following is a high-level breakdown followed by a narrative explanation of the total capital cost estimate for a potential Hawaiian Electric Proposal. The total project capital cost (and annual O&M costs) will be used to calculate the Revenue Requirement, which will then be used to calculate a for Proposal comparison purposes. The categories of costs include:

- Facility
  - EPC Contract
  - Allowance for Change Orders
  - Equipment
  - Owner's Cost
- Outside Services
- Interconnection
- Overheads
- AFUDC

These costs will be identified in Section 2.3.2.2 of the Hawaiian Electric Proposal(s). (See Appendix B, Section 2.3.2.2.)

- Facility (including any generation and storage components) - This line item, to the extent applicable, should include costs such as:

  Engineering, Procurement, and Construction ("EPC") Contract
  The total cost estimate of the facility is the projected EPC contract cost including the design of the facility up to the high-voltage terminals of the step-up transformers, procurement of all the equipment, and services necessary to build the facility and construction and commissioning of the facility.

  Allowance for Change Orders
  This allocation accounts for items such as additional requirements resulting from unforeseen conditions, unexpected permitting requirements, force majeure events, unanticipated interferences, different interpretations of design requirements, material unavailability, and longer than normal delivery times.

  Equipment
  This cost includes the generator and the facility equipment that support the operation of the generator and the distribution of electrical power around the station, as applicable. Engineering and testing services required to ensure that the equipment is properly functioning at the site, training and documentation necessary

to operate and maintain the equipment, and performance guarantees may also be included here.

Owner's Cost
Owner's costs for the facility are all the costs necessary for the design, permitting, procurement, construction, and commissioning of the facility and for the preparation of the Proposal that are not included in the major contracts (i.e. EPC). The Companies' Labor includes Project Management, Station Operator training and commissioning, Environmental, Safety, Legal, Corporate Communications, Community and Government Relations, Engineering, and Regulatory Affairs. Company Labor for the preparation of the Proposal is also included here. For purposes of recovery, only the incremental costs of Labor will be subject to separate recovery.

- Outside Services - This line item, to the extent applicable, should include costs such as:
    - Construction Management to oversee the EPC contractor
    - Legal for the preparation of the Environmental Impact Statement and PUC process
    - Engineering for development and evaluation of the project technical specifications, Interconnection Requirements Study (IRS) and emissions testing
    - Environmental to conduct the Environmental Impact Statement (EIS) and Air Permit consulting
    - General Services such as surveys, land appraisals, Environmental Condition Reports, public relations, office trailer rental, archeological services, landscaping, miscellaneous permits, builder's risk insurance, switchgear testing, hazard analysis, painting, monitoring services, and moving costs.
    - Material costs including spare parts, furnishings, IT equipment, appliances, generator system initial fills (fuels, oils, water), and telecommunications equipment for the station.
    - Travel costs required to inspect other similar facilities, observe final acceptance testing of critical equipment, and station operators' factory training

- Interconnection – This line item covers all interconnection costs that a similarly situated IPP would be responsible for as described in RFP Section 2.3.5, and to the extent applicable, should include costs such as:

    Transmission Line
    The cost estimate includes the design, procurement, and construction of any new transmission infrastructure needed to interconnect with the designated substation.

Switchyard
Work at the switchyard will include design, procurement, and construction of the switchyard and the interfaces between the high voltage terminals of the generator step-up transformers and the transmission line to which it will be connected. Site preparation of the switchyard and the design, procurement, and installation of the step-up transformers located in the switchyard, are typically included in the EPC contract.

Substation
Work at the designated substation that will include the design, procurement, and construction of the interfaces between the new transmission line and the substation buswork to which it will be connected.

Telecom
Accounts for direct labor, materials, and outside services to install telecommunication requirements for the project.

Project Management
Cost estimate of the project management design, procurement, contracting, and scheduling efforts for the interconnection only. Project management costs for the facility are included in the Owner's Cost estimate above.

- Overhead Costs

Overhead costs for the proposed facility will be estimated by the Company's budgeting software (UI Planner) and represent an allocation for those Company costs that are not attributable to any particular project or operation, but are essential nonetheless. Overheads are comprised of non-productive wages (such as holiday, sick, and vacation pay), employee benefits, payroll taxes, corporate administrative costs, and clearing costs.

- Allowance for Funds Used During Construction ("AFUDC")

The AFUDC will be calculated using the Company's budgeting software (UI Planner) and represents the cost of capital funding for the Project. The Company strives to minimize the cost of the AFUDC by ensuring that Project elements that are used or useful are placed in service as soon as possible, as well as minimizing the amount of time that AFUDC can accumulate, by minimizing the amount of time between expenditures on Project elements and their placement in service.

The Hawaiian Electric Proposal will include a Revenue Requirement for each year, which is calculated from the total project capital cost to determine the revenues needed to recover the cost of the project. The value of the Revenue Requirement Calculation for the Total Hawaiian Electric Proposal Project Capital Cost will be included in the Levelized Price calculation described below.

Annual O&M

The cost for ongoing O&M (fixed and variable) will be a component of the Revenue Requirement. All O&M should be included in this category, unless captured elsewhere in the Revenue Requirement Calculation, including but not limited to annual O&M expense to maintain facility; property taxes (if applicable), and insurance. As described in RFP Appendix G, a Hawaiian Electric Proposal will be required to cap its O&M costs at the amount included in the Proposal. Only actual costs will be recovered if such actual costs are lower than the maximum amounts in the Proposal.

Annual Revenue Requirement

The Hawaiian Electric Proposal will include a Revenue Requirement for each year, which is calculated from the total project capital cost to determine the revenues needed to recover the cost of the project. The value of the Revenue Requirement Calculation for the Total Hawaiian Electric Project Capital Cost will be included in the Levelized Price calculation.

The following is a narrative description of the proposed revenue requirement calculation and significant assumptions that the Hawaiian Electric Proposal should account for. The objective of a revenue requirement analysis is to illustrate the annual revenue requirements (ARR) for a utility Hawaiian Electric Proposal.

Revenue Requirement is defined as a calculated value which represents the estimated revenues needed from ratepayers which would allow the Company to recover its capital investment and expenses, honor its debt obligations, pay its revenue and income tax liabilities and pay its preferred shareholders while providing a fair return to its common shareholders for their investment. Specific factors or assumptions related to that particular project will be included in the analysis.

The purpose of a revenue requirement calculation is to determine the annual and total revenue requirements of a capital investment and annual O&M expense needed from customers. The ratemaking formula for revenue requirements is shown below.

$$RR = O + T + D + r(RB)$$

Where: RR = Revenue Requirements
O = Operating and Maintenance Expense
T = Tax Expense (Income and Revenue)
D = Depreciation Expense
r = Rate of Return on Rate Base
RB = Rate Base

The Company, in conjunction with the Independent Observer, may also conduct a risk assessment of the Hawaiian Electric Proposal to ensure an appropriate level of customer cost protection measures are included in such proposal.

APPENDIX G ATTACHMENT 1 – HAWAIIAN ELECTRIC DEVELOPMENT TEAM CERTIFICATION

Name of Hawaiian Electric Development Team Contact: _____

Unique Name of Facility: _____

This Hawaiian Electric Development Team Certification for Maui Electric Company, Ltd.'s, ("Company") Proposal in response to the Company's Request for Proposals for Renewable Dispatchable Generation and Energy Storage ("RFP") is made as of the date stated below.

A. COMPLIANCE WITH THE RFP AND CODE OF CONDUCT

Except as specified in Exhibit 1 attached to this Certification, the Hawaiian Electric Development Team certifies and acknowledges that it will/has:

1. Adhered to the terms of the RFP applicable to the Hawaiian Electric Development Team, including but not limited to: Section 1.7 (proposal submittal requirements), Section 1.7.4 (certification of non-collusion), Section 1.9 (Procedures for any Hawaiian Electric Proposal or Affiliate Proposals), and Section 3.4.4 (authorized signatory);

2. Adhered to the technical requirements of the RFP, excluding however those requirements inapplicable to the Hawaiian Electric Development Team such as execution of the Stage 3 Contract, pricing formula requirements for independent power producer proposals, submission of a Proposal Fee, dispute resolution, credit requirements, selection of a priority list, and submission of a best and final offer;

3. Complied with the Company's Code of Conduct Procedures Manual, attached as Appendix C to this RFP, with particular attention to the Communications Protocols described in Section C therein with respect to communication with the Company RFP Team.

B. INDEPENDENT INVESTIGATION

The Hawaiian Electric Development Team further certifies and acknowledges that it will/has:

1. Submitted the Hawaiian Electric Proposal based on its own investigations, examinations and determinations, including assessments of any risks that could have an effect on its obligations under the Hawaiian Electric Proposal.

2. Carefully examined the RFP documents and its appendices and has a clear and comprehensive knowledge of what is required of a Proposer under the RFP, and correspondingly, what is required of the Hawaiian Electric Development Team.

3. Examined and understands the technical requirements, schedule and evaluation process as it is laid out in the RFP.

C. COST PROPOSAL ACKNOWLEDGEMENTS

The Hawaiian Electric Development Team acknowledges and agrees that:

1. Recovery for Project capital costs and O&M costs will be capped at the amount included in the Hawaiian Electric Development Team's Proposal.

2. Only actual capital costs and O&M costs will be recovered even if such actual costs are lower than the Hawaiian Electric Development Team's proposed maximum amounts.

3. Costs of developing the proposal must be included in the Hawaiian Electric Proposal for evaluation purposes only. Only the incremental costs of developing the Hawaiian Electric Development Team's proposal will be charged to the project and passed through to customers. Incremental costs for Hawaiian Electric Proposals not serving as the Parallel Plan and which are not selected to the Final Award Group will not be recoverable from the Companies' customers.

D. ADHERENCE TO PPA REQUIREMENTS AND MILESTONES

The Hawaiian Electric Development Team acknowledges and agrees that:

1. The Hawaiian Electric Proposal will be consistent with the scope of work and responsibilities of the "Seller" under the terms of the applicable model Stage 3 Contract excluding inapplicable terms related to commercial and legal interactions between the Seller and the Company.

2. The Hawaiian Electric Proposal Facility will be designed and constructed to:

    a. Achieve the Performance Standards identified in Attachment B, Section 3 of the applicable model Stage 3 Contract, as modified by the IRS (subject to reasonable adjustment agreeable to the Company consistent with the Company's negotiation of such performance standards that would be completed with an independent power producer under similar circumstances);

    b. Meet the performance metrics as specified in the applicable model Stage 3 Contract.

        b.1. For facilities with a photovoltaic generation component, (i) PV System Equivalent Availability Factor, and (ii) Measured Performance Ratio;
        b.2. For facilities with a wind generation component, (i) Modified Pooled OMC Equipment Availability Factor, (ii) Performance Index, and (iii) Balance of Plant Efficiency Ratio;
        b.3. For Storage facilities (paired storage or standalone storage), (i) Storage Annual Equipment Availability Factor, (ii) Storage Annual Equivalent Forced Outage Factor, and (iii) Storage Capacity Ratio;

    c. Pass the Acceptance Test specified in the applicable Acceptance Test General Criteria section of the applicable model Stage 3 Contract;

    d. Pass the Control System Performance Test specified in the applicable Control System Acceptance Test Criteria section of the applicable model Stage 3 Contract;

e. If applicable, pass the On-line Performance Test specified in the applicable BESS Capacity Test section of the applicable model Stage 3 Contract;

f. If applicable, achieve a Demonstrated Capacity equal to or greater than that indicated in the Hawaiian Electric Proposal as measured pursuant to the applicable BESS Capacity Test section of the applicable model Stage 3 Contract;

g. Meet the project milestones identified in the Hawaiian Electric Proposal no later than the dates specified therein, which shall be consistent with the guaranteed project milestones required in the Guaranteed Project Milestones section of the applicable model Stage 3 Contract (subject to reasonable adjustment agreeable to the Company consistent with the Company's negotiation of such milestones that would be completed with an independent power producer under similar circumstances). Notice of completion of milestones and any delay will be provided to PUC and Consumer Advocate.

h. Achieve the reporting milestones identified in the Hawaiian Electric Proposal no later than the dates specified therein, which shall be consistent with the reporting milestones required in the Reporting Milestones of the applicable model Stage 3 Contract (subject to reasonable adjustment agreeable to the Company consistent with the Company's negotiation of such milestones that would be completed with an independent power producer under similar circumstances). Notice of completion of milestones and any delay will be provided to PUC and Consumer Advocate.

i. Will be subject to the applicable liquidated damages for the Stage 3 Contract provisions above. These liquidated damages would be paid from shareholder funds and would be passed through to customers through the Companies' Power Purchase Adjustment Clause or other appropriate rate adjustment mechanisms. Notice of any liquidated damages assessed and amounts of such liquidated damages will be provided to PUC and Consumer Advocate.

j. Will reconfirm requirements in GO7 application and any resulting approval order for such application.

k. Will provide annual report to PUC and Consumer Advocate on performance metrics.

E. DECLARATION AND SIGNATURE

1. The individual(s) that has (have) signed this Hawaiian Electric Development Team Certification is (are) duly authorized by the Hawaiian Electric Development Team to execute such on behalf of the Hawaiian Electric Development Team; and

2. All statements, specifications, data, confirmations and other information set out in this Hawaiian Electric Development Team Certification are complete and accurate in all material respects.

IN WITNESS WHEREOF, the HAWAIIAN ELECTRIC DEVELOPMENT TEAM hereby makes the certifications, acknowledgements and agreements stated herein as of the date stated under the signature of its authorized representative:

Dated at _____, _____ this _____ day of _____ 20_____.

_____
Signature of Hawaiian Electric Development Team Representative

_____
Name of Hawaiian Electric Development Team Representative (please print)

_____
Title of Hawaiian Electric Development Team Representative (please print)

EXHIBIT 1

EXCEPTIONS TO
PART A. COMPLIANCE WITH THE RFP AND CODE OF CONDUCT

1. With respect to Part A., Item 1:

   Adhered to the terms of the RFP applicable to the Hawaiian Electric Development Team, including but not limited to: Section 1.7 (proposal submittal requirements), Section 1.7.4 (certification of non-collusion), Section 1.9 (Procedures for any Hawaiian Electric Proposal or Affiliate Proposals), and Section 3.4.4 (authorized signatory);

   The Hawaiian Electric Development Team discloses the following exceptions:

   Prior to March 15, 2023, members of the Hawaiian Electric Development Team serving on the Company's Contingency Plan team were provided access to proprietary information and analyses which would typically not occur until after selection in the competitive evaluation process. Instead, because such information was provided for the Contingency Plan, which necessarily may now become the Hawaiian Electric Proposal, this information and analyses were provided to the Hawaiian Electric Development Team earlier than would normally be provided, which is not in accord with Section 1.9.1 of the RFP, which requires measures to safeguard against and address concerns associated with (1) preferential treatment of the Hawaiian Electric Proposal or members, agents, or consultants of the Company formulating the Hawaiian Electric Development Team; and (2) preferential access to proprietary information by the Hawaiian Electric Development Team.

   Preferential treatment and access to such proprietary information has been mitigated by Hawaiian Electric by disclosing such information to potential bidders pursuant to NDAs and extending the RFP timeframe to allow Proposers to review and utilize such information. This information includes: (1) a preliminary single line diagram and notes to show where two generators could be connected to the Waena Switchyard; (2) information on available capacity at the Waena site; (3) information on generator capacity factor estimation and resource adequacy sensitives; (4) information on the interconnection requirements study process; and (5) production simulation of one potential 40 MW project configuration for indicative future system fuel consumption data for greenhouse gas calculations.

2. With respect to Part A, Item 3:

   Complied with the Company's Code of Conduct Procedures Manual, attached as Appendix C to this RFP, with particular attention to the Communications Protocols described in Section C therein with respect to communication with the Company RFP Team

   The Hawaiian Electric Development Team discloses the following exceptions:

   Prior to March 15, 2023, members of the Hawaiian Electric Development Team and the Hawaiian Electric RFP Team, while members of the Company's Contingency Plan Team, communicated directly, in person and via email and other communication methods. As the Stage 3 RFP communication restrictions, as specified in the Stage 3 Code of Conduct Procedures Manual, had already been put in place, such communications between the Hawaiian Electric RFP Team and the Hawaiian Electric Development Team, were made outside of the Stage 3 RFP Code

of Conduct restrictions, which requires all communications to be completed through the dedicated RFP mailbox established for the Stage 3 RFP.

REQUEST FOR PROPOSALS

FOR

FIRM RENEWABLE DISPATCHABLE GENERATION

ISLAND OF MAUI

MAY 19, 2023

Docket No. 2017-0352

Appendix H – Interconnection Facilities Cost and Schedule Information

Maui Electric

TABLE OF CONTENTS

To assist Proposers in estimating costs of potential projects, the information provided in this document can be used to approximate the cost for Company-Owned Interconnection Facilities (COIF), including substation, telecommunications, security, transmission and distribution lines, and project management.

Tariff Rule No. 19, approved by the PUC, establishes provisions for Interconnection and Transmission Upgrades (https://www.hawaiianelectric.com/billing-and-payment/rates-and-regulations/). The tariff provisions are intended to simplify the rules regarding who pays for, installs, owns, and operates interconnection facilities in the context of competitive bidding. Tariff Rule No. 19 and applicable RFP requirements will be utilized as the basis for addressing interconnection and transmission upgrades for any projects developed. Proposers will comply with the terms and conditions as specified therein.

SECTION 1 – COST RESPONSIBILITIESWA

The purpose of Section 1 is to clearly define the cost responsibilities of construction, replacements, and upgrades of Company-Owned Interconnection Facilities (COIF) and existing Company-owned facilities in compliance with Tariff Rule No. 19.

1.1 – DEFINITIONS

1. Betterment – Any upgrading to a facility made solely for the benefit of and at the election of the Company and is not required by applicable laws, codes, Company Standards, and the interconnection requirements in accordance with Tariff Rule No. 19.
2. Company – Hawaiian Electric, Maui Electric, or Hawai‘i Electric Light.
3. Company-Owned Interconnection Facilities – The equipment and devices owned by Company that are required to permit a generating facility to operate in parallel with and deliver electric energy to Company’s system and provide reliable and safe operation of, and power quality on, Company’s system.
4. Grid Connection Point – The point that the new interconnection facilities associated with the Proposer’s project interconnects to the Company’s existing electrical grid.
5. Interconnection Agreement – The executed contract between the Company and Proposer (e.g., Power Purchase Agreement, Standard Interconnection Agreement, etc.).
6. Point of Interconnection – The point of delivery of energy supplied by Proposer to Company, where the Facility owned by the Proposer interconnects with the facilities owned or to be owned by the Company.
7. Proposer – The developer proposing a renewable project in response to a Company RFP.

1.2 – ABBREVIATIONS

1. ADSS – All Dielectric Self-Supporting
2. COIF – Company-Owned Interconnection Facilities
3. CT – Current Transformer
4. DFR – Digital Fault Recorder

5. DTT – Direct Transfer Trip
6. FS – Facility Study
7. GCP – Grid Connection Point
8. HVAC – Heating, Ventilation, and Air Conditioning
9. IRS – Interconnection Requirements Study (includes both SIS and FS)
10. NDA – Non-Disclosure Agreement
11. OPGW- Optical Ground Wire
12. POI – Point of Interconnection
13. PT – Potential Transformer
14. RTU – Remote Terminal Unit
15. SCADA – Supervisory Control and Data Acquisition
16. SIS – System Impact Study
17. UFLS – Under-Frequency Load Shed

1.3 – FACILITIES AT PROPOSER SITE

1. Proposer shall be responsible for all costs related to COIF at the Proposer site required by any relevant Rule or Tariff, Request for Proposal, and/or the IRS. This may include, but is not limited to:
   a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
   b. Site work (grading, trenching, manholes/handholes, conduits, cable trench, concrete pads/foundations, fencing, roadways/driveways, ground grid, lighting, etc.)
   c. Substation structures, design, and configuration (i.e., breaker and a half, ring bus, etc.)
   d. Control equipment enclosure/cabinet
   e. Equipment (circuit breakers, transformers, relays, switches, arresters, batteries, HVAC, RTU, DFR, DTT, meters, PTs, CTs, etc.)
   f. Telecommunication equipment (See Telecommunication Facilities section below)
   g. Electrical work (bussing, wiring, lightning protection, fiber optic cable, etc.)
   h. Security systems/equipment
2. Company shall be responsible for Betterment costs.

1.4 – PROPOSER FACILITY SERVICE POWER AND COMPANY SWITCHING STATION POWER

1. For all distribution-level service power, Proposer shall submit an Electrical Service Request Form via www.hawaiianelectric.com. Please refer to the Large Customer New Service Request brochure for milestones and estimated timeline.
2. Proposer shall be responsible for all costs related to providing service power to the Proposer's facility. Facility service power is NOT a part of COIF, but Proposers should account for it in the total costs to build the project.
3. Station power is required if a new Company switching station or substation is built to allow the interconnection of the Proposer's project. If station power is required, the

Proposer shall be responsible for all costs related to the primary and backup station power sources. This may include, but is not limited to:

a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
b. Overhead electrical facilities (poles, conductor, insulators, crossarms, guy wires, transformers, etc.)
c. Underground electrical facilities (cables, splices, termination, grounding, transformers, switchgears, etc.)
d. Step-down transformer
e. Civil/structural work (survey, grading, trenching, conduits, manholes/handholes, concrete pads, concrete pier foundations, pole hole excavation, etc.)
f. Vegetation trimming and traffic control

4. Options for primary station power sources for the Company's various switching station voltages are:
   a. Tap off the bus through a step-down transformer for 23kV through 69kV
   b. 12kV line extension and service transformer for 23kV through 138kV
   c. Gensets are not an allowable substitute for the above options
5. Proposer shall be responsible for obtaining all permitting and land rights.

1.5 – REMOTE SUBSTATION FACILITIES

1. Proposer shall be responsible for all costs for work at remote substations caused by the interconnection of Proposer's project. This may include, but is not limited to:
   a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
   b. Site work (grading, trenching, manholes/handholes, conduits, cable trench, concrete pads/foundations, fencing, roadways/driveways, ground grid, lighting, etc.)
   c. Substation structures
   d. New control equipment cabinet or existing enclosure expansion
   e. Equipment (circuit breakers, transformers, relays, switches, arresters, batteries, HVAC, DFR, DTT, meters, PTs, CTs, etc.)
   f. Electrical work (bussing, wiring, lightning protection, fiber optic cable, etc.)
   g. Telecommunications equipment
   h. Company has completed a high-level analysis to determine anticipated remote substation requirements prior to the RFP. Proposer may ask Company for a list of those requirements based on Proposer's indicated interconnection point after Proposer has signed a Non-Disclosure Agreement (NDA). Such requirements will be confirmed in the Interconnection Requirements Study.
2. Company shall be responsible for the following costs:
   a. Betterment
   b. Changes to the Under-Frequency Load Shed (UFLS) scheme

1.6 – INTERCONNECTION TO SPECIFIC COMPANY SITES

1. Proposer shall be responsible for all costs related to COIF required at the Company's site by any relevant Rule or Tariff, Request for Proposal, and/or the IRS. This may include, but is not limited to:
    a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
    b. Site work (grading, trenching, manholes/handholes, conduits, cable trench, concrete pads/foundations, fencing, roadways/driveways, ground grid, lighting, etc.)
    c. Substation structures, design, and configuration (i.e., breaker and a half, ring bus, etc.)
    d. Control equipment enclosure/cabinet
    e. Equipment (circuit breakers, transformers, relays, switches, arresters, batteries, HVAC, RTU, DFR, DTT, meters, PTs, CTs, etc.)
    f. Telecommunication equipment (See Telecommunication Facilities section below)
    g. Electrical work (bussing, wiring, lightning protection, fiber optic cable, etc.)
    h. Security systems/equipment
2. Company shall be responsible for Betterment costs.

1.7 – LINE EXTENSION FROM GRID CONNECTION POINT (GCP) TO PROPOSER SITE

1. Proposer shall be responsible for all costs related to the line extension between the GCP and the Proposer site. This may include, but is not limited to:
    a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
    b. Overhead electrical facilities (poles, conductor, insulators, crossarms, guy wires, etc.)
    c. Underground electrical facilities (cables, splices, terminations, grounding, transformers, switchgears, etc.)
    d. Civil/structural work (survey, grading, trenching, conduits, manholes/handholes, concrete pads, concrete pier foundations, pole hole excavation, etc.)
    e. Company fiber (ADSS fiber, OPGW shieldwire, splice boxes, etc.)
    f. Vegetation trimming and traffic control
2. The Company shall be responsible for the following costs:
    a. Betterment

1.8 – T&D SYSTEM UPGRADES

1. Proposer shall be responsible for all costs related to system upgrades or changes required to accommodate the Proposer's project (e.g., reconductoring or recircuiting of existing lines that do not have the required ampacity, re-fusing or re-programming of protective devices upstream of the GCP, etc.).

1.9 – COMPANY-OWNED FIBER

1. If Company-owned fiber is used to satisfy the communications requirements in the IRS, then the Proposer shall be responsible for all costs related to routing the ADSS fiber or OPGW from the nearest existing splice point to the Proposer site. This may include, but is not limited to:
    a. Project management, design, permitting/regulatory fees and approvals, land rights, installation labor, inspection, construction management, and testing
    b. Company fiber-optic cable (ADSS fiber cable or OPGW shieldwire) and associated equipment/hardware (splice boxes, innerduct, vibration dampers, etc.)
    c. Splicing and Testing of fiber strands
    d. Pole replacements and additional equipment if needed for additional capacity
    e. Civil/structural work (survey, grading, trenching, conduits, manholes/handholes, concrete pads, concrete pier foundations, pole hole excavation, etc.)
    f. Vegetation trimming and traffic control
2. Company will provide the location(s) of the nearest fiber splice point(s) after the Proposer has signed a Non-Disclosure Agreement (NDA).
3. Company shall be responsible for Betterment costs.

1.10 – TELECOMMUNICATION FACILITIES

1. Telecommunication Cabinet
    a. If a control equipment enclosure will not be built, the Proposer shall be responsible for all costs related to installing a telecommunication cabinet required to accommodate the telecommunication equipment at the Proposer's facility. This may include, but is not limited to equipment racks and ancillary infrastructure, 48V DC Power System (includes 48V DC Charger w/ at least 12-hr battery backup), alarming, and air conditioning.
2. Telecommunication Power
    a. Proposer shall be responsible for all costs related to providing reliable 48V DC power to Company equipment at a new Company switching station or a Proposer-owned station. This may include, but is not limited to battery racks, banks, fuse panels, and associated power system equipment.
3. Fiber Termination Equipment
    a. If Company-owned fiber is used to satisfy the communication requirements in the IRS, then the Proposer shall be responsible for all costs related to terminating the ADSS fiber or OPGW at the new Company switching station and point of interconnection to Company's existing system. This may include, but is not limited to a fiber termination panel and associated equipment/hardware (fiber guide, splice trays, connectors, etc.).
4. Microwave Radio or Wireless Radio
    a. If Company-owned microwave radio (6GHz, 10/11 GHz, etc.) or Company-owned wireless radio (900MHz, 450MHz, etc.) is used to satisfy the communications requirements in the IRS, then the Proposer shall be

responsible for all costs related to installing the microwave or wireless radio/link at the new Company switching station and remote site(s). This may include, but is not limited to:

i. Pre-design requirements (path survey/engineering, FCC frequency coordination, licensing, filings, EME study if required, etc.)
ii. Project management, design, permitting, regulatory fees and approvals, land rights, labor, inspection, construction management, and testing
iii. Pole or tower facilities to support the microwave dish and its connection to the microwave equipment (waveguide, cables, conduit, etc.)
iv. Civil/structural work (survey, grading, trenching, conduits, manholes/handholes, concrete pads, concrete pier foundations, pole hole excavation, etc.)
v. Antenna system design and installation

5. Leased Service
   a. If 3rd party leased service will provide telecommunication connectivity to the new Company switching station, then the Proposer shall be responsible for all costs related to ordering and installing the leased service at the site. This may include, but not be limited to the initial cost to establish the leased line(s) required for the project, monthly recurring leased cost of the service(s), and on-going maintenance of the service(s).
6. Telecommunication Service Equipment
   a. Telecommunication equipment is required to provide circuits to support the various applications at the new Company switching station. The Proposer shall be responsible for all costs related to installing the telecommunication equipment. This may include, but is not limited to:
      i. Project management, design, installation, and testing
      ii. Telecommunication routers, multiplexors, and associated equipment/hardware

1.11 – CONTROL SYSTEM ACCEPTANCE TEST (CSAT)

1. Proposer shall be responsible for all costs related to the CSAT, including all Company costs in support of the Proposer's CSAT.

1.12 – PROPOSER PAYMENTS

1. The Company shall require upfront payment prior to the commencement of any phase of work based on an estimate of Company costs for that phase. A true-up at the end of the project shall be completed and a refund or bill shall be processed in accordance with the Interconnection Agreement when necessary.
2. Proposer is also responsible for payments to the Company related to service contracts for service power.

SECTION 2 – INTERCONNECTION REQUIREMENTS AND COSTS

The information in Section 2 is based on typical interconnections as shown in the Attachments referenced. Conceptual design is not intended to cover all interconnection requirements. Final interconnection design will be subject to the results of a technical review. The per-unit cost figures below should not be used to create a detailed project estimate. A detailed project estimate typically requires a certain level of engineering to assess project site conditions and to factor in other parameters specific to the project.

The Proposer should identify the components assumed for their project and the quantity assumed for each. Each table below provides notes on the assumptions for each of the unit cost estimates. If a Proposer's project requirements are different than what is assumed in the notes, the Proposer should identify each difference and provide an estimated additional cost or savings resulting from those differences. Please see Attachment 1 for examples of how to apply the per-unit costs provided. All costs provided are Company costs only and do not include costs related to Proposer responsibilities including, but not limited to, permitting, land rights, community outreach, biological and/or cultural (archeological) surveys. Proposers should do their own due diligence for these costs.

For the purposes of Section 2, voltages are classified as follows:

- Transmission – 69kV

2.1 – SUBSTATION & METER BASELINE COSTS

A. Not Used

B. Not Used

C. Typical Transmission Interconnection

The costs in Section 2.1C are reflective of typical standard interconnections to existing circuits at transmission voltages. Costs for interconnection to specific Company sites are shown in Section 2.2. Costs are for Proposer-Build projects.

Item	Description	Cost
At New 69kV Switching Station		
30	Attachment 2 – 69kV Interconnection to an Existing Circuit	$875,000
Remote Sub Work		
34a	DTT for anti-islanding	$108,000

Notes:

a) Costs provided are in 2022 dollars.
b) Includes Company costs for engineering, materials, construction, and testing for Company-responsible items (See Section 3) related to Substation & Meter components as shown in the referenced attachment.

Item	Description	Cost
	c) Item 30 is required for all interconnections to existing 69kV lines. Please contact Company for more information on if Items 34a-c are required for a proposed GCP. d) Does NOT include T&D, Project Management, Telecommunications, or Security costs. e) Civil infrastructure and space for COIF for Item 30 provided by Proposer. f) Substation relay protection requirements have not been identified so costs are based upon typical line protection relaying requirements. g) Does not include costs for permitting, land rights, or a Relay Coordination Study. h) For T&D costs (including service power costs) – See Section 2.3. i) For Project Management costs – See Section 2.4. j) For Telecommunications costs – See Section 2.5. k) For Security requirements – See Section 2.6.	

2.2 – INTERCONNECTION TO SPECIFIC COMPANY SITES

Section 2.2 includes baseline costs for interconnection at specific Company sites identified in the RFP. Attachments 3 and 4 of Appendix H will be provided to Prospective Proposers who request the information via the communication method identified in Section 1.6 of the RFP and upon execution of an NDA as specified in Section 3.12.1 of the RFP. If a site is not specifically identified in the RFP, please use the typical costs in the previous sections for the applicable voltage and project size. Costs are for Proposer-Build projects. See Section 3 for responsibilities.

A. Lahainaluna Substation

Please refer to Attachment 3 for a single line diagram depicting the required interconnection to the Company's system at Lahainaluna Substation. Costs shown assume a Proposer-Build project.

Item	Description	Cost
41a	Company work for components at the Project Site on the Company side of the demarcation as shown in Attachment 3	$379,000
41b	Company work for components at Lahainaluna Substation as shown in Attachment 3	$1,757,000
Notes: a) Costs provided are in 2022 dollars. b) Includes Company costs for engineering, materials, construction, and testing for Company-responsible items (See Section 3) related to Substation & Meter components as shown in the referenced attachment. c) Does NOT include T&D, Telecommunications, or Security costs. d) Civil infrastructure and space for COIF for Item 41a provided by Proposer. e) Substation relay protection requirements have not been identified so costs are based upon typical line protection relaying requirements. f) Does not include costs for permitting, land rights, or a Relay Coordination Study.		

Item	Description	Cost
	g) For T&D costs (including service power costs) – See Section 2.3. Add Item 131 for T&D Baseline cost. h) For Project Management costs – See Section 2.4. i) For Telecommunications costs – See Section 2.5. j) For Security requirements – See Section 2.6. k) For typical durations to support Proposer-Build facilities – See Section 4.3. l) For additional durations to interconnect at Lahainaluna Substation – See Section 4.4.	

B. Kealahou Substation

Please refer to Attachment 4 for a single line diagram depicting the required interconnection to the Company‘s system at Kealahou Substation. Costs shown assume a Proposer-Build project.

Item	Description	Cost
42a	Company work for components at the Project Site on the Company side of the demarcation as shown in Attachment 4	$379,000
42b	Company work for components at Kealahou Substation as shown in Attachment 4	$1,757,000
Notes: a) Costs provided are in 2022 dollars. b) Includes Company costs for engineering, materials, construction, and testing for Company-responsible items (See Section 3) related to Substation & Meter components as shown in the referenced attachment. c) Does NOT include T&D, Telecommunications, or Security costs. d) Civil infrastructure and space for COIF for Item 42a provided by Proposer. e) Substation relay protection requirements have not been identified so costs are based upon typical line protection relaying requirements. f) Does not include costs for permitting, land rights, or a Relay Coordination Study. g) For T&D costs (including service power costs) – See Section 2.3. Add Item 131 for T&D Baseline cost. h) For Project Management costs – See Section 2.4. i) For Telecommunications costs – See Section 2.5. j) For Security requirements – See Section 2.6. k) For typical durations to support Proposer-Build facilities – See Section 4.3. l) For additional durations to interconnect at Kealahou Substation – See Section 4.4.		

C. Waena Switchyard – FIRM GENERATION ONLY

Please refer to Attachment 5 for a single line diagram depicting the required interconnection to the Company’s system at Waena Switchyard. Costs shown assume a Proposer-Build project.

Item	Description	Cost
50a	Company work for components at the Proposer's substation for monitoring and control	$386,000 /site
50b	Company work for components at Waena Switchyard as shown in Attachment 5	$1,176,000 /interconnection

Notes:

a) Costs provided are in 2023 dollars.
b) Includes Company costs for engineering, materials, construction, and testing for Company-responsible items (See Section 3) related to Substation & Meter components as shown in the referenced attachment.
c) Does NOT include T&D, Telecommunications, or Security costs.
d) Item 50a required if Proposer's substation is not located adjacent to Waena Switchyard.
e) Civil infrastructure and space for COIF for Item 50a provided by Proposer.
f) Substation relay protection requirements have not been identified so costs are based upon typical line protection relaying requirements.
g) Does not include costs for permitting, land rights, or a Relay Coordination Study.
h) For T&D costs (including service power costs) – See Section 2.3. Add Item 131 for T&D Baseline cost.
i) For Project Management costs – See Section 2.4.
j) For Telecommunications costs – See Section 2.5.
k) For Security requirements – See Section 2.6.
l) For typical durations to support Proposer-Build facilities – See Section 4.3.
m) For additional durations to interconnect at Waena Switchyard – See Section 4.4.

2.3 – T&D BASELINE AND LINE EXTENSION COSTS

A. Not Used

B. Not Used

C. Typical Transmission Interconnection Baseline

The costs in Section 2.3C are the baseline T&D costs for interconnections at transmission voltages. It includes 100ft of OH or UG line extension. For any extensions > 100ft, please add costs per Section 2.3D. Costs are for Proposer-Build projects.

Item	Description	Cost
130	69kV OH Final Tap by Company (Attachment 2) • Includes 2 wood poles, 1 span (100ft) OH line extension from each new pole toward Proposer facility and the removal of existing conductors between the new poles	$144,000

Item	Description	Cost
131	69kV OH Final Span for Termination to Existing Substation by Company (Attachments 3-4) • Includes 1 span (100ft) of 69kV conductors and 2 spans (100ft each) of shield wire from last pole to substation termination structure	$59,000 each

Notes:
a) Costs provided are in 2022 dollars.
b) Includes Company costs for engineering, materials, construction, and testing of Company-responsible items. See Section 3 for Proposer-Build responsibilities.
c) Interconnection will typically require one of these items depending on the existing facilities in the area and/or the type of construction for any line extension.
d) OH or UG line extensions (if > 100ft) – Add applicable costs per Section 2.3D.
e) OH/UG route and civil infrastructure drawings provided by Proposer.
f) Civil infrastructure (pads, MH/HHs, conduits, etc.) is designed, procured, and installed by Proposer.
g) Includes review of Proposer civil infrastructure designs and materials and inspection of Proposer civil infrastructure construction.
h) Does not include vegetation clearing, grading, dewatering, permitting or land rights.

D. Line Extensions and Upgrades

The costs in Section 2.3D are typical per unit costs for T&D line extensions using typical assumptions based on the Company's current standards and practices. Costs are for Proposer-Build projects.

69kV

Item	Description	Cost
160	Additional 100ft 69kV OH Line Extension	$3,300 each
161	Additional 100ft 69kV UG Line Extension	$5,700 each
165	69kV overbuild on existing accessible 12kV (200ft spans)	$1,293,000 / mile
166	69kV overbuild on existing inaccessible 12kV (250ft spans)	$2,191,000 / mile
170	Upgrade existing 69kV OH lines (250ft spans, accessible)	$744,000 / mile

Notes:
a) Costs provided are in 2022 dollars.
b) OH/UG route and civil infrastructure drawings provided by Proposer.
c) Civil infrastructure (pads, MH/HHs, conduits, etc.) designed, procured, and installed by Proposer.
d) Does not include vegetation clearing, grading, dewatering, permitting or land rights.
e) Includes Company costs for Company-responsible items – See Section 3.
f) Items 160 and 161 should be added to the T&D baseline costs for each additional 100ft of Proposer-Build OH or UG line that does not involve Company's existing energized facilities. Includes review and inspection of Proposer design/construction.
g) Items 165 and 166 includes Company costs to design/construct an OH line extension above Company's existing energized facilities and assumes all poles need to be replaced.

Item	Description	Cost
	h) Item 170 includes Company costs to reconductor an existing Company line to a larger size as determined by the SIS and assumes no poles need to be replaced.	

E. Service Power

Section 2.3E provides typical requirements and costs for distribution-level service power to the Proposer's facility and/or the proposed Company switching station. Execution of a proposal letter provided by Company in response to Proposer's electrical service request, and separate from the Interconnection Agreement, will be required for service power.

Service power to the Proposer's facility shall emanate from an existing distribution line via new Company overhead and/or underground facilities to the Proposer's service connection point.

Item	Description	Cost
188	Facility or Station Service Power • Includes 100ft UG 12kV line extension of two (2) feeders and one (1) padmount transformer and assumes no switchgear is required	$84,000 each
189	Distribution OH accessible (200ft spans, #1/0 AAC)	$719,000 / mile
190	Distribution OH underbuild accessible (200ft spans, #1/0 AAC)	$441,000 / mile
191	Distribution OH inaccessible (250ft spans, #1/0 AAC)	$1,382,000 / mile
192	Distribution UG double feeder (200ft spans, #2 AL XLPE)	$1,048,000 / mile
193	Distribution 3ph double riser w/ fuses (including pole/anchor)	$41,000 each

Notes:
a) Costs provided are in 2022 dollars.
b) OH/UG route and civil infrastructure drawings provided by Proposer.
c) Civil infrastructure (pads, MH/HHs, conduits, etc.) is designed, procured, and installed by Proposer.
d) Does not include vegetation clearing, grading, dewatering, permitting or land rights.
e) Includes engineering, materials, construction labor for electrical work, and inspection for UG civil infrastructure.
f) OH line extension – Add applicable costs per Items 189-191.
g) UG line extension (if > 100ft) – Add costs per Item 192.
h) Additional OH/UG transitions – Add costs per Item 193.
i) OH assumes wood poles and 3ph overhead conductor with neutral underbuild.
j) Item 190 assumes no poles need to be replaced.
k) Accessible assumes vehicles can be used during construction.
l) Inaccessible assumes helicopters are needed during construction.

For 69kV interconnections, the cost for primary and backup station power is included in the Substation baseline costs in Section 2.1B and assumes distribution-level service is not needed or preferred for station power.

2.4 – PROJECT MANAGEMENT BASELINE COSTS

Section 2.4 provides typical Project Management costs for interconnection projects which require a dedicated project manager. The total costs will be dependent on the Proposer's schedule and durations for engineering, construction, and testing/closeout.

A. Not Used

B. Not Used

C. Transmission Projects

Item	Description	Cost
197	Engineering Phase • Includes facilitation, coordination, and support for Engineering Design and Procurement periods	$18,300 / month
	Construction Phase • Includes facilitation, coordination, and support from the start of construction through back feed (energization)	$23,000 / month
	Testing/Closeout Phase • Includes facilitation, coordination and support for Developer system testing and CSAT	$11,700 / month
Notes: a) Costs derived using 2022 rates. b) Total costs are tied to schedule and duration of the entire project. c) The Closeout Phase shall extend 4 months past GCOD.		

2.5 – TYPICAL TELECOMMUNICATIONS REQUIREMENTS AND COSTS

Section 2.5 provides typical telecommunications requirements and costs for interconnection projects. The communications equipment will require a communications channel(s). Some options include lease line, fiber, or microwave.

A. Not Used

B. Variable Projects ≥ 1 MW and ≤ 3 MW

1. Primary communications links can consist of lease line, licensed radio, fiber, or microwave.
2. Back-up communications links are optional (can consist of lease line, licensed radio, fiber, or microwave).
3. Additional analog leased telephone lines are required to support revenue meters (Proposer shall do their own due diligence for costs on this).

C. Variable Projects > 3 MW

1. Primary communications links can consist of lease line, fiber, or microwave.
2. Back-up communications links are required (can consist of lease line, licensed radio, fiber, or microwave).
3. Back-up communications links must be transport diverse until the "last mile" for projects greater than 10MW.
4. Additional analog leased telephone lines are required to support revenue meters (Proposer shall do their own due diligence for costs on this).

D. Firm Projects

1. Primary communications links must be Company-owned fiber or microwave.
2. Back-up communications links are required (can consist of leased line or Company-owned fiber or microwave).
3. For interconnection to a new Company switching station, primary and back-up communications links must be transport diverse, with a minimum separation of 6 feet, to the new Company switching station.
4. For interconnection to an existing Company switching station, primary and back-up communications links must be transport diverse, with a minimum separation of 6 feet from the existing Company switching station to the Proposer's substation.
5. Additional analog leased telephone lines are required to support revenue meters (Proposer shall do their own due diligence for costs on this).

E. Projects Interconnecting to a Company Switching Station

1. If Proposer's substation is not adjacent to the proposed Company switching station, then Proposer is responsible for providing the communications links between the two (2) sites.
    a. If Proposer chooses to run fiber between the sites, Proposer will own the fiber from their site up to a splice box immediately outside of the Company switching station ("meet point"). Company will own fiber from the meet point to the termination into the Company switching station – See Item 220.
    b. All UG infrastructure will be designed, procured, and constructed by Proposer.
    c. If interconnection is to a new Company switching station, a communications cabinet may be required at both sites – See Item 202.
    d. If interconnection is to an existing Company switching station, a new communications cabinet will be required at the Proposer's substation and may be required at the existing Company switching station.
2. If Proposer's substation is adjacent to the proposed Company switching station, no additional Company costs are anticipated to be required for the Proposer's substation.

F. Telecommunications Baseline Costs

The costs below are high level per unit costs for communications requirements in support of the Project. Sections 2.5A through 2.5E above provide typical scenarios of when these options may be utilized.

Communications Cabinet or Enclosure

Item	Description	Cost
201	Communications Cabinet with circuits to support SCADA (Projects ≥ 1 MW and ≤ 3 MW) • Projects with SCADA and DTT but no diverse communication circuits	$164,000 / site
202	Communications Cabinet with circuits to support SCADA, Relay Protection, monitoring devices, etc. • Projects with SCADA, DTT, and diverse communication circuits	$192,000 / site

Notes:
a) Costs provided are in 2022 dollars.
b) All projects that require communications will require facilities to store the communications equipment. The examples above are provided but other alternatives may be available upon request.
c) Cabinet is used to support Company equipment and capable of providing communications circuit for SCADA, DTT, monitoring devices, etc.
d) Communications cabinet cost does not include fiber, microwave equipment or lease circuits.
e) Proposer will provide all conduits, foundations, HHs, AC power, grounding as required per Company standards.

Lease Line Options

Item	Description	Cost
205	Lease Line one-time and recurring costs	Will vary based on 3rd party provider

Notes:
a) Add cost of Communications Cabinet – See Items 201-202.
b) Check with Company to understand the current lease line requirements.
c) Communication circuit requirements will be based on applications needed for the project.
d) Company can provide communication circuit interconnection requirements and assist with review of circuit order from the 3rd party provider as needed.
e) Proposer to work directly with 3rd party provider if a lease line circuit is needed.
f) Cost will be the responsibility of the Proposer and is to be negotiated with the 3rd party provider.

Fiber-Optic Cable Option

Item	Description	Cost
210	New Fiber-only pole line (200' avg spans, 60-strand ADSS) • Includes new wood poles	$312,000 / mile
211	Fiber underbuild on new or existing pole line (200' avg spans, 60-strand ADSS) • Assumes no replacements of existing poles are needed	$166,000 / mile

Notes:
a) Costs provided are in 2022 dollars.
b) Add cost of Communications Cabinet – See Items 201-202.
c) Assumes no splices are needed along the route.

Microwave Option

Item	Description	Cost
215	Point-to-Point Microwave Link • Includes 2 each antenna equipment to create a radio link	$697,000 / link
216	50ft Microwave Tower	$612,000 each
217	100ft Microwave Tower	$888,000 each

Notes:
a) Costs provided are in 2022 dollars.
b) Add cost of Communications Cabinet – See Items 201-202.
c) Assumes there is radio line-of-site clearance between the communication endpoints.
d) Assumes FCC licensed microwave frequencies are available.
e) Assumes there are existing structures/buildings with space available on both ends to house the radio equipment.
f) Assumes Telecommunications grounding standards are up to date at both sites.
g) Assumes 48 V DC power with 12-hour battery backup is available.
h) Does not include special site-specific permit/approval activities that may be required including, but not limited to, Neighborhood Board(s), Conservation District Use Application, Environmental Assessment, Shoreline Management Area approval, biological (endangered species or habitat) surveys, and/or cultural (archeological) surveys or the cost of any migration required for approvals to be granted. Proposers should conduct their own due diligence for these costs.
i) Assumes space is available at both ends to construct antenna towers or structures that are rated to survive a Saffir-Simpson category 4 hurricane.
j) Other options for Microwave Towers of varying heights may be available.

Projects Interconnecting to a Company Switching Station Only

Item	Description	Cost
220	Fiber from "meet point" to termination in Company switching station • Assumes 24-strand fiber cable. • Includes splicing, termination, and testing work. • Civil infrastructure (HHs, conduits, etc.) is designed, procured, and installed by Proposer.	$31,000

Item	Description	Cost
Notes: a) Costs provided are in 2022 dollars. b) Required if the Proposer's substation is not adjacent to the Company switching station per Section 2.5E. c) Assumes the "meet point" is within 500ft of the termination in the Company switching station.		

2.6 – TYPICAL SECURITY REQUIREMENTS AND COSTS

Section 2.6 provides typical security requirements and costs for new facilities installed as a part of the interconnection. Security requirements and costs can vary based on many factors including, but not limited to, location, crime rate, environment, aspects of the surrounding area, terrain, accessibility, layout of the facility, etc. The specific requirements for each facility will be subject to final review during the design and engineering phase. Additional information, including the Company's Physical Security Strategy, is available upon request after execution of an NDA with the Company.

A. Proposer Responsibilities at Proposer Facility

The Proposer shall be responsible to incorporate security components and systems for **their facilities** that consider the Security Guidelines for the Electricity Sector (CIP-014-2): Physical Security, as published by the North American Electric Reliability Corporation (NERC) and that at a minimum, meet the requirements below.

For Company-owned facilities within the Proposer's Facility, Company requires:

1. Standard 8ft high security fence with 3-strand barbed wire V-top.
2. Interior mounted 4' high cattle fencing.
3. All gates will be secured using a proprietary padlock system.
4. Proposer-owned cabinets/enclosures housing Company equipment shall be secured with a lock provided by Company.
5. Company requires 24/7 access to Company facilities within the Proposer facility.

B. Proposer Responsibilities for New Company-Owned Substations

Company-owned substations interconnecting firm generation typically require high levels of security due to the critical role they play in the Company's system which may include, but is not limited to:

1. Camera Monitoring – Proposer to procure and install all camera mounts and cameras. Specific models required for cameras, mounts, caps, and other associated hardware will be provided to Proposer after an NDA is executed with the Company. Company's Security Integrator will terminate cables, adjust, and optimize as needed.
2. Electronic Card Access System – For control & microwave houses, Proposer procures/mounts card access devices and installs any cables necessary. Company

Security Integrator will terminate cables and program and test devices and peripherals.

3. Infrastructure – Conduits and associated electrical and junction boxes shall be installed by the Proposer as a part of the substation site development. Conduits shall be rigid PVC, dedicated for Security systems purposes only, and sealed properly from the origin to the termination point.
4. Cabling – Cabling shall be installed by the Proposer as a part of the substation site development and shall be of the type specified below for the applicable voltage. Company's Security Integrator will terminate both ends.
   a. 69kV Substations – CAT 5E
   b. 138kV Substations – CAT 6
5. Integrator – Company's Security Integrator will procure the server and necessary switches, terminate all ends, program the server, and set all fields of view for all camera shots.
6. Fencing – Schedule 40 galvanized fence post and fence fabric is required for fencing. The fencing shall be 8 feet high with heavy gauge support wire along the length of the bottom. 3-strand barbed wire shall be mounted atop the fence at a 45-degree angle on the inside and outside for the entire length of fence and gates.
7. Locks – All gates shall be secured using a proprietary padlock system. Company will provide physical padlocks for gates and electrical equipment.
8. Lighting – Motion and static lighting are necessary for additional safety and security deterrent measures and to enhance camera viewing at night. Proposer shall procure and install all lighting as a part of the substation site development. Motion LED lighting arrays shall be placed on all corners and entrances. Static LED lighting arrays shall be placed on the control house and throughout the yard to meet required lighting levels. Lighting shall be Dark Sky compliant.
9. Perimeter Intrusion Detection (138kV only) – Proposer shall procure and install devices and cables using a contractor that is trained and qualified to install the specified system. Company's Security Integrator will terminate cables, program, and test system. The specific models for the system will be provided to Proposer after execution of an NDA with the Company.

The costs below are the Company costs for the Company-responsible items above.

Item	Description	Cost
250	69kV Substation Security	$54,000 / site

Notes:
a) Costs provided are in 2022 dollars.
b) Includes Company costs for internal labor, materials, and contractors to support design, installation, programming, and testing of all security systems.
c) Location has flat terrain, is accessible, and is rural with a moderate to low crime rate and little to no homeless population.
d) Fire break is not needed.

SECTION 3 – PROPOSER-BUILD RESPONSIBILITIES

Section 3 defines Company and Proposer responsibilities for Proposer-Build interconnections.

3.1 – COIF AT PROPOSER SITE

Company will perform the following:

1. Review and approval of Proposer drawings and material selection.
2. Inspect Proposer construction.
3. Programming and functional testing of digital devices (i.e., DFR, RTU, etc.).
4. Terminate wiring between RTU and IPP interface cabinet.
5. Perform acceptance testing.
6. Procurement, installation, and testing of revenue meters.

Proposer is responsible for the following:

1. Design, procurement, and construction of:
    a. All COIF except what is identified above.
        i. Pull wiring between RTU and IPP interface cabinet and coil up on both ends.
    b. All civil infrastructure (conduits, equipment pads, etc.) at the Proposer facility.
2. As built drawings prior to acceptance testing.

3.2 – COIF AT EXISTING COMPANY-OWNED SUBSTATIONS

Company will perform all engineering, material procurement, and construction at existing Company-owned substations except as described below.

1. For an UG termination into an existing substation, Proposer is responsible for design, procurement, and construction of the UG T&D lines and associated civil infrastructure up to the termination on the riser structure.

3.3 – T&D LINE WORK

Company will perform the following:

1. Review and approve Proposer drawings.
2. Inspection of Proposer construction.
3. Design, procurement, and construction of electrical facilities for the final tap at the GCP.
4. Design, procurement, and construction of electrical facilities within the existing Company right-of-way (i.e., where Company's energized facilities are).
5. Procurement does not include the conductors or cable required for the last span as discussed below.
6. Break into Company's existing UG facilities for interception point (i.e., at an existing MH/HH/vault)

Proposer is responsible for the following:

1. Route design of the OH or UG lines (locations of poles, MHs, HHs, vaults, conduits, equipment, etc.).
2. Design, procurement, and construction of:
    a. All civil infrastructure (vaults, manholes, conduits, equipment pads, etc.) between the Proposer facility and the GCP.
    b. All electrical facilities from the Proposer facility up to and including the last pole or manhole/vault prior to existing Company facilities.
3. For OH to existing OH final tap
    a. Coil enough OH conductor on the last pole for Company to string and terminate the last span of conductor to the GCP.
4. For UG tap to existing OH final tap
    a. Stub-up the riser conduit above ground level at the bottom of the riser pole.
    b. Pull cable to the last MH/HH/vault prior to the riser.
    c. Provide enough cable for Company to make the last pull up the riser and terminate the cables.
5. For UG tap to existing UG
    a. Conduits to connect to interception point provided by Company.
    b. Pull cable to the last MH/HH/vault prior to intercepting Company's existing facilities.

3.4 – TELECOMMUNICATIONS

Company will perform the following:

1. Review and approval of Proposer drawings.
2. Design, procurement, installation, and testing of network equipment such as routers, multiplexers and associated hardware required at Proposer Site, Company Switching Station and/or Remote Substation Facilities to provision circuits required for the project.
3. Design, procurement, and installation of fiber termination equipment within Company owned or managed facilities at Proposer Site, Company Switching Station and/or Remote Substation Facilities, as needed, to support the communication requirements.
4. Design, procurement, and installation of microwave radio within Company owned or managed facilities at Proposer Site, Company Switching Station and/or Remote Substation Facilities, as needed, to support the communication requirements.

Proposer is responsible for the following:

1. Preparation of drawings related to the installation of telecommunication equipment to be turned over for Company ownership and/or Company management, including telecommunications cabinets and/or racks and telecommunications power.
2. Design, procurement, and installation of telecommunications cabinets and/or racks at the Proposer site and/or Company Switching Station to support the telecommunications equipment, as well as supporting equipment including air conditioning, alarming equipment, ground bars and fuse panels.
3. Design, procurement, and installation of equipment at the Proposer site and/or Company Switching Station to support telecommunications power requirements,

including, but not limited to, batteries, battery racks, rectifiers, and distribution panels.

4. Design, procurement, and installation of fiber cable, as needed, to support communications requirements, including SCADA connection from the Developer's RTU to the Company's RTU.
5. Ordering and installation of leased services, as needed, to support communications requirements.

3.5 – SECURITY

Responsibilities for Proposer-Build projects are the same as for Company-Build projects. See Section 2.6 for those responsibilities.

SECTION 4 – TYPICAL COMPANY DURATIONS FOR INTERCONNECTION PROJECTS

The tables below in Section 4 are to be used as a reference when developing an overall project schedule to assist Proposers in setting realistic durations and deadlines for critical milestones. These tables represent typical durations for the Company to complete the listed critical milestones that assist in moving the interconnection project through the IRS, Engineering, Procurement, and Construction phases. The durations below do not include time for Proposer to complete items they are responsible for. These high-level typical durations are for planning purposes only and is not intended to cover all project specific requirements. Specific project details can increase or decrease these durations. The detailed project schedule will be determined after the IRS is completed.

4.1 – NOT USED

4.2 – NOT USED

4.3 – TRANSMISSION PROJECTS

Milestone	Duration Proposer-Build	Notes
IRS Phase		
Model Validation	1 month	May increase depending on # of iterations
System Impact Study (SIS)	150 calendar days	Following Model Acceptance
Facility Study (FS)	40 business days	Following completion of SIS, SLD Acceptance, and Receipt of Developer Drawings and Schedules
Engineering Phase		
30% Design & Review	20 business days	
60% Design & Review	20 business days	Following 30% Design acceptance.
90% Design & Review	20 business days	Following 60% Design acceptance
Issued for Construction (IFC) Design & Review	20 business days	Following 90% Design acceptance.

Milestone	Duration Proposer-Build	Notes
Procurement Phase		
Procurement	N/A	Procurement of materials typically happens at 60% design completion
Construction Phase		
Construction	N/A	Based on scope/complexity of work
Acceptance Testing	25 business days	Approximately 3 weeks after construction completion
CSAT	30 business days	To occur after commissioning of Proposer's Facility. Duration depends on Proposer's ability to meet the Performance Standards.
Notes		
a) For Proposer-Build projects, the Engineering Phase includes design reviews of Proposer designs for COIF and review of SOIF supporting/impacting COIF. b) N/A indicates that the task is the responsibility of the Proposer in a Proposer-Build project.		

4.4 – ADDITIONAL DURATIONS TO INTERCONNECT AT AN EXISTING SUBSTATION

Milestone	Duration Company-Build	Notes
Engineering Phase		
30% Design & Review	40 business days	
60% Design & Review	50 business days	Following 30% Design acceptance.
90% Design & Review	50 business days	Following 60% Design acceptance
Issued for Construction (IFC) Design & Review	30 business days	Following 90% Design acceptance.
Procurement Phase		
Procurement	Up to 14 months	Procurement of materials typically happens at 60% design completion and after PUC approval. Material lead times dependent on manufacturer availability.
Construction Phase		
Construction	3 months	Construction to begin after procurement completion.
Notes		
a) The durations listed are in addition to the durations listed in Section 4.3. b) The Engineering Phase includes Company design & review of Company-Owned Interconnection Facilities (COIF) & reviews of Proposer-Owned Interconnection Facilities (SOIF) supporting/impacting COIF.		

PROJECT EXAMPLES - APPENDIX H UNIT COST TABLE

Examples provided for illustrative purposes only and is not binding for actual facility costs.
Estimated costs represent Company costs charged to the Proposer.

Projects interconnecting to a 69kV circuit

Example 1

20MW variable project interconnecting to an existing 69kV OH circuit. Proposer to build a new Company-owned 2-bay BAAH switching station per Attachment 2 of this Appendix H. Line extension includes interception of existing circuit and a 1500ft extension of two (2) new 69kV OH lines to new Company switching station (not including the 100ft spans at the tap). All lines are accessible. Proposer to construct the new OH lines between the termination structures at the substation and the last poles before intercepting the existing line. Company will construct the final tap from the last poles to the GCP. DTT for anti-islanding required at two (2) remote substations. Company to install 2 miles of ADSS fiber (underbuild) to the new Company switching station and install Company-owned equipment in Proposer-provided communications cabinet; back-up communications is required. Proposer to provide leased line for backup telecommunications. Proposer's substation is adjacent to Company's switching station. Assumed durations: Engineering = 18 months, Construction = 10 months, Testing/closeout = 6 months.

Appx H Item	Description	Quantity	Unit	Unit Price ($)	Total Cost ($)
30	69kV interconnection (new substation)	1	EA	$875,000	$875,000
34a	DTT for anti-islanding	2	EA	$108,000	$216,000
130	69kV OH Final Tap	1	EA	$144,000	$144,000
160	Additional 100ft OH Line Extension	30	EA	$3,300	$99,000
	69kV OH line extension (by Proposer)	1	LS	$0	$0
197	Project Management - Engineering	18	MO	$18,300	$329,400
197	Project Management - Construction	10	MO	$23,000	$230,000
197	Project Management - Testing/Closeout	6	MO	$11,700	$70,200
202	Comm Cabinet	1	EA	$192,000	$192,000
205	Leased line (by Proposer)	1	LS	$0	$0
211	Company fiber underbuild (primary)	2	MI	$166,000	$332,000
250	Company security costs	1	LS	$54,000	$54,000
			ESTIMATED TOTAL =		**$2,541,600**

Example 2

20MW firm generation project interconnecting at Kealahou substation. The project requires one (1) 69kV line to Kealahou from the Proposer's site. The termination at Kealahou will be OH and requires adding a termination to an existing bay. Proposer to run a 1,000ft OH gen-tie line (not including 100ft span into sub) from Proposer's site to Kealahou. Company to string final OH span from last pole to termination structure at Kealahou. Proposer to run fiber between Proposer's substation and Kealahou since substation is not adjacent to Kealahou. A comm cabinet is required at the Proposer's substation. Assumed durations: Engineering = 12 months, Construction = 10 months, Testing/closeout = 6 months.

Appx H Item	Description	Quantity	Unit	Unit Price ($)	Total Cost ($)
42a	Company work at Proposer's substation	1	EA	$379,000	$379,000
42b	Company work at Kealahou substation	1	EA	$1,757,000	$1,757,000
Gen-tie Line					
131	69kV OH Final Span to Exist Sub	1	EA	$59,000	$59,000
160	Add'l 100ft OH Line Extension	10	EA	$3,300	$33,000
197	Project Management - Engineering	12	MO	$18,300	$219,600
197	Project Management - Construction	10	MO	$23,000	$230,000
197	Project Management - Testing/Closeout	6	MO	$11,700	$70,200
202	Comm Cabinet (at Proposer's sub)	1	EA	$192,000	$192,000
220	Fiber from "meet point" to sub	1	EA	$31,000	$31,000
	Fiber civil infrastructure by Proposer	1	LS	$0	$0
			ESTIMATED TOTAL =		**$2,970,800**

Electrical service to Proposer Facility

Example 3

Proposer requests service from existing 12kV line 0.5 miles away from the facility (new OH line for 0.4 miles and 0.1 miles underbuilt on the Company-owned interconnection lines). The OH line risers down and 2 feeders will serve a padmount transformer 100ft away from the riser pole. Proposer to install civil infrastructure (ductlines, MH/HH/vaults, equipment pads, etc.).

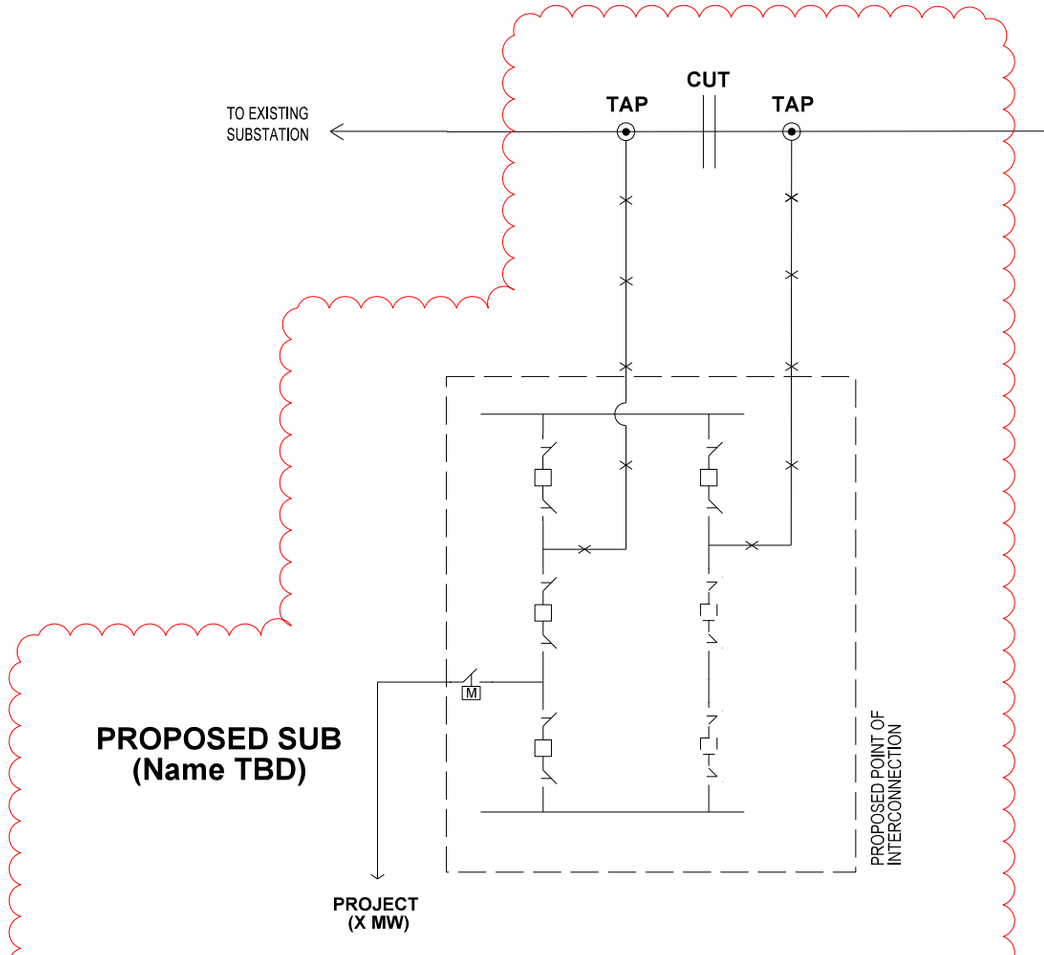
Appx H Item	Description	Quantity	Unit	Unit Price ($)	Total Cost ($)
188	Padmount tsf for facility service	1	EA	$84,000	$84,000
189	12kV OH accessible	0.4	MI	$719,000	$287,600
190	12kV OH underbuild	0.1	MI	$441,000	$44,100
193	12kV 3ph riser	1	EA	$41,000	$41,000
	12kV civil infrastructure (by Proposer)	1	LS	$0	$0
			ESTIMATED TOTAL =		**$456,700**

Electrical service to Proposer Facility and Primary station service for Company-owned switching station

Example 4

Proposer requests service from existing 12kV line 0.2 miles away from the facility. Line extension is a new OH accessible line. The OH line riser down and 2 feeders will serve a padmount transformer 100ft away from the riser pole. Primary station service for the Company-owned switching station will be tapped off of the facility service line extension, riser underground, with 2 feeders going to a padmount station service transformer in the switching station located 300ft away from the tap point. Proposer to install civil infrastructure (ductlines, MH/HH/vaults, equipment pads, etc.).

Appx H Item	Description	Quantity	Unit	Unit Price ($)	Total Cost ($)
188	Padmount tsf for station service	2	EA	$84,000	$168,000
189	12kV OH accessible (facility service)	0.2	MI	$719,000	$143,800
193	12kV 3ph riser (facility service)	1	EA	$41,000	$41,000
193	12kV 3ph riser (station service)	1	EA	$41,000	$41,000
192	UG dbl feeder (station service)	0.04	MI	$1,048,000	$39,697
	12kV civil infrastructure (by Proposer)	1	LS	$0	$0
			ESTIMATED TOTAL =		**$433,497**



LEGEND

EXISTING 69KV LINE

INSTALL 3-PHASE 69KV, 715A MIN (NORMAL) OVERHEAD CONDUCTOR

NOTES

1. THE 69KV BUS EQUIPMENT, MAIN AND TIE BREAKERS SHALL BE RATED 1200A CONTINUOUS, AND SHALL BE DESIGNED TO WITHSTAND A SHORT CIRCUIT CURRENT OF 40 KAIC AT 72.5KV.
2. ALL 69KV GCB's, DISCONNECT SWITCHES, STATION POST INSULATORS, AND INSTRUMENT TRANSFORMERS ARE TO BE DESIGNED FOR 350KV BIL.
3. OTHER REQUIREMENTS ARE IN DEVELOPMENT AND WILL BE PROVIDED

DRAFT

FOR ESTIMATING PURPOSES ONLY

NO.	DATE	REVISIONS	BY	CHK'D	APP'D
-	-	-	-		

PROJECT 69kV INTERCONNECTION
T&D PLANNING SINGLE LINE

DESIGNED | DRAWN | DATE 06/03/2022 | SCALE NONE

CHECKED | ELEC. | MECH. | STRUC.

APPROVAL

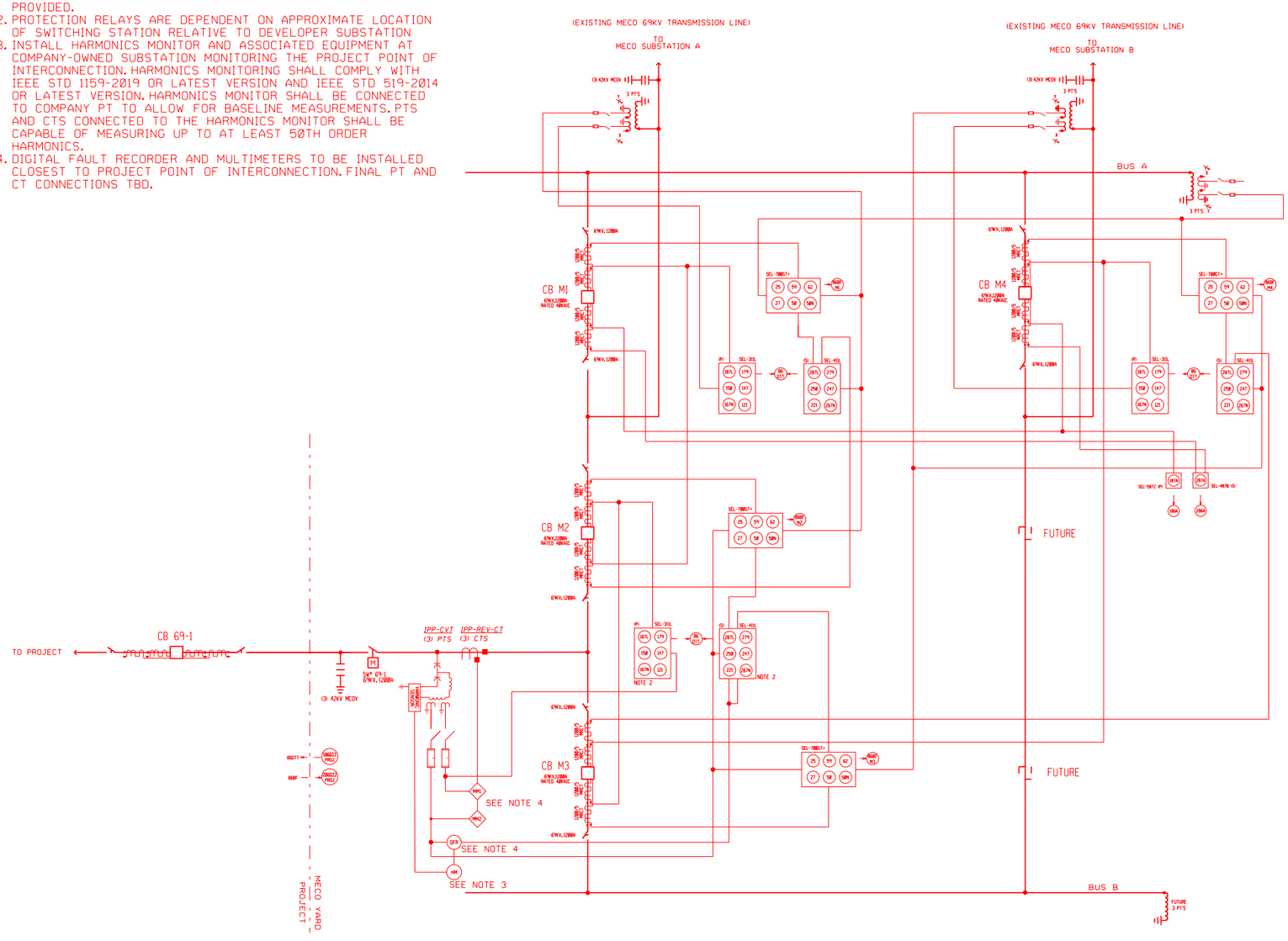
TRANSMISSION & DISTRIBUTION PLANNING DEPARTMENT
HAWAIIAN ELECTRIC
HONOLULU, HAWAII

DRAWING NUMBER: PRELIMINARY | REV: A

$SYTIME $USERN- E $DGNSPEC

NOTES

1. OTHER REQUIREMENTS ARE IN DEVELOPMENT AND WILL BE PROVIDED.
2. PROTECTION RELAYS ARE DEPENDENT ON APPROXIMATE LOCATION OF SWITCHING STATION RELATIVE TO DEVELOPER SUBSTATION
3. INSTALL HARMONICS MONITOR AND ASSOCIATED EQUIPMENT AT COMPANY-OWNED SUBSTATION MONITORING THE PROJECT POINT OF INTERCONNECTION. HARMONICS MONITORING SHALL COMPLY WITH IEEE STD 1159-2019 OR LATEST VERSION AND IEEE STD 519-2014 OR LATEST VERSION. HARMONICS MONITOR SHALL BE CONNECTED TO COMPANY PT TO ALLOW FOR BASELINE MEASUREMENTS. PTS AND CTS CONNECTED TO THE HARMONICS MONITOR SHALL BE CAPABLE OF MEASURING UP TO AT LEAST 50TH ORDER HARMONICS.
4. DIGITAL FAULT RECORDER AND MULTIMETERS TO BE INSTALLED CLOSEST TO PROJECT POINT OF INTERCONNECTION. FINAL PT AND CT CONNECTIONS TBD.



DRAFT

FOR COST ESTIMATE ONLY
FOR REVIEW & COMMENT ONLY

NO.	DATE	REVISIONS	BY	CHK'D	APP'D
-	-	-	-		

[NAME TBD] INTERCONNECTION
PLANNING SINGLE LINE

DESIGNED	DRAWN	DATE 06/03/2022	SCALE NONE
CHECKED ELEC. MECH. STRUC.		TRANSMISSION & DISTRIBUTION PLANNING DEPARTMENT HAWAIIAN ELECTRIC HONOLULU, HAWAII	
APPROVAL		DRAWING NUMBER PRELIMINARY	REV. A

Notes to be added to the 69kV Company Substation Single Line Diagram

COMPANY SUBSTATION:	TBD
COMPANY SLD REVISION NUMBER AND DATE:	[NAME TBD] INTERCONNECTION PLANNING SINGLE LINE PRELIMINARY, REV. A, 06/03/2022
NOTES DATE:	06/03/2022

1. 69kV bus equipment and breakers shall be rated 1200A continuous and shall be designed to withstand a short circuit current of 40KAIC @ 72.5kV.

2. All 69kV Gas Circuit Breakers (GCB), disconnect switches, station post insulators, and instrument transformers are to be designed for 350kV BIL.

3. 69kV breaker M1 and M4 to be 1PH synchro-checked across its 69kV Bus A and line potentials (3-PH) and allowed to close only under the following conditions:
   A. Automatic Reclosing
      i. [TBD by IRS]
   B. Manual and Supy Closing:
      i. Voltage magnitude, frequency, and phase angle difference within acceptable limits
      ii. Dead-line and dead-bus
      iii. Dead-line and hot-bus
      iv. Hot-line and dead-bus

4. 69kV breaker M2 to be 3PH synchro-checked across its line potentials (3-PH) on both sides of the 69kV breaker and allowed to close only under the following conditions:
   A. No Automatic Reclosing
   B. Manual and Supy Closing:
      i. Voltage magnitude, frequency, and phase angle difference within acceptable limits
      ii. Three-phase dead-line and three-phase dead-line
      iii. Three-phase dead-line and three-phase hot-line
      iv. Three-phase hot-line and three-phase dead-line

5. 69kV breaker M3 to be 3PH synchro-checked across its line potentials (3-PH) on both sides of the 69kV breaker and allowed to close only under the following conditions:
   C. No Automatic Reclosing
   D. Manual and Supy Closing:
      i. Voltage magnitude, frequency, and phase angle difference within acceptable limits
      ii. Three-phase dead-line and three-phase dead-line
      iii. Three-phase dead-line and three-phase hot-line
      iv. Three-phase hot-line and three-phase dead-line

6. All trips from developer to Company shall trip and block close breakers M2 and M3.

7. Install a harmonics recorder and associated equipment at each project point of interconnection, which will be in continuous service and on a rolling window basis monitor sub-cycle voltage and currents and capable of remote interrogation. Harmonics monitoring shall comply with IEEE Std 1159-2019 or latest version and IEEE Std 519-2014 or latest version. Harmonics monitor shall be connected to company-side PT to allow for baseline measurements. PTs and CTs connected to the harmonics monitor shall be capable of measuring up to at least 50th order harmonics. The following inputs shall be provided:

    a. 69kV voltage (3-ph) at or near the point of interconnection for Project
    b. 69kV current (3-ph) at or near the point of interconnection measuring total current from Project

8. Substation to be built as functional ring bus in formation of breaker-and-half as shown on Planning SLD. Space should be left for two additional breakers to be installed to complete the second breaker-and-half bay.

Protection Notes:

1. Bus A differential relay operation shall trip and block close breakers M1 and M4 via manual lockout relay.
2. Line current differential relay operation shall trip and block close breakers M2 and M4, via MECO lockout relay. Developer breaker 69-1 tripped and blocked close via separate dedicated lockout relay owned by the Developer.
3. The local breaker failure scheme shall trip and block close all adjacent breakers via non-electrically resettable lockout relays.
4. Breaker failure of 69kV breaker M2 or M3 to initiate direct transfer trip signal via the BFTT relay which will trip and block close Developer's 69kV breaker 69-1 via separate dedicated lockout relays owned by the Developer.
5. Breaker failure of Developer's 69kV breaker 69-1 to initiate direct transfer trip signal via the BFTT relay which will trip and block close breaker M2 and M3 at the MECO substation via dedicated remotely resettable lockout relay.

System Operations Notes:

1. All 69kV breakers are controlled and supervised by Company System Operator via supervisory equipment and also have control switches in the control house.
2. Install a digital fault recorder near point of interconnection, which will be in continuous service and on a rolling window basis monitor sub-cycle voltage, currents and harmonics, as well as disturbance events and capable of remote interrogation following an event. The following inputs shall be provided and direct hard wired to the recorder:
    a. Status of all 69kV [Name TBD] substation breakers
    b. Status of all lockouts for 69kV [Name TBD] substation breakers
    c. 69kV voltage (3-ph) at or near the point of interconnection

d. 69kV current (3-ph) at or near the point of interconnection measuring individual phase currents from the Project
e. Digital Inputs from Protection Relays emulating the trip output of the Relay

3. Each of the following control and status points shall be remotely controlled and supervised by Company System Operator:
   a. Trip/Close and status of all 69kV breakers and Motor Operated Switches
   b. Status of each lockout
4. Each of the following analog points shall be telemetered to Company System Operator:
   a. All 69kV line amps (3 phase), watts (MW), and vars (MVAR)
   b. All 69kV bus and line voltages (3 phase) (kV)
   c. Energy received MWh values via Revenue Meter "A" (Pulse Accumulator Point or Analog Point acceptable)
   d. Fault Distance for all 69kV lines

   (Note, meters, relays, and transducers for a-d shall be Company owned, maintained, and operated.)
5. Each of the following initiates an alarm to Company System Operator:
   a. Protection communication failure (Loss of Pilot Alarm)
   b. RTU communication failure
   c. 125V DC battery low voltage
   d. 125V DC charger trouble
   e. Loss of Trip circuit (individual alarm for each trip circuit)
   f. 48V DC battery low voltage
   g. 48V DC charger trouble
   h. Line Relay Loss of 69kV line and/or synchronism-check (bus) potential (for each line relay)
   i. 69kV GCB low SF6 gas pressure (individual alarm for each GCB)
   j. Block operation SF6 gas (which indicates SF6 low-low gas pressure) for each GCB
   k. 69kV GCB spring discharge alarm (individual alarm for each GCB)
   l. Loss of normal AC station power source
   m. Loss of emergency AC station power source
   n. Operation of AC station power auto-transfer switch to emergency source
   o. Each lockout relay (86) operation
   p. Each digital protective relay (primary and secondary) trouble alarm

Notes to be added to the 69kV Project Single Line Diagram

PROPOSED PROJECT NAME:	
PROPOSED PROJECT SIZE:	
DEVELOPER SLD REVISION NUMBER AND DATE:	
MECO SLD REVISION NUMBER AND DATE:	[NAME TBD] Interconnection Planning Single Line, Preliminary, Rev. A, 06/03/2022
COMPANY SUBSTATION:	TBD

1. Project shall install point-on-wave breakers [TBD—For Project without self-energization], specifically independent pole operated (IPO) breakers with residual flux calculation capability, when more than five energizations are expected or observed in any 12-month period after commercial operations. Energizations is only to occur in coordination with the Company system operator. The voltage deviation at the point of interconnection (POI) must be limited to +/- 6% when energizing the Project. [TBD by IRS]

2. Opening of 69kV breakers M2 and M3 shall trip Developer's 69kV breaker CB 69-1 via Company-owned lockout relay.

3. Project breaker CB 69-1 shall be allowed to close only under the following conditions:
    a. No Automatic Reclosing
    b. Manual Closing shall be allowed for the following conditions under the coordination of the Company system operator:
        i. Hot line (company-side) and dead bus (project-side)
        ii. Hot line (company-side) and hot bus (project-side) [TBD—For Projects with self-energization]
            1. Active synchronization control (i.e., an active synchronizer) on the generation facility shall be used to limit the disturbance, caused by closing, to a minimum. If synchronization parameters, such as voltage magnitude, angle and frequency difference are used during this process, these parameters shall be reviewed and approved by Company.
        iii. Dead line (company-side) and hot bus (project-side), for black start provided by grid forming capabilities.

Protection Notes:

1. Breaker failure of MECO 69kV breaker M2 or M3 shall trip a MECO lockout relay which will trip and block close Developer 69kV breaker 69-1 via separate dedicated lockout relay.
2. Breaker failure of Developer 69kV breaker 69-1 shall trip developer-owned dedicated lockout relay which will trip dedicated lockout relay in MECO substation. Dedicated lockout relay in MECO substation will trip and block close MECO 69kV breakers M2 and M3.
3. All 69kV CT's are to be MRCT's with relaying accuracy class C800 unless noted otherwise. MRCT's are to have full distributed windings on all taps and a minimum thermal rating factor of 2.0. (Provide the

Protection Department with CT saturation, ratio correction factor curves, and continuous thermal rating factors.)

4. All microprocessor relays, instruments, CT's, and PT's are to have test switches.

System Operations Notes:

1. The following Developer's inputs shall be provided and direct hard wired to MECO's digital fault recorder:
    a. Status of all Developer's 69kV breakers
    b. Status of all Developer's 35kV breakers
    c. Status of all lockouts for Developer's breakers
    d. Digital Inputs from Protection Relays emulating the trip output of the Relay
    e. Amps, watts, vars and voltage (3phase) at each inverter
2. Trip Control for Project Breaker 69-1 (MECO SCADA close control can also be provided at the Developers request, and with proper synch check relaying)
3. MECO System Operator shall be enabled to issue the following to the Developer via mutually agreed communication protocol interface (typically DNP 3.0):
    a. Active Power reference set point* control signal. MECO's Active Power Control Interface will take precedence over customer's local active power control; and
    b. Voltage or MVAR (analog kV or MVAR) set point control signal, or discrete contact pulse for incremental Voltage or MVAR set point raise/lower control. Specific control type to be established during control system design review.
    c. Voltage/VAR control mode (Constant VAR, AVR)
    d. [As Applicable] Frequency Response Mode (Droop,Isoch,FFR,Disabled)
    e. [As Applicable] Frequency Droop Setting (%)
    f. [As Applicable] Isoch Target Frequency (Hz)

    (*A Pulse Width Modulated (PWM) Raise-Lower Control could be agreed to in lieu of set point control, during the plant controller design review, the active power control interface should be submitted for HELCO review and agreement prior to finalizing.)

4. All control values must be retained in non-volatile memory such that will be restored immediately upon return from Plant Controller restart, power outage, loss of communication, etc.
5. The Project will provide the following signals for telemetering to the HELCO System Operator:
    a. 69kV line amps (3 phase), watts (MW), vars (MVAR), and voltage (kV) (3 phase)

b. Status of the Project 69kV breakers 69-1
c. Status of the Project feeder breakers
d. Amps (3 phase), watts (MW), vars (MVAR) from each Project feeder breaker
e. Status of all lockouts
f. Latest received power reference set point (Echo)
g. Latest received voltage setpoint (Echo)
h. Latest received VAR setpoint (Echo)
i. Ramp Rate (Maximum Dispatchable Up & Down)
j. [Solar Projects] Plane of Array Irradiance at each MMS/MMT (Watts/m2)
k. [Solar or Wind Projects] Ambient air temperature at each MMS/MMT (Celsius)
l. [Solar or Wind Projects] Wind speed at each MMS/MMT (mph)
m. [Wind Projects] Wind direction at each MMT (degrees from true north)
n. [Wind Projects] Ambient Air Pressure at each MMT (mbar)
o. [Solar or Wind Projects] Number of Inverters or WTGs Available (count)
p. Status of each inverter/WTG
q. MW output of each inverter/WTG
r. MW setpoint of each inverter/WTG
s. MVAR output of each inverter/WTG
t. MVAR setpoint of each inverter/WTG
u. [Solar Projects] Global Horizontal Irradiance (Watts/m2)
v. [Variable Resource Projects] Total Facility Power Possible (MW)
w. [Variable Resource Projects] Resource Potential (MW)
x. [Solar Projects] Gross MW Production of PV System (MW)
y. [Wind Projects] Gross MW Production of WTGs (MW)
z. [Projects with BESS] Gross MW Production/Consumption of BESS System (MW)
aa. Net AC MW production at Point of interconnection (MW)
bb. Net AC MVAR production at the Point of interconnection (MVAR)
cc. Total Facility Auxiliary Load (Power Demand) (MW & MVAR)
dd. [Projects with BESS] BESS State of Charge (% of BESS Contract Capacity)
ee. [Projects with BESS] Facility Duration at Current Output (minutes)
ff. [Projects with BESS] YTD BESS Effective Full Cycles

gg. Minimum Sustained Power Limit (MW) (ecomin, typically 0 for inverter-based technology, can be less than 0 for energy storage allowed to charge from grid)

hh. Minimum transient Power Limit (MW) (lfcmin, typically 0 for inverter-based technology, can be less than 0 for energy storage allowed to charge from grid)

ii. [Firm Projects] Available Capacity (MW)

jj. Voltage/VAR control mode (Constant VAR, AVR)

kk. [As Applicable] Frequency Response Mode (Droop,Isoch,FFR,Disabled)

ll. [As Applicable] Frequency Droop Setting (%)

mm. [As Applicable] Isoch Target Frequency (Hz)

6. Each of the following initiates a separate alarm to HELCO System Operator:
    a. Protection communication failure (Loss of Pilot Alarm);
    b. RTU communication failure
    c. Violation of Maximum Ramp Rate Upward or Downward (Performance Standard);
    d. Active Power Control Interface Status (Local/Remote)
    e. Automatic Voltage Regulation (AVR) Status – (Enabled/Disabled)
    f. Frequency Response Status (Enabled/Disabled)
7. [For RDG Contracts] Each of the following quantities need to be logged locally for Company review upon request:
    a. Status of each inverter/WTG
    b. MW output of each inverter/WTG
    c. MW setpoint of each inverter/WTG
    d. MVAR output of each inverter/WTG
    e. MVAR setpoint of each inverter/WTG
    f. [Solar Projects] Global Horizontal Irradiance (Watts/m2)
    g. [Solar Projects] Back of panel temperature (Celsius)

REQUEST FOR PROPOSALS

FOR

RENEWABLE DISPATCHABLE GENERATION

AND

ENERGY STORAGE

MAUI

MAY 19, 2023

Docket No. 2017-0352

Appendix I –Maui Near-Term Grid Needs Assessment Update

Maui Electric

July 29, 2022

The Honorable Chair and Members
of the Hawai‘i Public Utilities Commission
Kekuanao‘a Building, First Floor
465 South King Street
Honolulu, Hawai‘i 96813

Dear Commissioners:

Subject: Docket No. 2017-0352 – To Institute a Proceeding Relating to a Competitve Bidding Process to Acquire Dispatchable and Renewable Generation
Docket No. 2018-0165 – Instituting a Proceeding to Investigate Integrated Grid Planning
Updated O‘ahu and Maui Island Near Term Grid Needs Assessment

In accordance with Ordering Paragraph No. 2 of Order No. 38479,[1] issued on June 30, 2022 in the subject proceeding, the Hawaiian Electric Companies[2] respectfully submit the attached July 29, 2022 *O‘ahu Near-Term Grid Needs Assessment* and *Maui Near-Term Grid Needs Assessment* as Attachment 1 and Attachment 2, respectivley. This report describes the methodology and inputs used to study scenarios whose results were then used to inform recommendations for Grid Needs for solution sourcing for the Stage 3 Request for Proposals ("RFP") for O‘ahu and Maui Island, which the Companies plan to discuss at the RFP stakeholder conference through a virtual meeting scheduled for August 5, 2022 from 1:00 to 3:00 pm HST. A virtual meeting invitation has been emailed to Integrated Grid Planning participants and the competitive bidding distribution list. Other interested parties may contact OahuRenewableRFP@hawaiianelectric.com for meeting information. A recording of the meeting and presentation slides will be posted at https://www.hawaiianelectric.com/clean-energy-hawaii/selling-power-to-the-utility/competitive-bidding-for-system-resources/stage-3-oahu-rfp when available.

The Companies look forward to working with the Commission, the Independent Observer, and stakeholders to finalize the RFP and launching a competitive and successful procurement.

[1] Ordering Paragraph No. 2 of Order No. 38479 provided: "The HECO Companies shall file an updated Near-term Grid Needs Assessment for Oahu and Maui Island within 30 days of this Order[.]"

[2] "Hawaiian Electric Companies" or "Companies" are Hawaiian Electric Company, Inc., Hawai‘i Electric Light Company, Inc., and Maui Electric Company, Limited.

Sincerely,

/s/ Marc Asano

Marc Asano
Director, Integrated Grid Planning

Enclosure

c: Service List

Hawai'i Powered

Maui Near Term Grid Needs Assessment

July 2022 Report

Hawaiian Electric

July 29, 2022

Maui Grid Needs Assessment

- Executive Summary – Key Findings
- Key Inputs and Assumptions, Methodology
- Capacity Expansion Plans
- Energy Reserve Margin Analysis
- Probabilistic Resource Adequacy Analysis
- Recommendations for Near-term Action Plan

Executive Summary - Background

On February 18, 2022 the Commission directed Hawaiian Electric to prepare a Stage 3 RFP to address reliability needs:

> As such, in order to meet the future replacement capacity needs, the Commission finds it is necessary for Hawaiian Electric to perform another round of competitive procurements on Oahu and Maui as soon as possible. Accordingly, the Commission directs Hawaiian Electric to develop RFP materials for a Stage 3 competitive bidding process.
>
> The Stage 3 RFP scope should be based on the latest grid needs assessment for Oahu and Maui and should account for the anticipated development schedules for the Stage 1 and 2 projects.
>
> In summary, the Commission directs Hawaiian Electric to move with urgency to ensure an adequate amount of replacement renewable projects are pursued in order to meet the reliability needs and fossil fuel retirement goals in line with Hawaii's energy policy goals.

On March 23, 2022 the Commission provided additional guidance, to conduct a Stage 3 RFP:

> On Maui, notwithstanding the Company's March 10 Letter recommending delaying the Stage 3 RFP, Hawaiian Electric has separately identified "the need to urgently issue an RFP for additional resources to be in place by 2027[,]" due to the Company's concern that 50 MW of capacity at the Maalaea Power Plant may reach end of life in this timeframe. The Commission also notes the heightened need for reducing the reliance on fossil fuels in light of recent geopolitical tensions impacting the price of Hawaii's fuel supply.
>
> The scope of the Stage 3 RFPs can be tailored to meet the near-term needs without precluding future procurements or conflicting with forthcoming results from the IGP docket, as directed by the Commission regarding the Firm Renewable RFP on Oahu. In developing the Stage 3 RFPs, the Commission directs Hawaiian Electric to be explicit in its justification for the scope of this and any parallel procurements.

Executive Summary – Objectives

Objectives of this assessment include:

- Develop resource portfolios that meet near-term RPS and GHG reduction goals and put Maui in an advantageous position to meet longer-term RPS and GHG goals
- Ensure reliability of the system through a balanced portfolio of resources that can be reasonably in-service by 2027 to mitigate the removal of up to 80 MW of firm thermal generation
- Add new low-cost renewable dispatchable generation (wind, solar, battery energy storage) to further decarbonize the electric sector
- Acquire more flexibility for the current and future generation system, building upon the recently acquired renewable dispatchable solar generation and aggregated grid services
- Diversify the type and geography of the resource portfolio to be more resilient
- Inform Stage 3 procurement and Company contingency plans

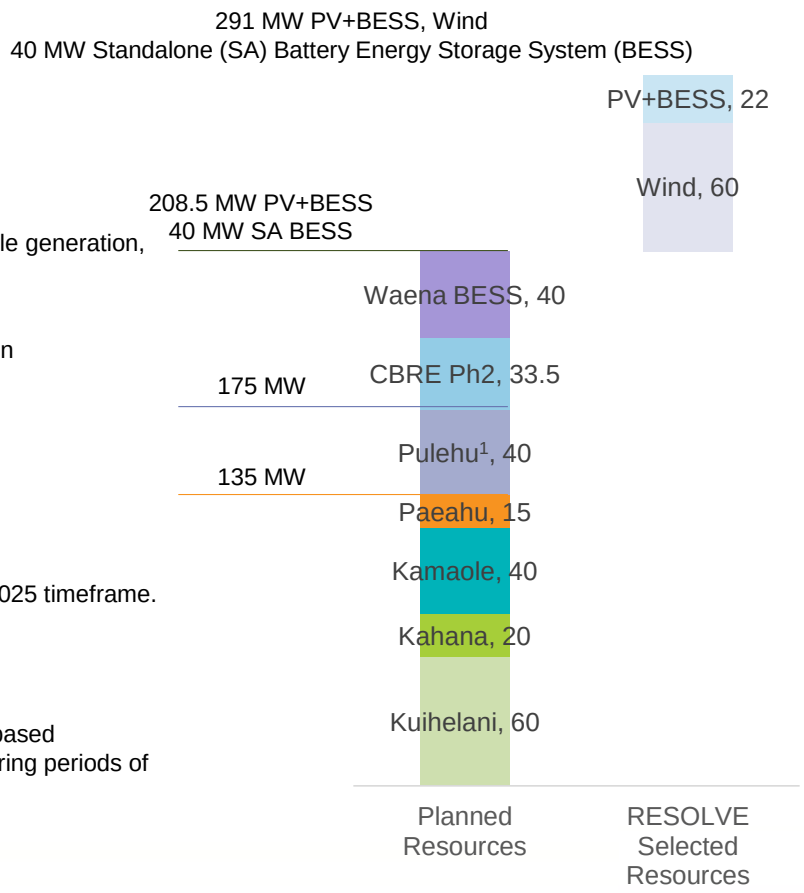
Executive Summary – Key Findings

- Low-cost renewable energy backed by firm generation continues to be the optimal resource mix over the next decade across different futures of low, base, and high adoption of customer technologies.
- By 2030, 170 GWh of energy efficiency, 56 MW of private rooftop solar, and 43 MW of private battery energy storage is needed to reduce supply-side energy and capacity needs to ensure resource adequacy. All scenarios analyzed include the impacts of 30 MW Battery Bonus/Grid Services Program.
- In addition to the energy provided by the original portfolio of Stage 1 and 2 projects, the optimized resource plan calls for an additional 240 GWh of renewable energy to be acquired by 2027, which includes replacement energy from the expiring 30 MW Kaheawa Wind Power 1 power purchase agreement, and approximately 13 MW of firm generation. The energy provided by projects that withdrew from the recent RFP process would add to the 240 GWh to inform the Stage 3 procurement target.
- Probabilistic resource adequacy analysis indicates that 9 MW of renewable firm generation would minimize occurrences of annual unserved energy if the optimized resource plan indicated above can be interconnected by 2027. By 2035, another 9 MW for a total of 18 MW of renewable firm generation would be needed to accommodate future load growth. When combining Stage 1 and 2 projects plus future resources, a total of 290 MW of PV+BESS and wind and 40 MW of standalone storage must be interconnected by 2027 to meet reliability metrics.
- The Stage 3 procurement targets and contingency plans should consider a number of risks and uncertainties; including but not limited to, on-going supply chain issues, economic and inflationary factors, force majeure, among others. By 2027, Kahului Power Plant (32 MW) must be retired to comply with environmental regulations and 49 MW of firm generation at Maalaea Power Plant are at risk in the 2025-2026 timeframe due to unavailability of spare parts.
- Hawaiian Electric recommends the Stage 3 procurement seek up to 40 MW of firm generation (along with continued efforts for battery bonus and grid services aggregation programs) to mitigate reliability and supply chain risks and uncertainties. In a scenario where 142 MW of renewable resources are interconnected by 2027, the addition of 40 MW of firm generation would not satisfy reliability targets; however, would minimize annual unserved energy and place the expected reliability slightly worse than the 2021 benchmark of 0.15 days/year. In a scenario where 242 MW of renewable resources are interconnected by 2027, 18 MW of firm generation is needed to achieve the same level of reliability as 2021 benchmarks.

Executive Summary – Key Findings

- Reliability Standards Used by Various Jurisdictions
  - Loss of Load Expectation (LOLE) ≤ 0.10 Days/Yr (US Mainland)
  - Loss of Load Hours (LOLH) ≤ 3 hrs (Belgium, France, GB, Poland)
  - Expected Unserved Energy (EUE) ≤ 20 MWh or 0.002% of load (AEMO)
- In 2030, compliance with all three standards is achievable with various resource mixes
  - **RESOLVE Base Case, 18 MW Firm Generation Addition Scenario ($214MM)[2]**: 291 MW of variable generation, 40 MW of standalone BESS, and 18 MW of firm generation
    - Variable Generation: 209 MW planned, 82 MW future (includes 60 MW wind)
  - **Low Renewable Scenario ($248MM)[2]**: 142 MW of variable generation and 63 MW of firm generation
    - Variable Generation: 60 MW planned (Kuihelani), 82 MW future (includes 60 MW wind)
  - **No Firm Addition Scenario ($280MM)[2]**: 328 MW of variable generation
    - Variable Generation: 60 MW planned (Kuihelani), 268 MW future (includes 60 MW wind)
- Assumed Removals from Service
  - Kahului 1-4 (32 MW) – Must be retired in 2027 due to environmental regulations
  - Maalaea 10-13 (49 MW) – Manufacturer will no longer produce spare parts; end of life expected in 2025 timeframe.
  - Maalaea 4-9 (33 MW)
  - Kaheawa Wind Power 1 (30 MW) – Expiring PPA in 2027
- Firm Generation – In this report, firm generation or thermal generation refers to a synchronous machine based technology that is available at any time under system operator dispatch for as long as needed, except during periods of outage and deration, and is not energy limited or weather dependent.

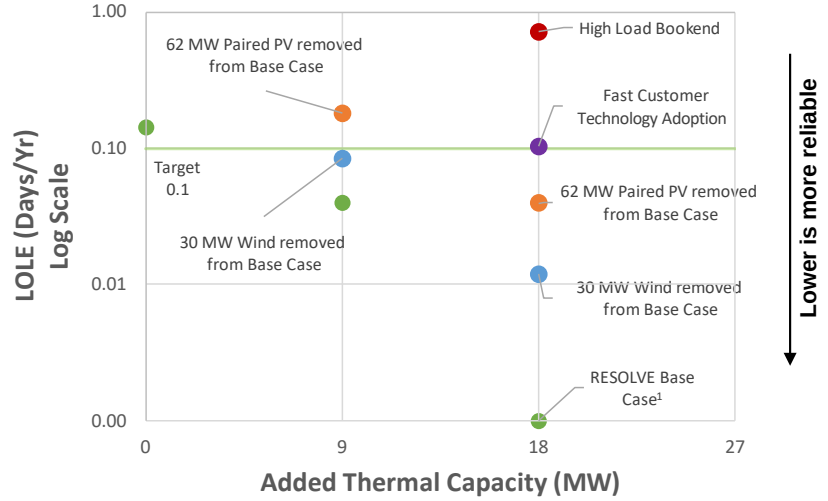
Planned Variable Resource Additions and Future Resources Optimized in RESOLVE

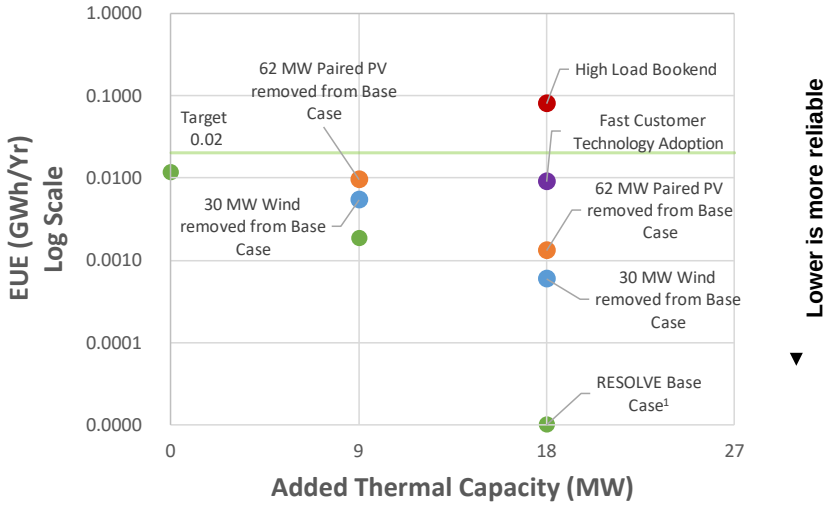


Executive Summary – Key Findings: **18 MW of new firm generation provides a reasonable level of reliability over a range of potential future pathways and uncertainties**

Probabilistic Resource Adequacy Analysis of the RESOLVE Base Case Sensitivities: Incremental changes to wind, PV+BESS, firm generation
Planned Resources: 209 MW of PV+BESS from Stage 1 and 2, and 40 MW standalone BESS
Future resources beyond planned: 82 MW of variable generation

Incremental additions of internal combustion engines (ICE) firm (thermal) generation of 9-18 MW meets both LOLE and EUE targets as shown in the green data points. In orange and blue data points are removals of wind or PV+BESS capacities from the base RESOLVE (optimized) case to simulate market conditions where not all projects reach commercial operations.





- Thermal (ICE) in addition to 291 MW Variable (Base Case)
- Thermal (ICE) in addition to a 30 MW wind reduction from Base Case
- Thermal (ICE) in addition to a 62 MW PV+BESS reduction from Base Case

- Thermal (ICE) in addition to 291 MW Variable (Base Case)
- Thermal (ICE) in addition to a 30 MW wind reduction from Base Case
- Thermal (ICE) in addition to a 62 MW PV+BESS reduction from Base Case

1. RESOLVE Base case selected 13 MW combined cycle by 2030, in addition to 60 MW onshore wind and 22 MW PV+BESS, which is roughly equivalent to the 18 MW ICE addition evaluated here.

Hawaiian Electric

Hawai'i Powered

Executive Summary – Key Findings: **New Firm Generation can address EUE shortfalls in low variable renewable periods**

Base Case with 0 MW Firm Generation

Hours Beginning	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.10	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.07	0.22	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.37	0.32	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.13	0.25	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.52	0.22	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.27	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.16	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.13	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.33	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.02	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.09	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.48	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.28	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Base Case with 9 MW Firm Generation

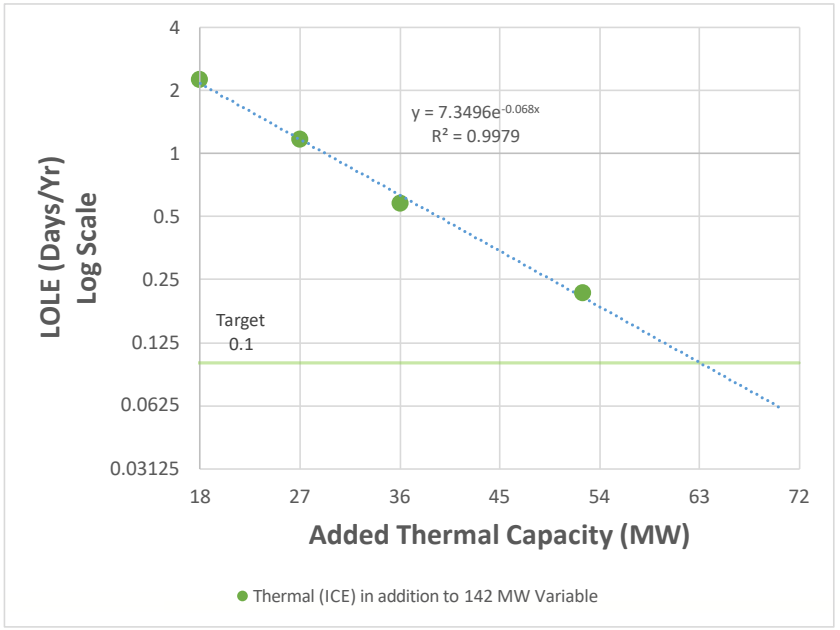
Hours Beginning	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.18	0.06	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.12	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.27	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.01	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.25	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

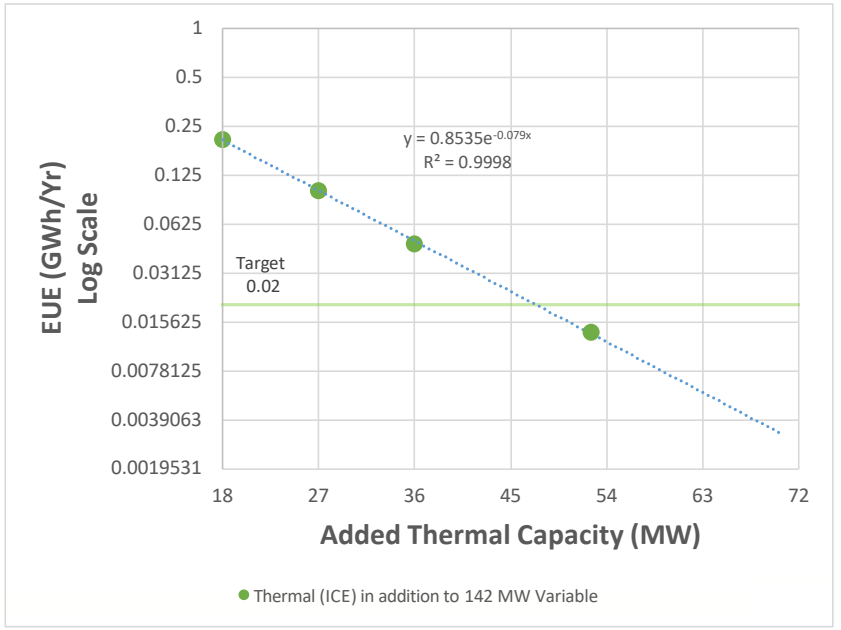
Pictured are heatmaps of unserved energy to show likelihood of when unserved energy may occur based on probabilistic resource adequacy analysis. Shortfalls are shown during the months of March, April and May where wind has a lower capacity factor and the PV+BESS do not have enough energy to load shift and meet unserved demand.

Executive Summary – Key Findings: **With limited new renewables (Kuihelani Solar, future 82 MW PV+BESS / wind), 63 MW firm generation is needed to improve reliability to established standards for LOLE and EUE**

Probabilistic Resource Adequacy Analysis
Kuihelani Only with Firm Generation (ICE) Sensitivities: Kuihelani, 60 MW wind, 22 MW PV+BESS, plus 9-18 MW incremental ICE additions
Planned Resources: 60 MW (Kuihelani)
Beyond Planned Resources: 82 MW of variable generation

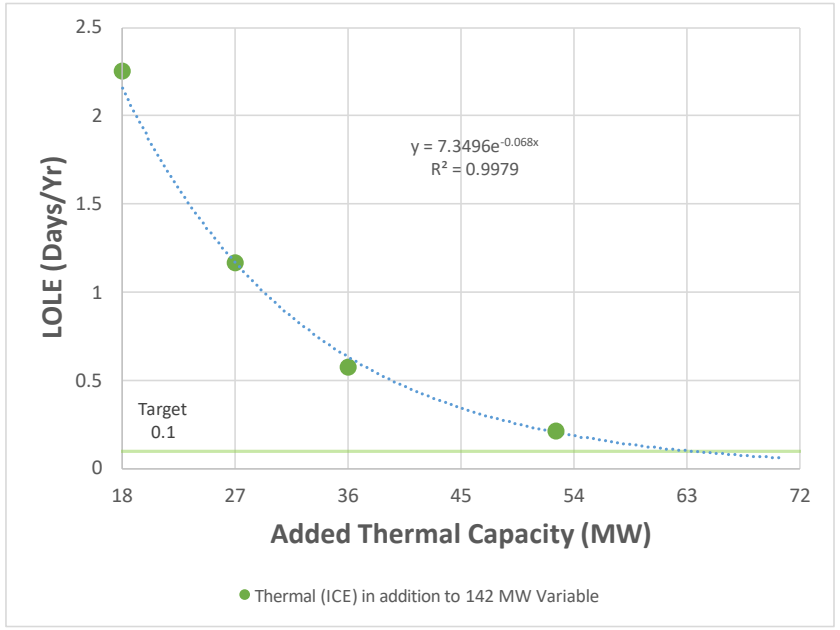
In a case where project delays persist and a total of 142 MW of variable generation reaches commercial operations by 2027, approximately 48 MW of firm generation meets the EUE target but not the LOLE target. Approximately 63 MW of firm generation is needed to meet the LOLE target.

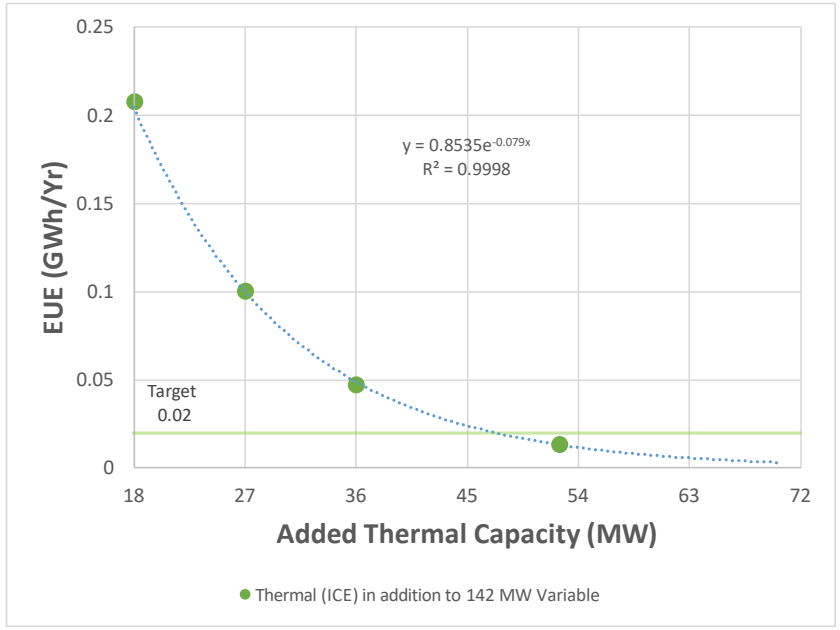




Executive Summary – Key Findings: **Resource portfolio diversity is important to balance diminishing returns on reliability improvements when adding increasing amounts of a single resource type**

Using the same data and analysis from the previous slide, the following figures expressed in non-log scale, show that increasing additions of the same resource type have diminishing returns on improvements to reliability.

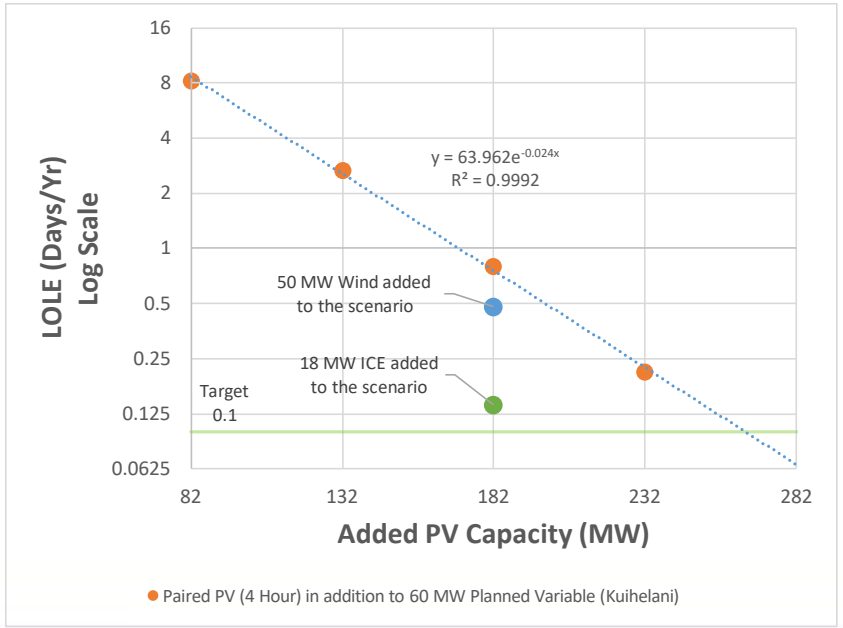


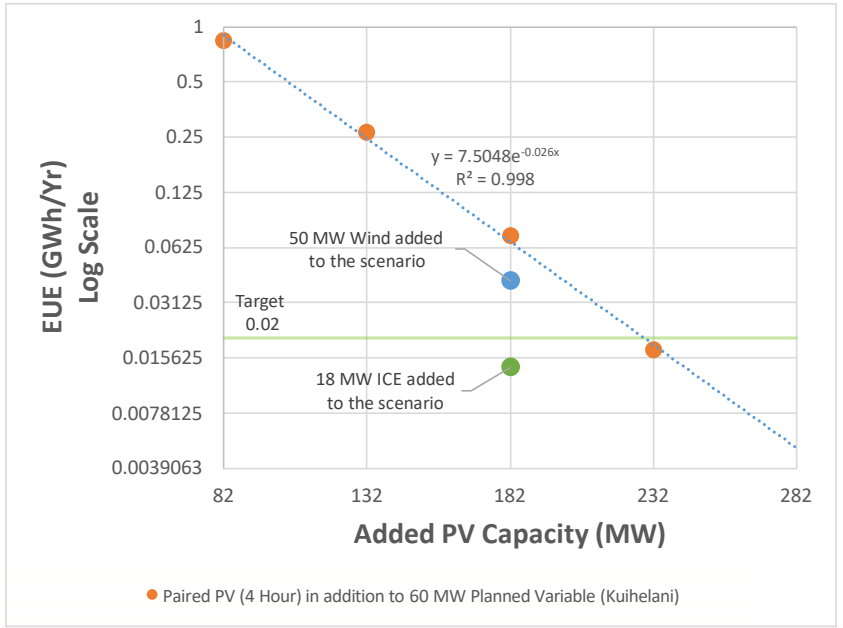


Executive Summary – Key Findings: **A high amount of new variable generation (328 MW of variable generation including Kuihelani Solar and 82 MW PV+BESS / wind) is needed with no new firm additions to meet LOLE and EUE standards**

Probabilistic Resource Adequacy Analysis, year 2030
Kuihelani Only with PV+BESS Sensitivities : Kuihelani, 60 MW wind, 22 MW PV+BESS, plus incremental 50 MW PV+BESS additions
Planned Resources: 60 MW
Beyond Planned Resources: 82 MW (60 MW of wind and 22 MW PV+BESS)

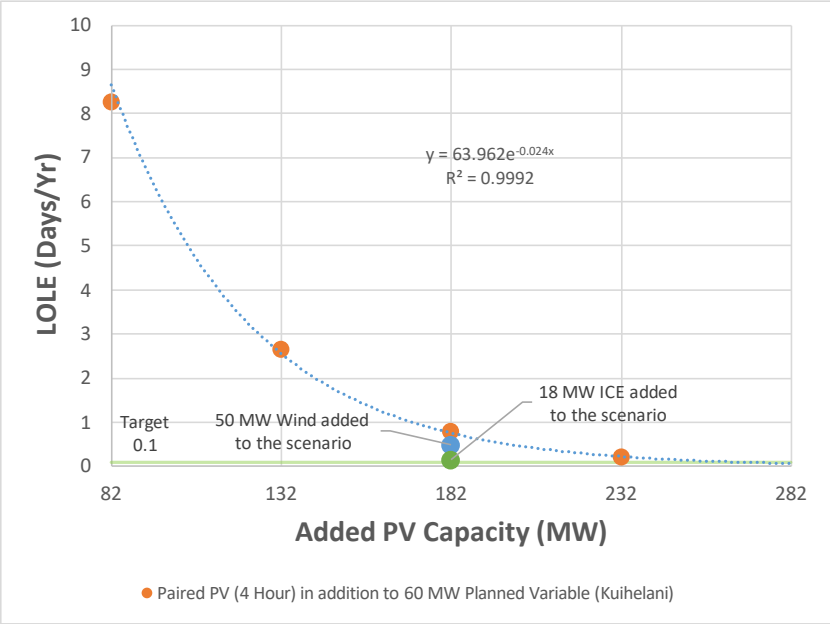
Given no new firm generation additions, incremental PV+BESS additions were tested in the orange data points. The analysis suggests 232 MW of additional PV+BESS meets the EUE target but not the LOLE target. To meet the LOLE target, extrapolating the data, an additional 36 MW of PV+BESS is needed to meet the LOLE target. In total, 328 MW of variable renewables in this case (60 MW Kuihelani, 82 MW PV+BESS / wind, 186 MW additional PV+BESS based on curve fit) is similar to the Base case with 291 MW of variable renewables and 40 MW of standalone storage. Shown in the green data points, 100 MW of additional PV+BESS for a total of 242 MW of renewable resources plus 18 MW of firm generation will provide a reasonable level of reliability.

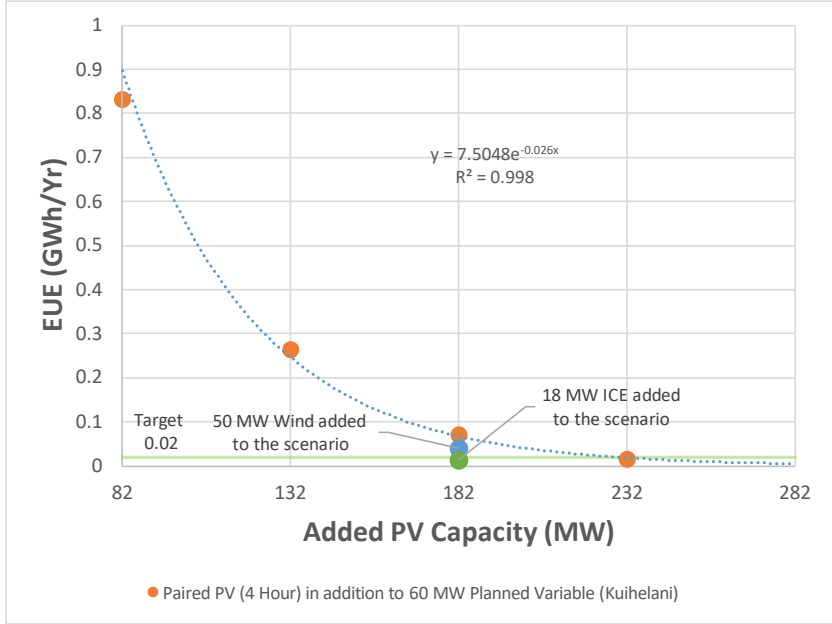




Executive Summary – Key Findings: **Resource portfolio diversity is important to balance diminishing returns on reliability improvements when adding increasing amounts of a single resource type**

As observed in the Kuihelani Solar Only with ICE firm generation sensitivities, the increasing additions of the same resource type have diminishing returns on improvements to reliability. At 182 MW of new renewables, adding 18 MW of ICE (green data point) improves reliability more than another 50 MW of PV+BESS (right most orange data point).





Key Inputs and Assumptions, Methodology

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Key Inputs and Assumptions

- Sales Forecast
- Fuel Price Forecast
- Resource Cost Forecast
- Regulating Reserve Requirement
- Hourly Dependable Capacity for Energy Reserve Margin
- Variable Renewable Resource Potential
- Renewable Energy Zone Enablement
- Planned Resources
- Near-Term Conditional Fossil Fuel Generation Removal from Service

Key Inputs and Assumptions

The PUC approved March 2022 IGP inputs and assumptions were used for the following assumptions.

- Sales Forecast
- Fuel Price Forecast
- Resource Cost Forecast

Additional assumptions are described below.

- Regulating reserve requirement –The 1-minute and 30-minute regulating reserve requirement was included, as described in the November 2021 GNA Methodology Report
- Hourly Dependable Capacity for Energy Reserve Margin – The hourly dependable capacity (HDC) for variable renewables was based on the 80th percentile calculation methodology discussed with the TAP.
- Variable Renewable Resource Potential – Consistent with the approved March 2022 IGP inputs and assumptions, the analyses used the Alt-1 scenario that was developed in NREL's revised Assessment of Wind and Photovoltaic Technical Potential for the Hawaiian Electric Company. Because a high amount of capacity was identified for slopes up to 15%, the resource potential was not split further for slopes up to 30%.

Key Inputs and Assumptions – Renewable Energy Zones

Renewable Energy Zone (REZ) upgrades are composed of two costs:

- Transmission Network Expansion costs – transmission upgrades not associated with a particular REZ group but are required to support the flow of energy within the transmission system
- REZ Enablements – new or upgraded transmission lines and new or expanded substations required to connect the transmission hub of each REZ group to the nearest transmission substation

In this analysis, only the REZ enablement costs were included.

- No transmission network expansion costs were included
- Additional details on the REZ and identified infrastructure, requirements, and costs were discussed in the Hawaiian Electric Transmission REZ Study, filed as part of the November 2021 GNA Methodology Report

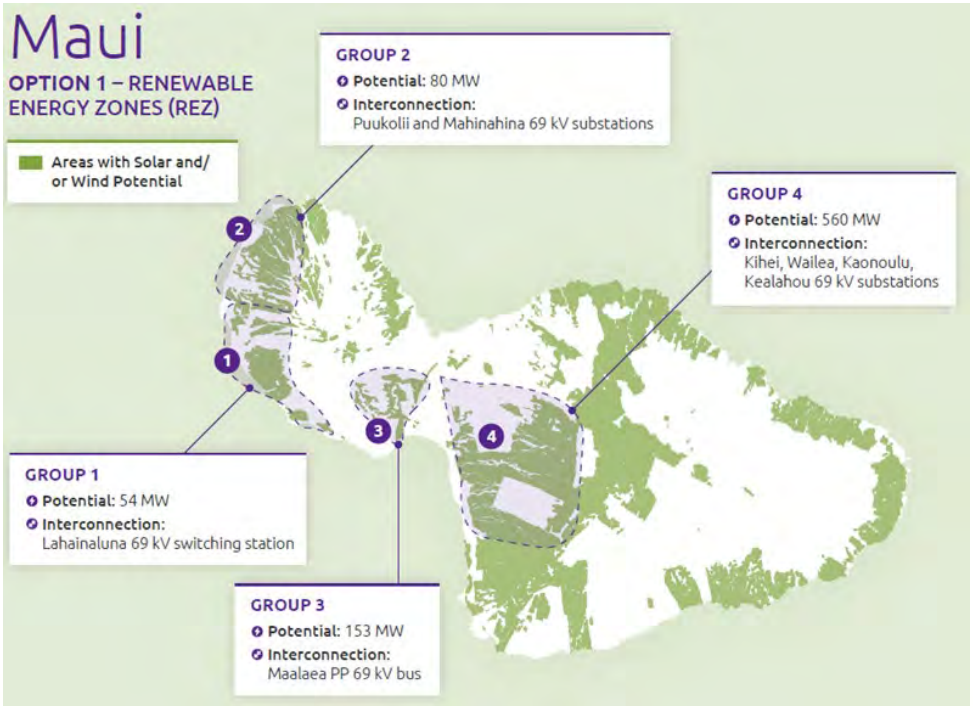
Key Inputs and Assumptions – Renewable Energy Zones

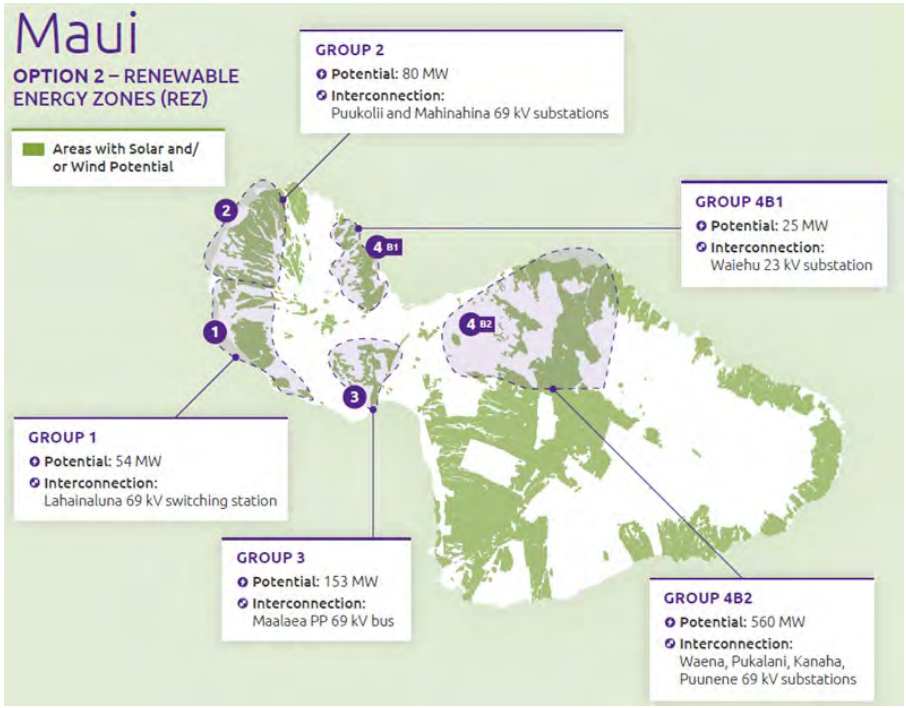
In order to model a reasonable number of candidate resource options, the REZ groups were aggregated by similar REZ enablement cost for modeling in RESOLVE.

- Group A in RESOLVE (287 MW) – Group 1, 2, 3 from the REZ Study
- Group B in RESOLVE (560 MW) – Group 4A from the REZ Study
- Group C in RESOLVE (585 MW) – Group 4B1, 4B2 from the REZ Study

Key Inputs and Assumptions – Renewable Energy Zones Modeled in RESOLVE

The maps below indicate the location of Group 1, 2, 3, 4/4A, 4B1, and 4B2 that were modeled in RESOLVE.





Key Inputs and Assumptions – Planned Resources

The RESOLVE model assumes 2027 as the first year to build new resources. Resources assumed in-service prior to 2027 are shown below. Existing PPAs are assumed to terminate at the end of their contract term, allowing RESOLVE to re-optimize the capacity, energy and other grid services the projects previously provided. For example, Kaheawa Wind Power 1 (30 MW) is assumed to expire in 2027.

Resource	PV (MW)	BESS (MW/MWh)
Kuihelani Solar	60	60/240
Paeahu Solar	15	15/60
Kamaole Solar	40	40/160
Kahana Solar	20	20/80
Pulehu Solar[1]	40	40/160
Waena BESS[2]	N/A	40/160
CBRE Phase 2 Small Projects	8.475	-
CBRE Phase 2 RFP	25	25/100

1. Pulehu Solar withdrew from the RFP process on May 4, 2022
2. Waena BESS application is pending approval

Key Inputs and Assumptions – Near-Term Conditional Fossil Fuel Removal from Service

Hawaiian Electric assumed that certain amounts of firm fossil fuel generation would not be available for dispatch for the purposes of identifying Grid Needs. The planning assumptions noted below do not imply that Hawaiian Electric will retire the amount of firm generation capacity in the years indicated. Actual removal is conditioned upon a number of factors including, whether sufficient resources have been acquired and placed into service to provide replacement grid services, reliability, resilience considerations, among others.

- Remove Kahului Power Plant no later than 2027 (32 MW) (environmental regulations)
- Remove Maalaea 10-13 by 2027 (49 MW) (estimated end of life based on lack of spare parts)
  - M13 – May 2025
  - M11 – September 2025
  - M12 – May 2026
  - M10 – September 2026
- Remove Maalaea 4-9 in 2030 (33 MW)

Key Inputs and Assumptions – Near-Term Conditional Fossil Fuel Removal from Service

The lack of available spare parts for Maalaea 10-13 may cause these units to be removed from service. The figure below provides an illustration of when end of life may be reached for each unit, given the Company's current stock of spare parts. A similar situation where spare parts become unavailable could occur for Maalaea 4-9.

Therefore, as a planning exercise, it is prudent to evaluate the near-term grid needs assuming Maalaea 10-13 and Maalaea 4-9 are removed from service.

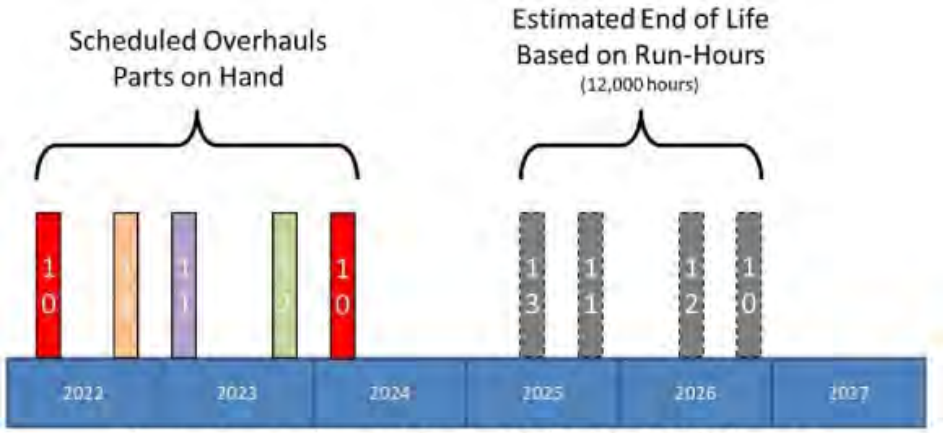
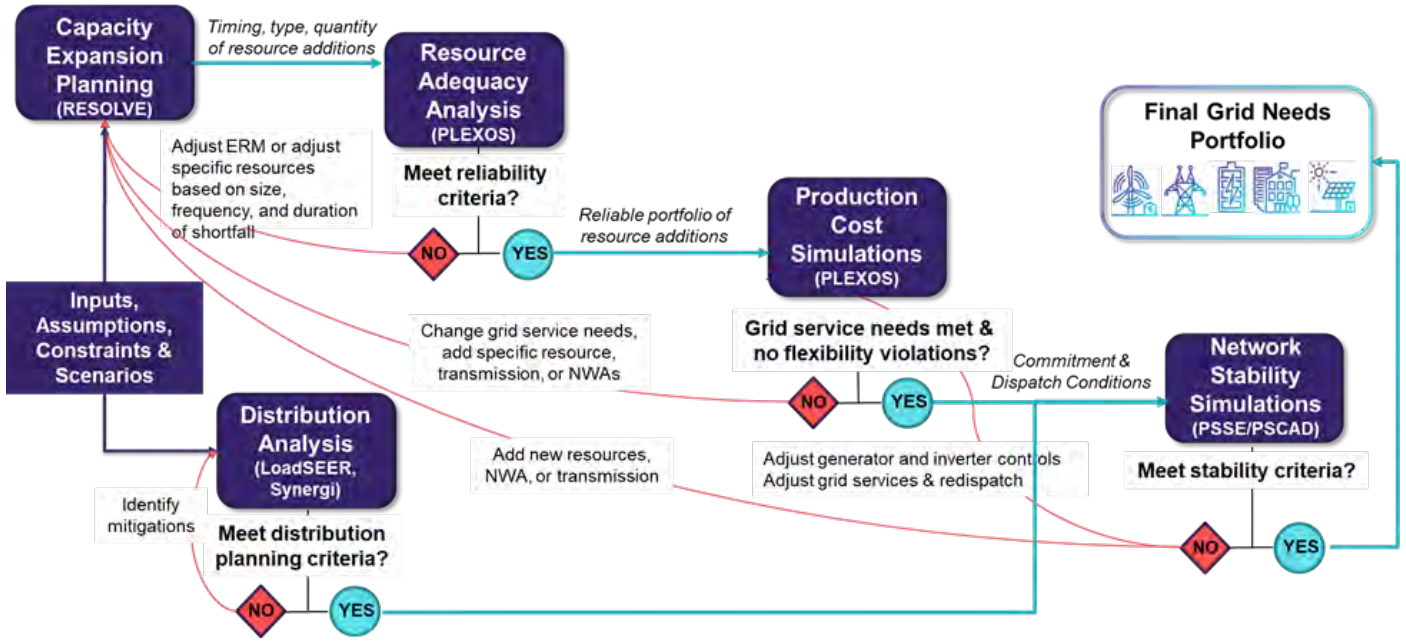


Figure 1 – Estimated End of Life for M10 thru 13

Methodology

- Grid Needs Assessment Methodology
- Define Grid Needs
- Capacity Expansion (RESOLVE)
- Resource Adequacy (PLEXOS)
- Production Cost Simulation (PLEXOS)

Grid Needs Assessment (GNA) Methodology



- The grid needs assessment focuses on the first three steps of the methodology through capacity expansion planning, resource adequacy, and production cost simulations.
- The PUC approved March 2022 IGP Inputs and Assumptions were used in this analysis.
- The methodology is consistent with the November 2021 Grid Needs Assessment and Solution Evaluation Methodology.

GNA Methodology – RESOLVE and PLEXOS Models

1. RESOLVE – Used to determine the optimal type, quantity, and timing of resource additions across a range of constraints to provide directional Grid Needs under various scenarios
   a. The planning assumptions are used to determine a Base portfolio of Grid Needs as well as evaluate resource portfolios under low load, high load, and faster customer technology adoption scenarios
   b. The outputs of RESOLVE are intended to be directional only and are not intended to be a prescriptive pathway
2. PLEXOS – Used to evaluate the energy reserve margin (ERM) and conduct probabilistic analyses on the RESOLVE resource plans for resource adequacy, verify the hourly operations and dispatch of the resources on the system and evaluate production cost
   a. The capacity need was informed by the magnitude and duration of unserved energy observed where the net load, increased by the 30% ERM guideline, was not met by existing resources.
   b. The need was further analyzed using a probabilistic approach endorsed by the TAP. The probabilistic analyses examined 5 weather years for PV and wind, 50 random generator outages for a total of 250 model iterations. The results were then used to calculate loss of load expectation, loss of load events, loss of load hours, and expected unserved energy.
   c. After evaluating the reliability of the resource plan, the operations and dispatch of the resource portfolio was analyzed to examine how the new resources would be operated in future years and evaluate the production cost

Grid Needs means the specific grid services (including but not limited to capacity, energy, and ancillary services) identified in the Grid Needs Assessment, including transmission and distribution system needs that may be addressed through a Non-Wires Alternative.

Capacity Expansion Plans

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Customer Technology Adoption is a Priority

2030 Customer Technology (incremental from 2021 levels)	Peak Load Impact (MW)	Impact to Sales (GWh)	Approximate Quantity
Energy Efficiency	24	170	N/A
Electric Vehicles	10	52	17,466
Private Rooftop Solar	56 (Installed Capacity)	95	7,114
Private BESS	43 MW / 114 MWh (Installed Capacity)	-5	7,275
Non-DER/EV Time-of-Use	1.2	N/A	N/A

Customer technology adoption is considered first in meeting grid needs. Procurement targets identified through the GNA analyses are to meet the residual grid needs after accounting for forecasted EE, EV, DER, and non-DER/EV TOU. 30 MW of Battery Bonus and grid services aggregation are currently being pursued and future DER programs (and included in the analyses) will provide additional flexibility to contribute to grid energy and capacity needs. These customer resources, when acquired cost-effectively, are critical to meeting the needs of the grid.

Further analyses can be completed during the solution sourcing phase of IGP to identify appropriate incentives to design new programs that achieve the forecasted amounts of DER and EE, i.e., evaluate the “freeze” cases.

Capacity Expansion Plans – Scenario Analysis

- **Base Scenario** – Assumes the base set of IGP sales and fuel price forecasts from the PUC approved March 2022 Inputs and Assumptions, in-service of S1/S2/CBRE projects. Existing power purchase agreements are assumed to terminate at the end of their current contract term. Existing fossil fuel generating units continue through the study period, unless otherwise noted. New variable renewable resources are allowed to be built up to the NREL Alt-1 resource potential.
- **Low Load Scenario** – Assumes the set of IGP sales forecasts that reduce customer demand including the high Distributed Energy Resource (DER), high Energy Efficiency (EE), and low Electric Vehicle (EV) forecasts. Together, these forecast layers provide a low load to bookend or bound future, plausible demand that Hawaiian Electric should plan to serve. Other planning assumptions follow the Base Scenario.
- **High Load Scenario** – Assumes the set of IGP sales forecasts that increase customer demand including the low DER, low EE, and high EV forecasts. Together, these forecast layers provide a high load to bookend or bound future, plausible demand that Hawaiian Electric should plan to serve. Other planning assumptions follow the Base Scenario.
- **Faster Customer Technology Adoption Scenario** – Assumes the set of IGP sales forecasts for high adoption levels of customer technologies including DER, EE, and EV. As a result, this sales forecast trends between the base and high load bookend.

Capacity Expansion Plans – Scenario Analysis

The table below provides the forecast assumptions for EE, DER, EV and Time-of-Use (TOU) load shapes associated with customers who do not have DER or EV for the Base, Low Load, High Load, and Faster Customer Technology Adoption (Faster Tech) cases.

Forecast Layer	Base	Low Load	High Load	Faster Tech
EE	Base	High	Low	High
DER	Base	High	Low	High
EV	Base	Low	High	High
EV Charging Shape	Managed	Managed	Unmanaged	Managed
Non-DER, Non-EV TOU	Base	High	Low	High

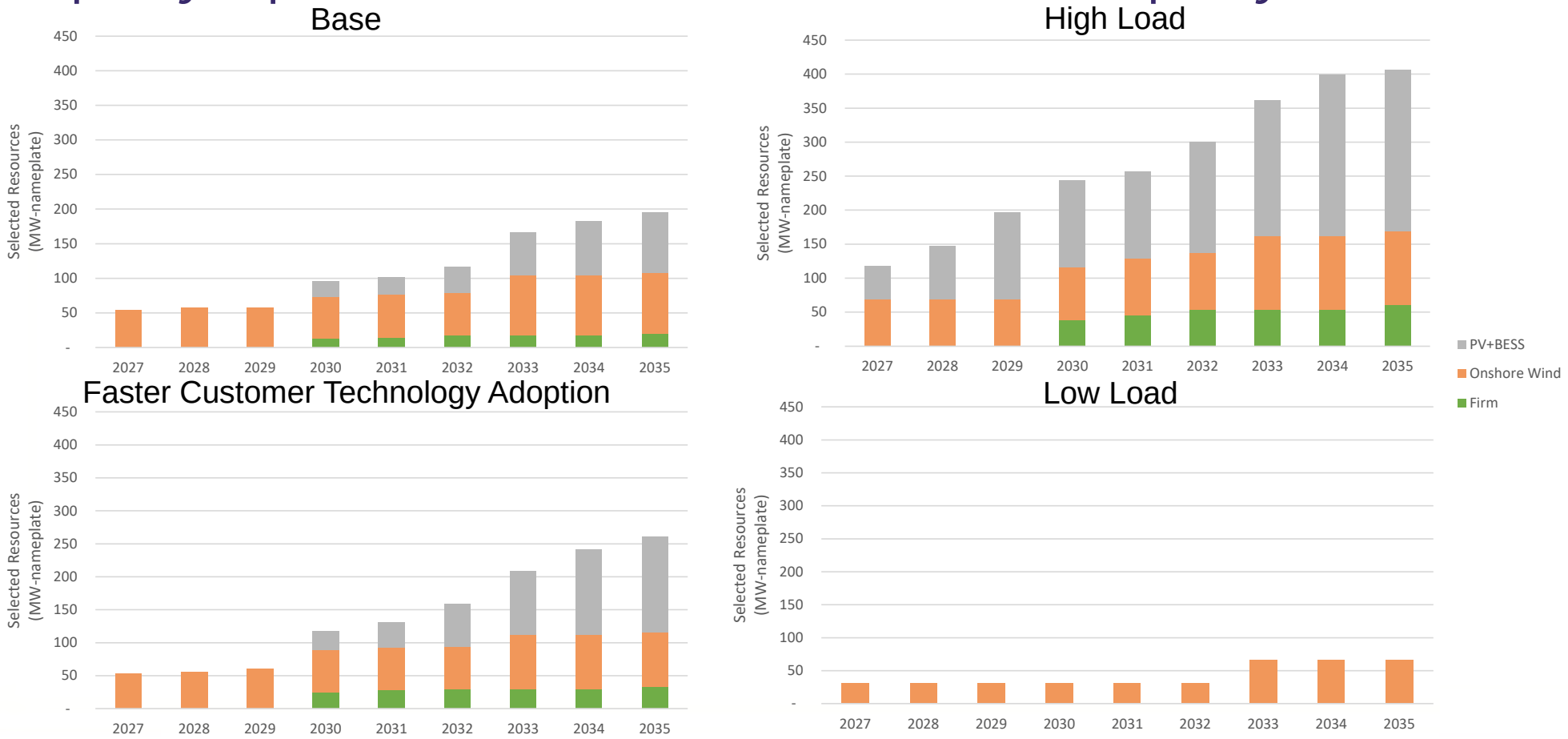
Capacity Expansion Plans – Resource Plans

The following slides show the least-cost plans as optimized in the RESOLVE model for the various scenarios and high/low load bookends. The modeling results demonstrate that the resource mix is consistent across the various futures depending on the level of load to be served. Wind is the first choice because of its lower cost ($/kWh basis) and higher capacity factor compared to PV+BESS. However, PV+BESS continues to be selected to meet the grid needs through 2035. These resources continue to be cost-effective with the REZ costs that were modeled.

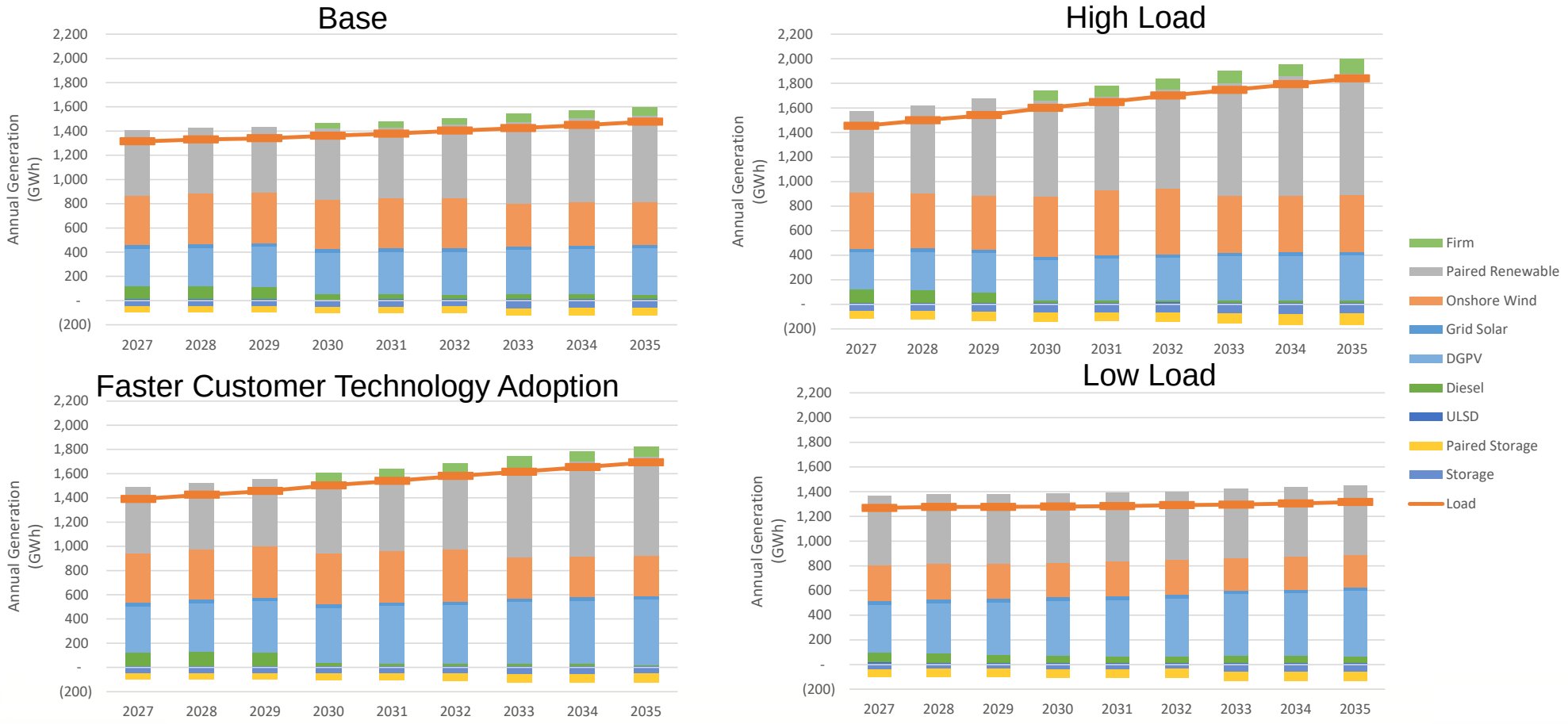
Customer resources are significant contributors to reducing supply-side needs. Additional grid-scale resources would be needed if customer resources are not adopted in significant amounts as shown on Slide 26. This is observed on the energy chart on Slide 31, and the reduced amount of resources selected by the model in the low load scenario. However, in a decarbonized scenario where load grows due to electrification of transportation, the effects can be seen in the high load scenario where significant additional resources are needed.

In all cases, fossil fuel use declines significantly as firm generation is used primarily as stand-by generation when other renewable resources (i.e., wind and solar) are not available.

Capacity Expansion Plans – Incremental Installed Capacity



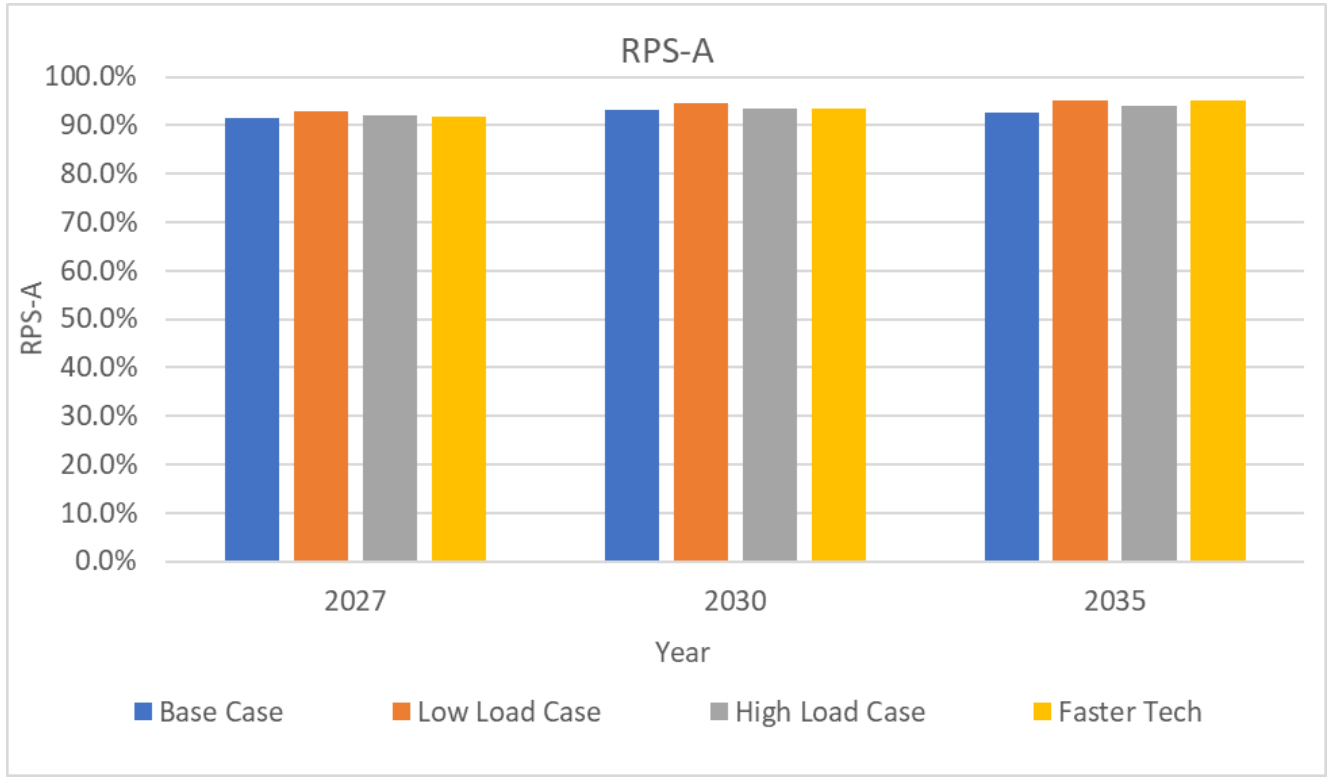
Capacity Expansion Plans – Annual Generation



Detailed Resource Plan

Year	Base Case	High Load	Low Load	Faster Tech
2027	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 69 MW Onshore Wind - Zone C Install 27 MW Paired PV with 94 MWh Battery - Zone B Install 22 MW Paired PV with 54 MWh Battery - Zone C	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 31 MW Onshore Wind - Zone C	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C
2028	Install 3 MW Onshore Wind - Zone C	Install 10 MW Paired PV with 21 MWh Battery - Zone B Install 19 MW Paired PV - Zone B		Install 2 MW Onshore Wind - Zone C
2029		Install 34 MW Paired PV with 109 MWh Battery - Zone B Install 15 MW Paired PV with 5 MWh Battery - Zone C		Install 4 MW Onshore Wind - Zone C
2030	33 MW Maalaea 4-9 Removed Install 13 MW CC Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C	33 MW Maalaea 4-9 Removed Install 39 MW CC Install 8 MW Onshore Wind - Zone C	33 MW Maalaea 4-9 Removed	33 MW Maalaea 4-9 Removed Install 25 MW CC Install 4 MW Onshore Wind - Zone C Install 28 MW Paired PV with 28 MWh Battery - Zone C
2031	Install 2 MW CC Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C	Install 3 MW CC Install 7 MW Onshore Wind - Zone C Install 4 MW CT		Install 3 MW CC Install 10 MW Paired PV with 10 MWh Battery - Zone C
2032	Install 3 MW CC Install 12 MW Paired PV with 20 MWh Battery - Zone C	Installed 8 MW CT Installed 22 MW Paired PV with 68 MWh Battery - Zone B Installed 14 MW Paired PV with 18 MWh Battery - Zone C		Install 2 MW CC Install 19 MW Paired PV with 35 MWh Battery - Zone C Install 8 MW Paired PV with 18 MWh Battery - Zone B
2033	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 24 MW Onshore Wind - Zone C Install 13 MW Paired PV with 27 MWh Battery - Zone C Install 23 MW Paired PV with 61 MWh Battery - Zone B	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 36 MW Onshore Wind - Zone C	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 18 MW Onshore Wind - Zone C Install 1 MW Paired PV with 3 MWh Battery - Zone C Install 32 MW Paired PV with 102 MWh Battery - Zone B
2034	Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C	Install 36 MW Paired PV with 102 MWh Battery - Zone B Install 2 MW Paired PV - Zone C Install 1 MW Biomass		Install 16 MW Paired PV with 38 MWh Battery - Zone B Install 16 MW Paired PV with 55 MWh Battery - Zone C
2035	Install 2 MW CC Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C	Install 8 MW Biomass		Install 4 MW Biomass Install 14 MW Paired PV with 21 MWh Battery - Zone B Install 2 MW Paired PV with 14 MWh Battery - Zone C

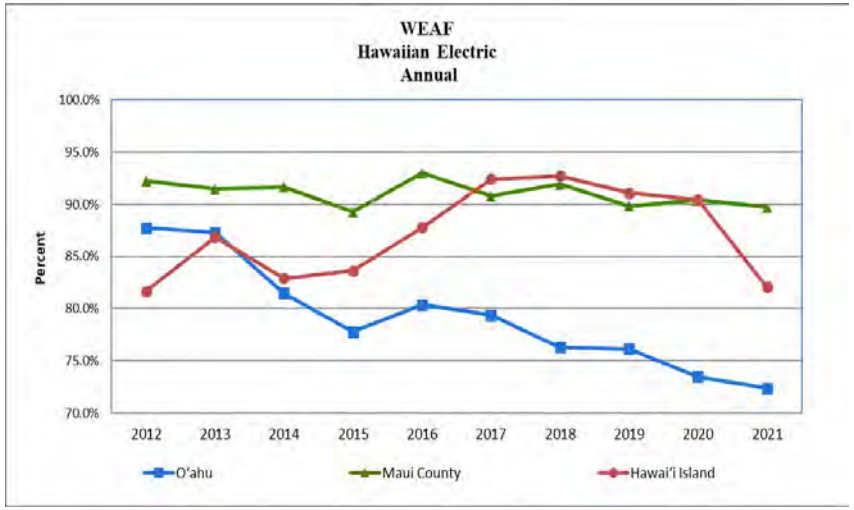
Capacity Expansion Plans – RPS-A



Despite the change in forecasted loads and resource selection across the Base, Low Load, High Load, and Faster Customer Tech cases, the resulting RPS-A is consistently high and ahead of mandated targets. This indicates that the favorable economics of adding low-cost renewables is driving their selection in the resource plans ahead of RPS mandates.

Capacity Expansion Plans – Thermal HDC and ERM Target Sensitivity

- Based on TAP feedback, applying an hourly dependable capacity (HDC) for firm thermal generation and evaluation of different levels of energy reserve margin (ERM) were tested to ensure that the optimal least-cost resource mix did not change significantly. This analysis iterates, in part, on the probabilistic resource adequacy analysis discussed later in this report.
- Currently, existing and new firm generation have an HDC of 1 or 100%, where there are no assumed derates for maintenance or forced outages. Capacity expansion plans were developed to test the sensitivity of the thermal resource selection to the ERM target and HDC.
- A thermal HDC was applied in RESOLVE to represent the availability of thermal units after planned and unplanned outages using the 2021 Weighted Equivalent Availability Factor (WEAF). This metric is the percentage of time a fleet of generating units is available to generate electricity, weighted for generator size where larger generators have a greater effect on WEAF.
- The table on the following slide are the results of this analysis. It is observed that the resource mix of wind, solar, and energy storage is unchanged. The amount of firm generation that is selected by RESOLVE changes based on the ERM. This suggests that the ERM and HDC do not impact building of low-cost renewables (i.e., firm generation does not displace lower cost solar and wind resources); however, firm generation depends on the level of reliability desired.



Capacity Expansion Plans – Thermal HDC and ERM Target Sensitivity

Year 2030	Base	30% ERM, Thermal HDC	20% ERM, Thermal HDC	15% ERM, Thermal HDC	10% ERM, Thermal HDC
Existing firm HDC (%)	100%	89.72%	89.72%	89.72%	89.72%
New firm HDC (%)	100%	97.4%	97.4%	97.4%	97.4%
ERM Requirement (%)	30%	30%	20%	15%	10%
New Firm (selected by RESOLVE)	13	26	12	4	0
Existing Firm	126	126	126	126	126
Paired PV	22	25	18	17	14
Onshore Wind	60	60	62	62	64
Paired Storage (MW/MWh)	22 MW / 22 MWh	25 MW / 25 MWh	18 MW / 18 MWh	17 MW / 17 MWh	14 MW / 14 MWh

Capacity Expansion Plans – Key Findings

- In the near-term, the same type of resources are being selected by RESOLVE through 2034 and the resource build only varies in quantity and timing across the different scenarios.
  - While the plans diverge slightly in 2035 when the faster customer technology adoption and high load scenarios build a new resource (biomass), the selected capacity is small (4-8 MW).
  - This indicates that in the near-term, the grid needs are similar and that further load scenarios may not be needed.
  - The resulting RPS-A for these plans is consistently high and further supports that the load bookends are an appropriate framework for considering load scenarios.
- Regardless of the HDC applied to thermal units or ERM target percentage, high amounts of renewables (wind, PV+BESS) are still consistently selected in RESOLVE
  - Firm thermal capacity is still needed for ERM targets between 15-30%

RESOLVE to PLEXOS – Detailed Resource Plan

Adjustments were made to the RESOLVE resource plan to reflect minimum installed capacities for thermal generating units.

*The combined cycle resource selected by RESOLVE is much smaller than the assumed block size for a 1x1 LM2500 CC (48 MW). However, because RESOLVE built this resource to meet a capacity need for ERM, the combined cycle was converted to two 9 MW ICE units.

Year	Base Case (RESOLVE)	18 MW ICE (PLEXOS)
2027	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C
2028	Install 3 MW Onshore Wind - Zone C	Install 3 MW Onshore Wind - Zone C
2029		
2030	33 MW Maalaea 4-9 Removed **Install 13 MW CC*** Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C	33 MW Maalaea 4-9 Removed **Install 18 MW ICE** Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C
2031	**Install 2 MW CC*** Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C	Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C
2032	**Install 3 MW CC*** Install 12 MW Paired PV with 20 MWh Battery - Zone C	Install 12 MW Paired PV with 20 MWh Battery - Zone C
2033	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C
2034	Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C	Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C
2035	**Install 2 MW CC*** Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C	Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C

Energy Reserve Margin Analysis

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Energy Reserve Margin

Historically, Maui's capacity planning criteria was defined by Rule 1 with consideration for a reserve margin:

- The total capability of the system must at all times be equal to or greater than the summation of the following:
  - The capacity needed to serve the estimated system peak load less the total amount of interruptible load;
  - The capacity of the unit scheduled for maintenance; and
  - The capacity that would be lost by the forced outage of the largest available unit in service
- Consideration will be given to maintaining a reserve margin of approximately 20 percent based on Reserve Ratings

The current Energy Reserve Margin criteria was developed to consider the dynamic nature of variable resources and limited duration storage

- The ERM is the percentage which the system capacity must exceed the system load in each hour
- The hourly evaluation of available energy allows for a statistical representation of the impact of variable and finite resources at all hours of the day
- The ERM for Maui is 30% to provide reasonable reliability reserve to address some level of contingencies, forecast errors, and uncertainties inherent in planning assumptions

Energy Reserve Margin – Scenario Analysis

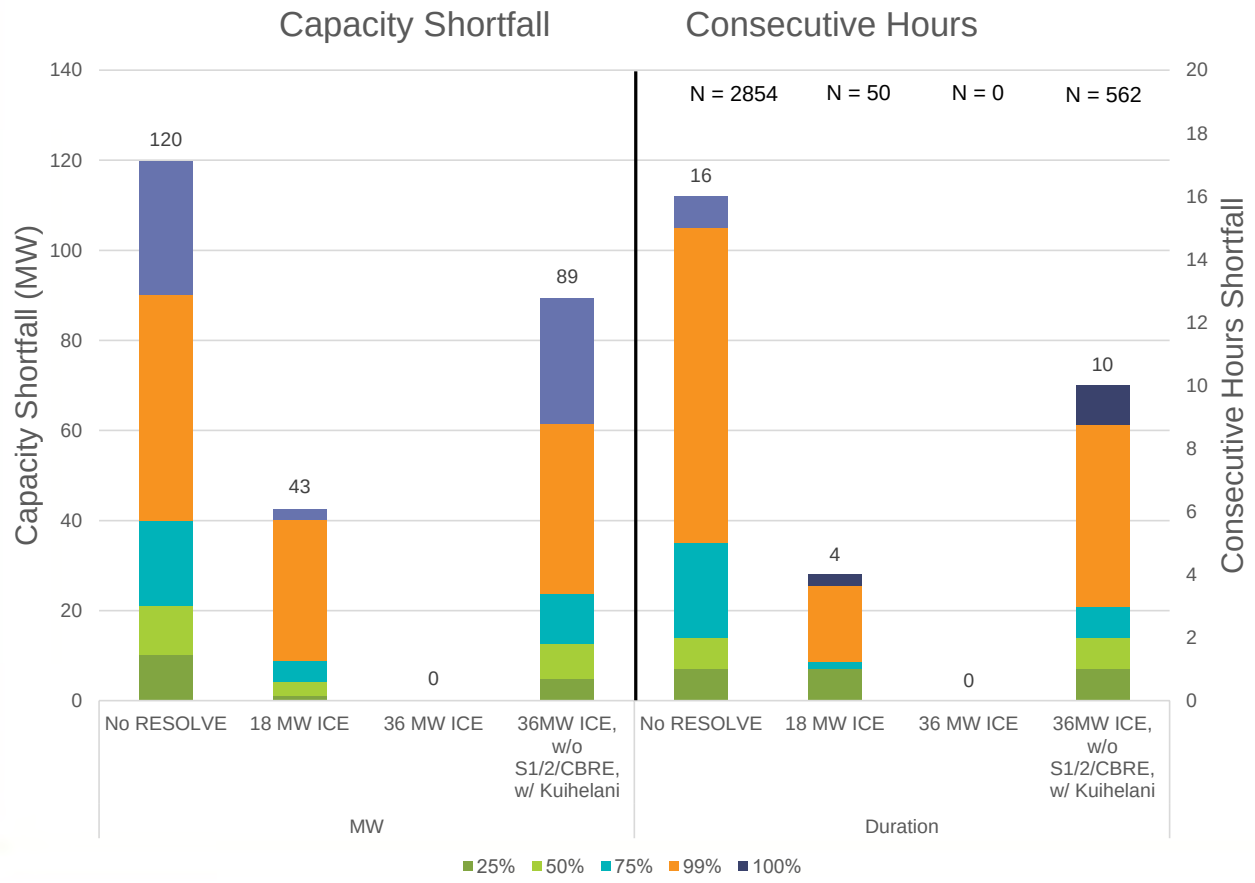
Using the Base scenario as a guide, various scenarios were evaluated to determine the capacity shortfall and consecutive hours of shortfall. These two metrics provide insight into both the size and duration of a capacity shortfall.

- **No Future RESOLVE Resources** – Using the Base scenario, planned resource additions for S1/S2/CBRE and planned removals are included but any selected RESOLVE resources are not included. This scenario will identify the capacity that RESOLVE selected to meet ERM.
- **18 MW ICE** – Using the Base scenario, partial installations of combined cycle that were selected by RESOLVE were accelerated from 2031, 2032 and combined into year 2030 for a total of 18 MW. For capacity planning purposes, this thermal generating resource was represented by 2 x 9 MW ICE units.
- **36 MW ICE** – Using the Base scenario, the partial installations of combined cycle were again converted to 18 MW of ICE. An additional 18 MW of ICE was added and the combined 36 MW was installed in 2027.
- **36 MW ICE, w/o S1/S2/CBRE Ph2, w/ Kuihelani Solar (Kuihelani)** – Using the 36 MW ICE scenario, less certain planned resources were removed from Stage 1, Stage 2, and CBRE Ph 2. Kuihelani was still included because there was relatively more certainty it would be in service compared to other projects.

Energy Reserve Margin – Detailed Resource Plan

Year	No RESOLVE	18 MW ICE	36 MW ICE	36 MW ICE w/o S1/S2/CBRE P2
2027	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C Install 36 MW ICE	30 MW Kaheawa Wind Power 1 Removed 9.47 MW Kahului 1-2 Removed 23 MW Kahului 3-4 Removed 49.36 MW Maalaea 10-13 Removed Install 54 MW Onshore Wind - Zone C Install 36 MW ICE
2028		Install 3 MW Onshore Wind - Zone C	Install 3 MW Onshore Wind - Zone C	Install 3 MW Onshore Wind - Zone C
2029				
2030	33 MW Maalaea 4-9 Removed	33 MW Maalaea 4-9 Removed Install 18 MW ICE Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C	33 MW Maalaea 4-9 Removed Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C	33 MW Maalaea 4-9 Removed Install 3 MW Onshore Wind - Zone C Install 22 MW Paired PV with 22 MWh Battery - Zone C
2031		Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C	Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C	Install 2 MW Onshore Wind - Zone C Install 3 MW Paired PV with 3 MWh Battery - Zone C
2032		Install 12 MW Paired PV with 20 MWh Battery - Zone C	Install 12 MW Paired PV with 20 MWh Battery - Zone C	Install 12 MW Paired PV with 20 MWh Battery - Zone C
2033	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C	21 MW Kaheawa Wind Power 2 Removed 21 MW Auwahi Wind Removed Install 25 MW Onshore Wind - Zone C Install 25 MW Paired PV with 54 MWh Battery - Zone C
2034		Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C	Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C	Install 5 MW Paired PV with 13 MWh Battery - Zone B Install 11 MW Paired PV with 8 MWh Battery - Zone C
2035		Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C	Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C	Install 7 MW Paired PV with 23 MWh Battery - Zone B Increase Paired PV by 3 MW - Zone C

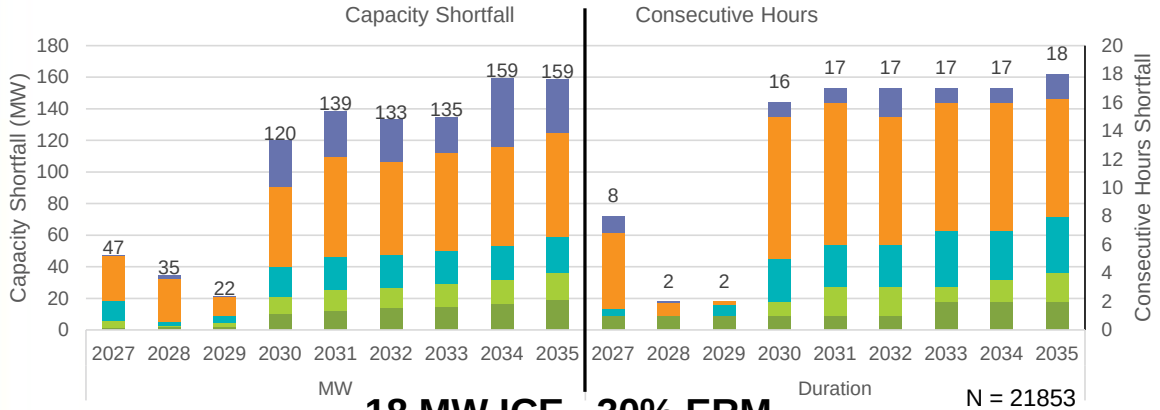
Energy Reserve Margin – ERM Needs (2030)



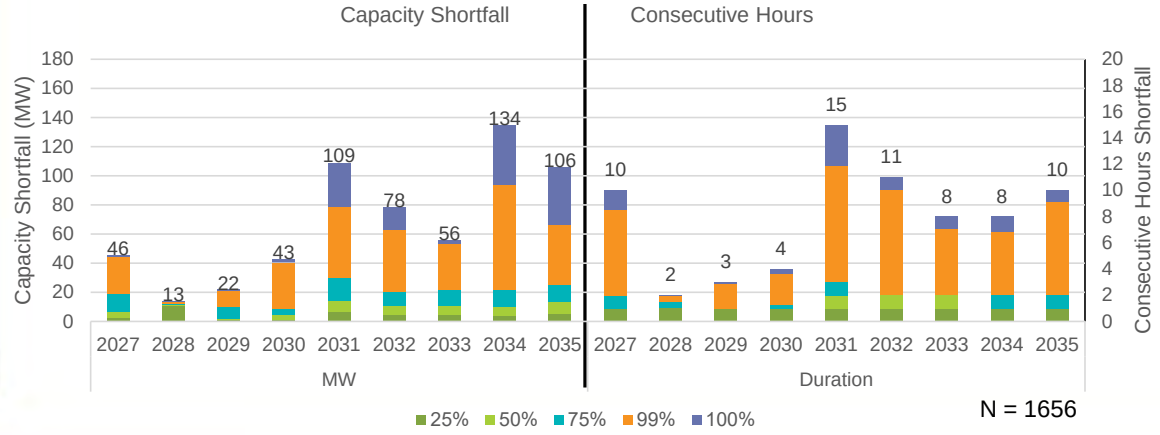
- 30% ERM and p80 HDCs were included in this analysis
- N: Total hours of unserved energy.
- The capacity shortfalls for each hour in 2030 is shown on the left.
- The duration of each capacity shortfall is shown on the right.
- The colors represent percentiles that show the distribution of hourly shortfalls and shortfall durations throughout 2030.

Energy Reserve Margin – Annual ERM Needs

No RESOLVE Selected Resources – 30% ERM



18 MW ICE– 30% ERM



2027-2029

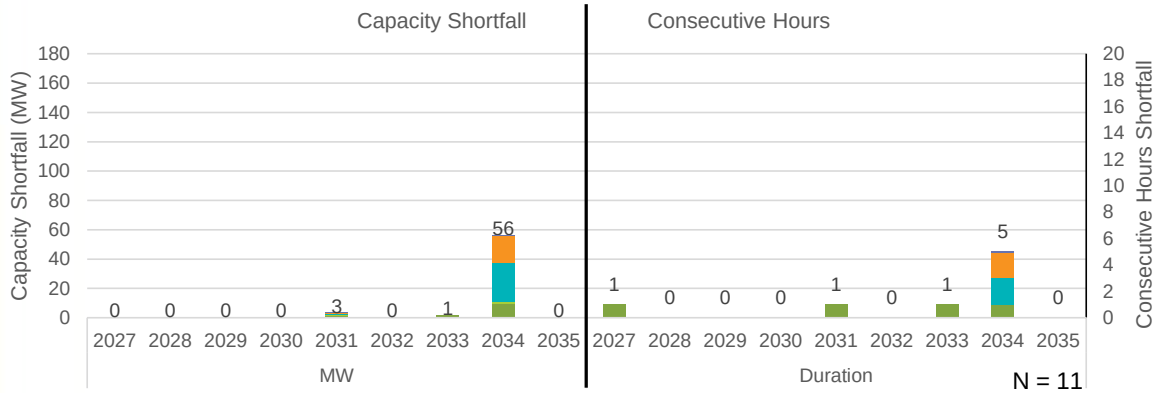
- Capacity shortfalls are due to the removal of Maalaea 10-13 and maintenance of the dual train combined cycles

2030-2035

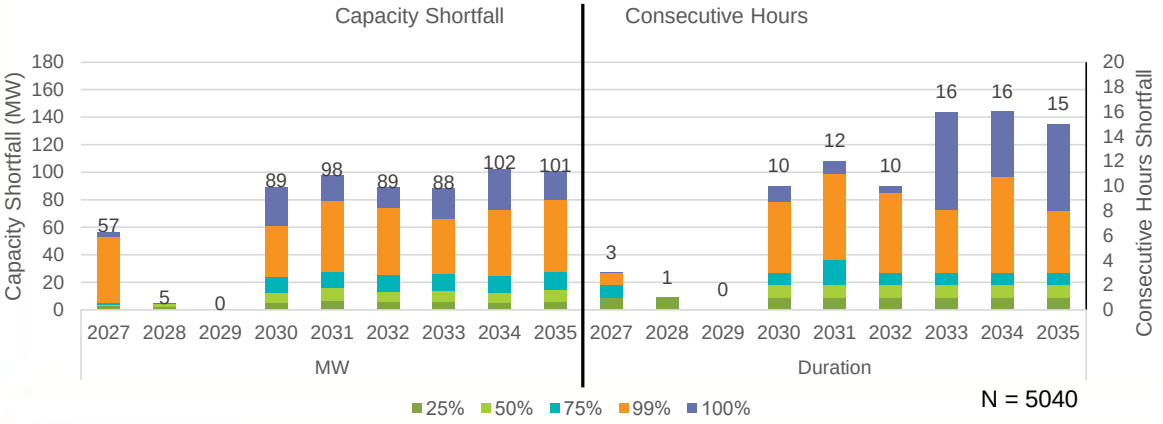
- Capacity shortfalls are due to the removal of Maalaea 4-9
- The addition of 18 MW ICE in 2030 reduces 2030+ shortfalls relative to the no RESOLVE resources case

Energy Reserve Margin – Annual ERM Needs

36 MW ICE – 30% ERM



36 MW ICE, w/o S1/S2/CBRE Ph 2, with Kuihelani – 30% ERM



- **36 MW ICE:**
  - **2034** – Capacity shortfall is due to maintenance on the dual train combined cycles
- **36 MW ICE w/ S1/S2/CBRE Ph 2**
  - **2030-2035** – Capacity shortfalls are due to the removal of Maalaea 4-9

Although 36 MW of ICE is installed in 2027 in both cases, the wind and PV+BESS has a significant impact on the remaining capacity need.

Energy Reserve Margin – Key Findings

- The No RESOLVE selected resources scenario identified the capacity and duration to be met by future resources.
- Excluding the extreme outliers, at the 99th percentile, a capacity need of 90 MW and 15 consecutive hours in 2030 was determined.
- The 18 MW ICE scenario confirms that there is still a residual ERM need after accounting for the RESOLVE additions so additional capacity is needed.
- The 36 MW ICE scenario shows that additional ICE can solve for residual ERM needs in 2030.
- The 36 MW ICE w/o S1/S2/CBRE Ph 2, w/ Kuihelani scenario shows that a 36 MW additional ICE may not be enough if other planned renewable projects in the resource plan withdraw.
- Grid needs from 2027 – 2035 agree with the general trends highlighted in 2030, that 36 MW of new thermal generation satisfies most of the future ERM needs and that even more capacity, above 36 MW, may be needed if projects from Stage 1, Stage 2, and CBRE are not able to go into service in this timeframe.

Probabilistic Resource Adequacy Analysis

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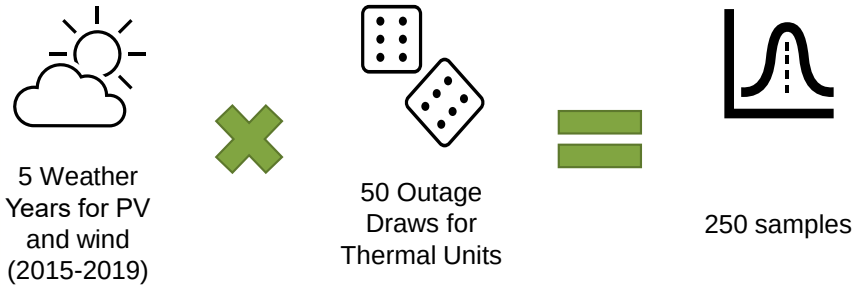
Probabilistic Analyses



- A probabilistic framework was developed with and endorsed by the TAP to further examine the resource adequacy of the plans in a selected year.
- Probabilistic resource adequacy is a method to quantify the risk of capacity shortfalls given the uncertainty in future system operating conditions.
- This method utilizes a random sampling approach to define distributions of generating resource availability using an outage rate for thermal generators and historical weather years for variable renewable resources.
- 50 outage draws for thermal generators and 5 weather years for variable renewable resources were examined for a total of 250 samples for each case.

Probabilistic Analyses – Key Metrics

Several metrics can be calculated to characterize the reliability of the resource plan

- LOLE or Loss of Load Expectation is the average number of event-periods per year with unserved load across all simulated random samples. In the Company's analyses, this is defined as days per year.
- LOLEv or Loss of Load Frequency is the average count of events per year with unserved load across all simulated random samples. An event is defined as consecutive hours of unserved load.
- LOLH or Loss of Load Hours is the average number of hours with unserved load across all simulated random samples.
- EUE or Expected Unserved Energy is the average load not served per year across all simulated random samples.

LOLE: Target of 0.1 represents commonly used standard on the US Mainland.

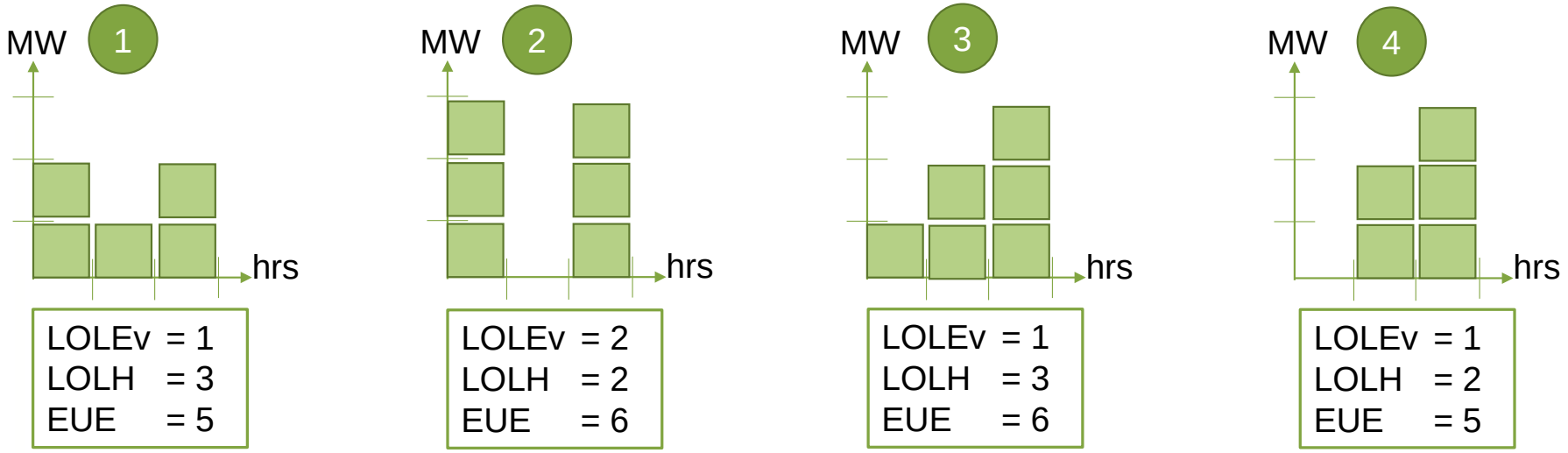
LOLH: Belgium, France, Great Britain, and Poland have a standard of equal to or less than 3 hr/yr.

EUE: Australia/AEMO have a standard of equal to or less than 0.002% of total energy demand. Using the 2030 forecasted net load on Maui, this is equivalent to 20 MWh.

The TAP recommends multiple metrics to assess resource adequacy. Although different jurisdictions use different metrics for their reliability standard, reporting a suite of metrics provides a fuller picture of the reliability of a resource plan. For example, LOLE indicates the number of days of unserved energy but does not indicate the magnitude (EUE), duration (LOLH), or number of events (LOLEv).

See EPRI Report 3002023230, Resource Adequacy for a Decarbonized Future, A Summary of Existing and Proposed Resource Adequacy Metrics, April 2022

Probabilistic Analyses – Key Metrics



Illustrative examples of LOLEv, LOLH, and EUE. Each of these metrics characterize the size and duration of unserved energy. One day of unserved energy (LOLE) can consist of one or more unserved energy events. One unserved event (LOLEv) can have a duration of one or multiple hours of unserved energy as long as the unserved energy occurs within a continuous set of hours. The total number of unserved hours is LOLH and the total amount of unserved energy is EUE.

- Examples 1 and 3 have the same LOLEv and LOLH but different EUE
- Examples 1 and 4 have the same LOLEv and EUE but different LOLH
- Examples 2 and 3 have the same EUE but different LOLEv and LOLH

Adapted from Telos Energy

Probabilistic Analyses – Key Findings

The key findings of the probabilistic analyses include:

- Each resource type improves reliability to a different degree. There are diminishing returns with each new addition of a single resource technology to improve reliability.
  - An incremental 50 MW PV+BESS addition to a base of Kuihelani Solar (60 MW) plus 22 MW PV+BESS, 60 MW wind reduced LOLE from **8.27** to **2.66** days/year. Further 50 MW additions had a reduced reduction in LOLE relative to the same base (+100 MW / **0.8** days/yr, +150 MW / **0.21** days/yr). (Slide 52)
  - An incremental 18 MW ICE addition from a base of Kuihelani Solar plus 22 MW PV+BESS, 60 MW wind reduced LOLE from **8.27** to **2.26** days/yr. Further 9 MW additions had a reduced reduction in LOLE relative to the same base (+27 MW / **1.17** days/yr, +36 MW / **0.58** days/yr). (Slide 55)
  - A 9 MW, 12-hour long duration energy storage (LDES) did not provide the same degree of reliability as a 9 MW ICE (36 MW ICE / **0.58** days/yr, 27 MW ICE + 9 MW LDES / **0.62** days/yr)
  - Adding 242 MW of variable generation and 18 MW of firm generation (**0.14** days/yr) or adding 291 MW of variable generation and 40 MW of standalone BESS (**0.14** days/yr) will achieve a similar LOLE as Maui in 2021 (**0.15** days/yr). (Slide 52)
- Due to potential community opposition to new wind plants, the model selected wind was converted to PV + BESS on an energy basis (ratio of 1 MW wind to 2 MW of PV). Probabilistic cases examining the substitution of 50 MW wind for 50 MW PV+BESS and comparison of the removal of 30 MW of wind vs 62 MW PV indicate that while wind improves reliability, PV + BESS improves reliability to a greater degree. (Slide 52)

Probabilistic Analyses – Stakeholder Feedback

The Company has incorporated significant stakeholder feedback into the Maui GNA that was provided by the TAP on the ongoing O‘ahu GNA analyses.

This feedback is reflected in additional cases conducted for the probabilistic analyses including evaluation of:

- Long duration storage
- Finer increments of thermal additions
- Finer increments of PV+BESS additions
- Tradeoffs between continuing existing generation against removal and replacement with new generation

Probabilistic Analyses – Variable Resource Additions

Green = LOLE ≤ 0.10 Days/Yr (US Mainland), LOLH ≤ 3 hrs (Belgium, France, GB, Poland), EUE ≤ 0.002% of load/20 MWh (AEMO)

Year 2030	Existing Firm (MW)	Firm Removed (MW)	Future Firm (MW)	Planned Variable (MW)	Future Variable (MW)	SA BESS (MW)	LOLE (Days/Yr)	LOLEv (Events/Yr)	LOLH (Hours/Yr)	EUE (GWh/Yr)
Reference Case - 2021	240	-	-	-	-	-	0.15	0.16	**0.25**	**0.00**
Base Case – w/o S1/S2/CBRE Ph2, w/ Kuihelani	126	-114	0	60	82	0	**8.27**	13.83	**38.37**	**0.83**
Add 50 MW PV+BESS	126	-114	0	60	132	0	**2.66**	4.90	**10.85**	**0.26**
Add 100 MW PV+BESS	126	-114	0	60	182	0	**0.80**	1.44	**2.72**	**0.07**
Add 150 MW PV+BESS	126	-114	0	60	232	0	**0.21**	0.38	**0.67**	**0.02**
Add 100 MW PV+BESS, 18 MW ICE	126	-114	18	60	182	0	**0.14**	0.24	**0.53**	**0.01**
Add 100 MW PV+BESS, 36 MW ICE (High Load Bookend)	126	-114	36	60	182	0	**0.68**	1.30	**2.62**	**0.08**
Add 100 MW PV+BESS, 50 MW wind	126	-114	0	60	232	0	**0.48**	0.78	**1.42**	**0.04**
Base Case, No ICE	126	-114	0	208.5	82	40	**0.14**	0.31	**0.62**	**0.01**

Planned Variable includes: Kuihelani (60 MW), Paeahu (15 MW), Kamaole (40 MW), Kahana (20 MW), Pulehu (40 MW), CBRE Ph 2 (33.5 MW)
Future Standalone BESS includes: Waena BESS (40 MW)
Future Variable selected by RESOLVE includes: Wind (60 MW), PV+BESS (22 MW)

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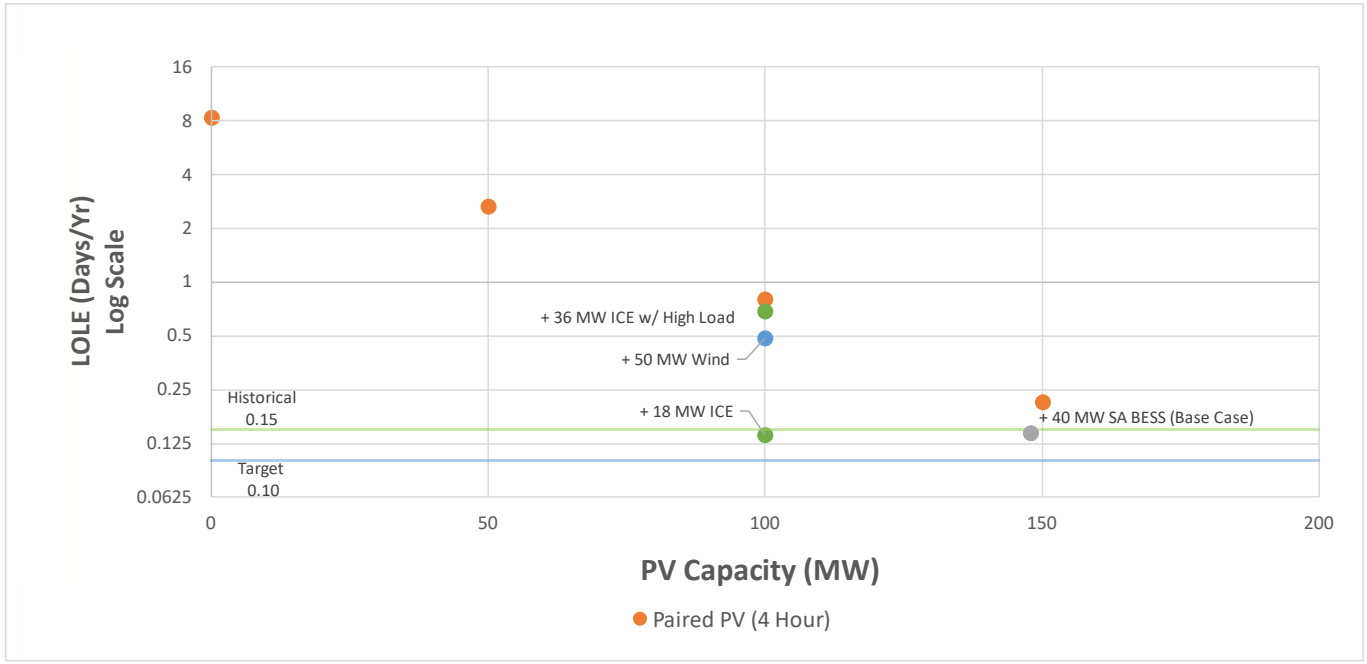
Probabilistic Analyses – Variable Resource Additions



LOLE

Add 100 MW PV+BESS

Add 100 MW PV+BESS,
50 MW onshore wind

Add 150 MW PV+BESS

Historic Level = 0.15

Add 40 MW SA BESS (Base Case, No ICE - includes S1/S2/CBRE Ph2)

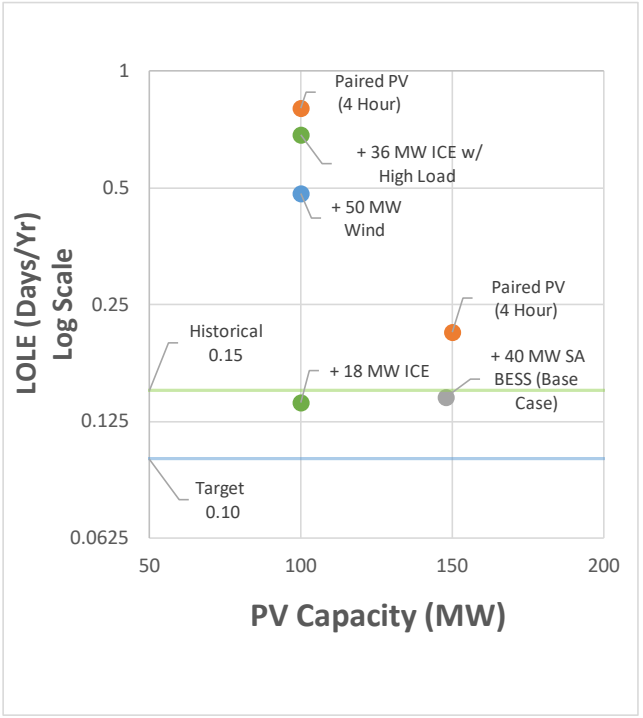
Add 100 MW PV+BESS,
18 MW ICE

US Mainland LOLE = 0.1

Probabilistic Analyses – Variable Resource Additions

LOLE is satisfactory if all the Stage 1, Stage 2, and CBRE Ph2 projects are in service (Base, No ICE Case) relative to historical reliability. Those resources could be replaced by 100 MW of PV paired with 4-hour storage and 18 MW of ICE and achieve a comparable level of reliability (lower green data point).

- With the addition of 100 MW of paired PV and a total of 36 MW of ICE, LOLE would be unsatisfactory in the High Load Bookend (upper green datapoint).
- 50 MW of paired PV improves LOLE more than 50 MW of wind (blue data point compared with the rightmost orange data point).
- 18 MW of thermal improves LOLE more than 50 MW of wind or 50 MW of paired PV (green data point compared with blue and rightmost orange datapoint)
- LOLE is worse than the historical level in the case with 150 MW of paired PV added. In comparison, the Base Case achieves an acceptable LOLE with slightly less paired PV but with the addition of 40 MW of standalone storage (gray datapoint).



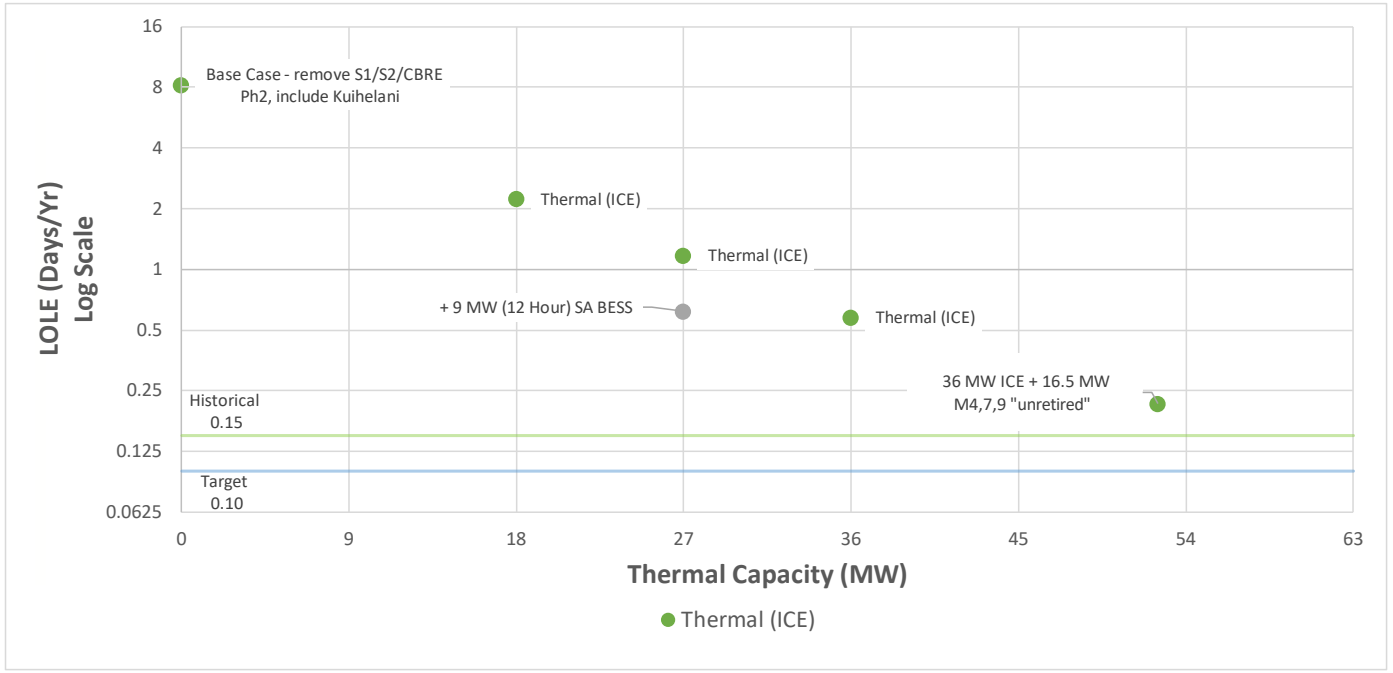
Probabilistic Analyses – Firm Resource Additions

Green = LOLE ≤ 0.10 Days/Yr (US Mainland), LOLH ≤ 3 hrs (Belgium, France, GB, Poland), EUE ≤ 0.002% of load/20 MWh (AEMO)

Year 2030	Existing Firm (MW)	Firm Removed (MW)	Future Firm (MW)	Planned Variable (MW)	Future Variable (MW)	SA BESS (MW)	LOLE (Days/Yr)	LOLEv (Events/Yr)	LOLH (Hours/Yr)	EUE (GWh/Yr)
Reference Case - 2021	240	-	-	-	-	-	0.15	0.16	0.25	0.00
Base Case - remove S1/S2/CBRE Ph2, include Kuihelani Solar	126	-114	0	60	82	0	8.27	13.83	38.37	0.83
Add 18 MW ICE	126	-114	18	60	82	0	2.26	3.57	9.97	0.21
Add 27 MW ICE	126	-114	27	60	82	0	1.17	1.84	4.70	0.10
Add 36 MW ICE	126	-114	36	60	82	0	0.58	0.91	2.41	0.05
Add 36 MW ICE, not retired: M4, M7, M9	142.5	-97.5	36	60	82	0	0.22	0.33	0.73	0.01
Add 27 MW ICE, add 9 MW 12-Hour BESS	126	-114	27	60	82	9	0.62	1.01	2.68	0.06

Planned Variable includes: Kuihelani (60 MW), Paeahu (15 MW), Kamaole (40 MW), Kahana (20 MW), Pulehu (40 MW), CBRE Ph 2 (33.5 MW)
Future Standalone BESS includes: Waena BESS (40 MW)
Future Variable selected by RESOLVE includes: Onshore Wind (60 MW), PV+BESS (22 MW)

Probabilistic Analyses – Firm Resource Additions



LOLE

Base Case - remove S1/S2/CBRE Ph2, include Kuihelani

Add 18 MW ICE

Add 27 MW ICE

Add 27 MW ICE, add 9 MW 12-Hour BESS

Add 36 MW ICE

Add 36 MW ICE, unretire M4, M7, M9

Historic Level = 0.15

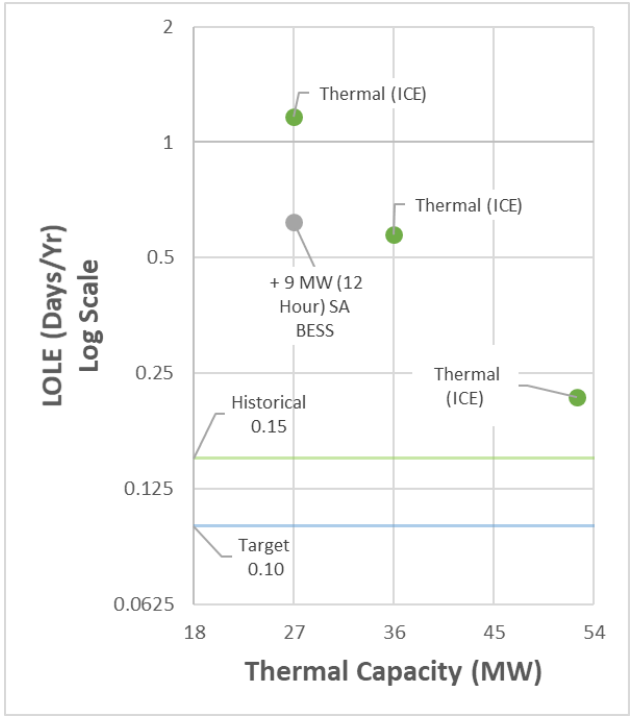
US Mainland LOLE = 0.1

Probabilistic Analyses – Firm Resource Additions

With the Stage 1, Stage 2, and CBRE Ph2 projects not in service (except Kuihelani which is in service), LOLE (8 days/year, see previous slide) does not meet the historical level.

- LOLE still does not meet the historical level with an additional 36 MW thermal and with existing units M4, M7, and M9 remaining in service and does not meet the US Mainland standard of 0.1 (lowest green datapoint).
- 9 MW of firm thermal generation improves LOLE more than 9 MW of 12-hour stand-alone BESS (middle green datapoint compared with gray datapoint).

Long duration energy storage may not necessarily reduce firm generation needs; however, additional solar + BESS would help to reduce firm generation needs. To meet immediate reliability needs, firm generation can adequately address reliability risks if solar + BESS resources are unable to reach commercial operations.



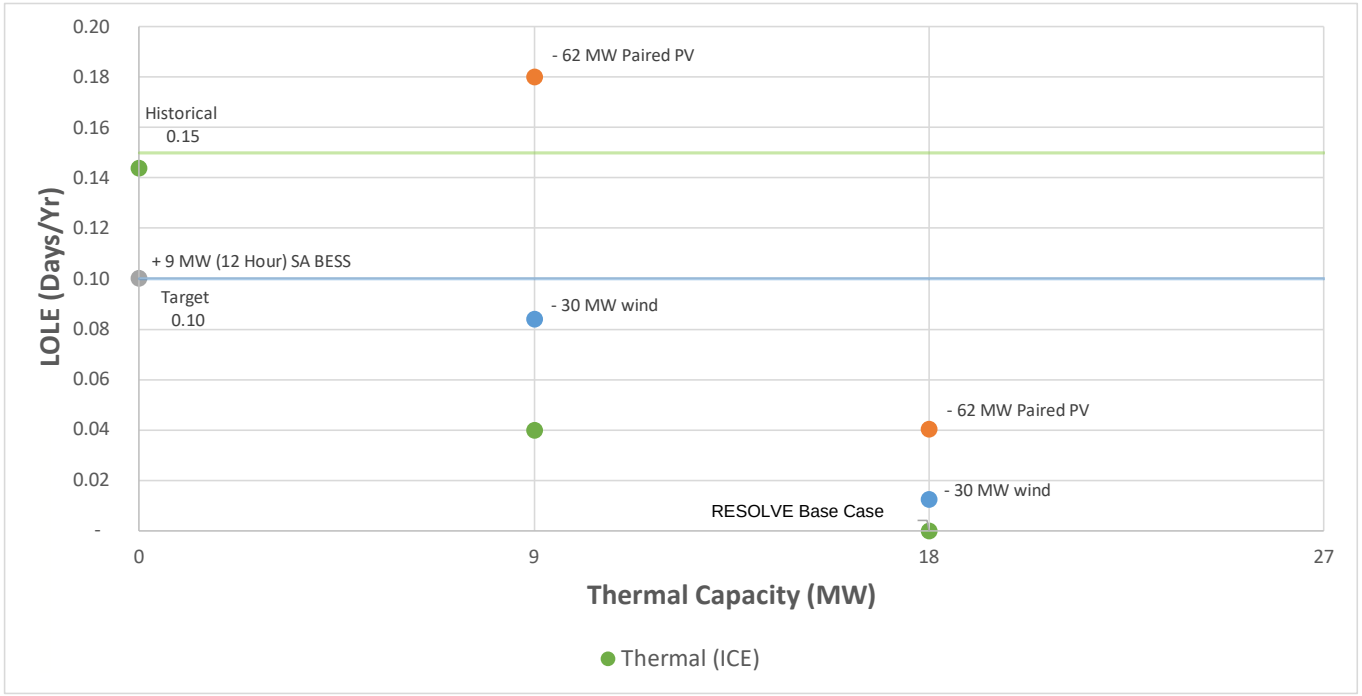
Probabilistic Analyses – Firm/Variable Resource Additions

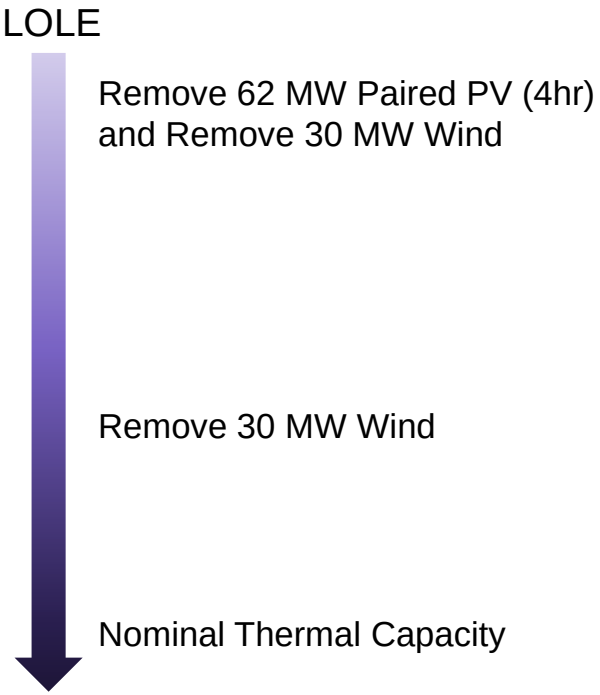
Green = LOLE ≤ 0.10 Days/Yr (US Mainland), LOLH ≤ 3 hrs (Belgium, France, GB, Poland), EUE ≤ 0.002% of load/20 MWh (AEMO)

Year 2030	Existing Firm (MW)	Firm Removed (MW)	Future Firm (MW)	Planned Variable (MW)	Future Variable (MW)	SA BESS (MW)	LOLE (Days/Yr)	LOLEv (Events/Yr)	LOLH (Hours/Yr)	EUE (GWh/Yr)
Reference Case - 2021	240	-	-	-	-	-	0.15	0.16	0.25	0.00
Base Case, No ICE	126	-114	0	208.5	82	40	0.14	0.31	0.62	0.01
Add 9 MW ICE	126	-114	9	208.5	82	40	0.04	0.07	0.13	0.00
Add 9 MW ICE, remove 62 MW PV	126	-114	9	208.5	20	40	0.18	0.34	0.62	0.01
Add 9 MW ICE, remove 30 MW wind	126	-114	9	208.5	52	40	0.08	0.15	0.33	0.01
Add 18 MW ICE (RESOLVE Base Case)	126	-114	18	208.5	82	40	0	0	0	0
Add 18 MW ICE, remove 62 MW PV	126	-114	18	208.5	20	40	0.04	0.08	0.12	0.00
Add 18 MW ICE, remove 30 MW wind	126	-114	18	208.5	52	40	0.01	0.03	0.04	0.00
Add 9 MW 12-Hour BESS	126	-114	0	208.5	82	49	0.10	0.22	0.49	0.01

Planned Variable includes: Kuihelani (60 MW), Paeahu (15 MW), Kamaole (40 MW), Kahana (20 MW), Pulehu (40 MW), CBRE Ph 2 (33.5 MW)
Future Standalone BESS includes: Waena BESS (40 MW)
Future Variable selected by RESOLVE includes: Onshore Wind (60 MW), PV+BESS (22 MW)

Probabilistic Analyses – Firm/Variable Resource Additions





Firm thermal resources can be added as a contingency for project uncertainty. Removing renewable resources has a reduced impact on LOLE when there are firm thermal resources on the grid.

Probabilistic Analyses – Additional Unit Removals

Green = LOLE ≤ 0.10 Days/Yr (US Mainland), LOLH ≤ 3 hrs (Belgium, France, GB, Poland), EUE ≤ 0.002% of load/20 MWh (AEMO)

Year 2030	Existing Firm (MW)	Firm Removed (MW)	Future Firm (MW)	Planned Variable (MW)	Future Variable (MW)	SA BESS (MW)	LOLE (Days/Yr)	LOLEv (Events/Yr)	LOLH (Hours/Yr)	EUE (GWh/Yr)
Reference Case - 2021	240	-	-	-	-	-	0.15	0.16	**0.25**	**0.00**
Base Case, No ICE	126	-114	0	208.5	82	40	**0.14**	0.31	**0.62**	**0.01**
Add 9 MW ICE	126	-114	9	208.5	82	40	**0.04**	0.07	**0.13**	**0.00**
Add 18 MW ICE, retire M15	113	-127	18	208.5	82	40	**0.04**	0.04	**0.12**	**0.00**
Add 36 MW ICE, retire M15 & M18	100	-140	36	208.5	82	40	**0.02**	0.03	**0.06**	**0.00**
Add 36 MW ICE retire M15 & M18, no Future Variable	100	-140	36	208.5	0	40	**0.03**	0.03	**0.04**	**0.00**

Firm resources can be added as a contingency to meet reliability due to uncertainty in several planned projects and can accelerate removal from service of existing firm units if variable generation targets are reached.

Probabilistic Analyses – Firm/Variable Resource Additions

In 2030, compliance with all three standards is achievable with various resource mixes

- **RESOLVE Base Case, 18 MW Firm Generation Addition Scenario ($214MM)**: 291 MW of variable generation, 40 MW of standalone BESS, and 18 MW of firm generation
  - Variable Generation: 209 MW planned, 82 MW future (includes 60 MW onshore wind)
- **Low Renewable Scenario ($248MM)**: 142 MW of variable generation and 63 MW of firm generation
  - Variable Generation: 60 MW planned (Kuihelani), 82 MW future (includes 60 MW onshore wind)
- **No Firm Addition Scenario ($280MM)**: 328 MW of variable generation
  - Variable Generation: 60 MW planned (Kuihelani), 268 MW future (includes 60 MW onshore wind)

LOLE continues to decrease and reliability improves as more resources are added.

- Removing variable resources has a reduced adverse impact on LOLE when there is a higher capacity of firm thermal resources in the system.
  - Firm thermal resources can be added to the system as a contingency for project or forecast uncertainty.
- There are diminishing returns to LOLE improvement as more resources are added to the system.

Probabilistic Analyses – EUE Heatmap

Base Case with 0 MW Firm Generation

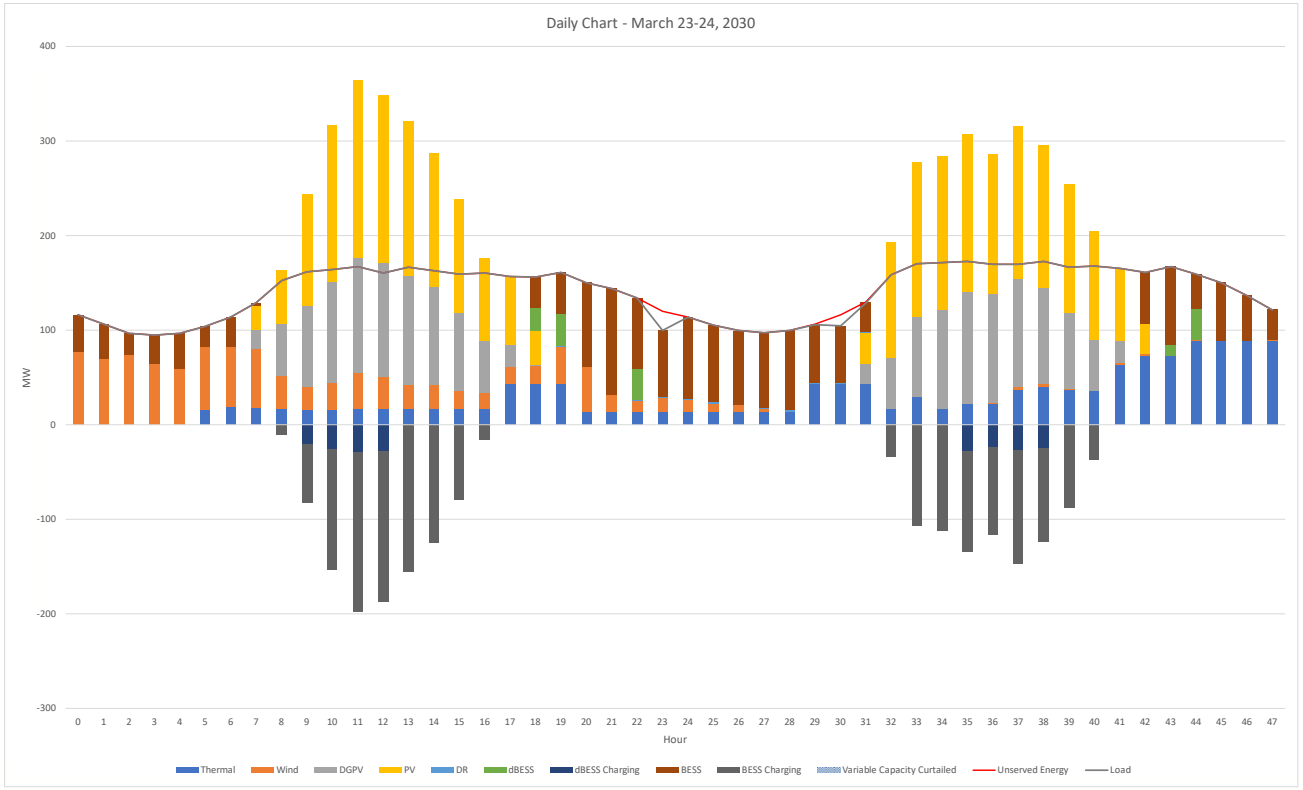
Hours Beginning	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.10	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.07	0.22	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.37	0.32	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.13	0.25	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.52	0.22	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.27	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.16	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.13	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.33	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.02	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.09	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.48	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.28	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Base Case with 9 MW Firm Generation

Hours Beginning	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.18	0.06	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.12	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.27	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.01	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.25	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

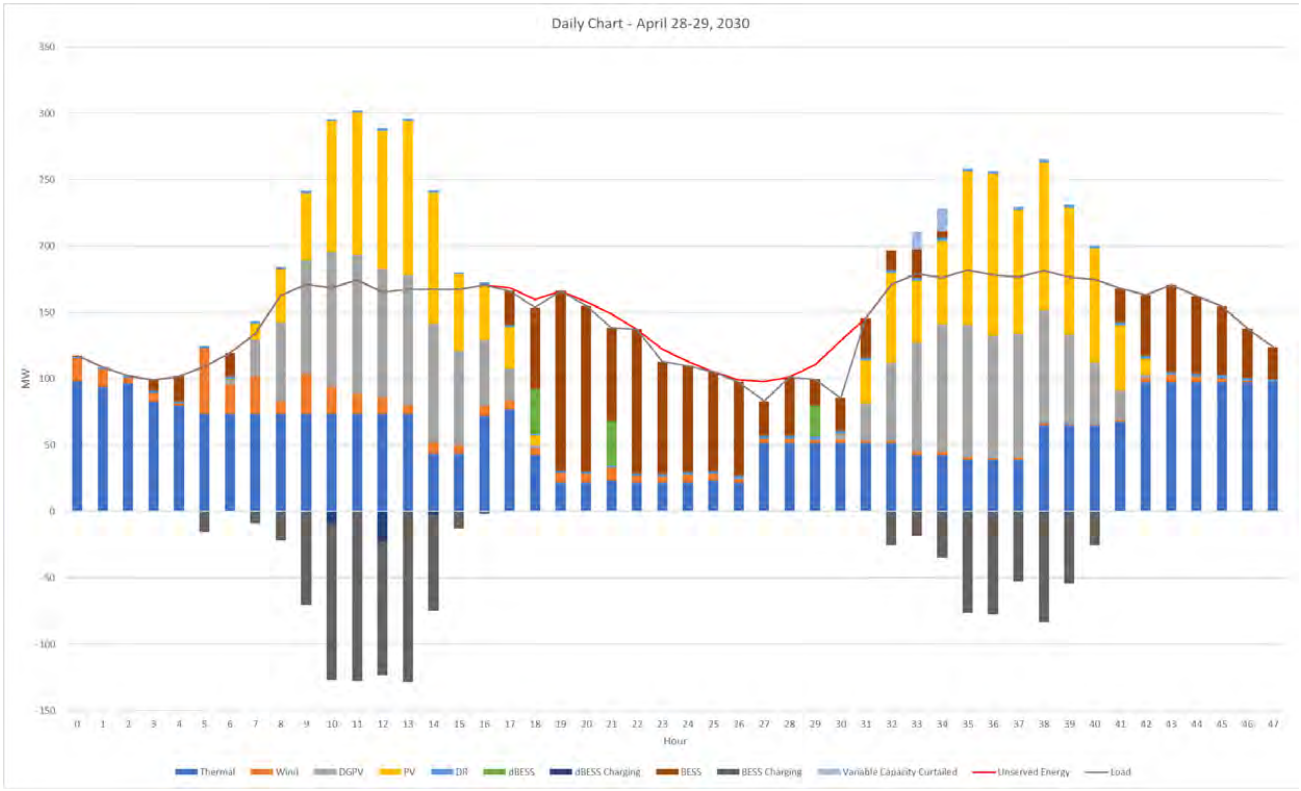
Pictured are heatmaps of unserved energy to show likelihood of when unserved energy may occur based on probabilistic resource adequacy analysis. Shortfalls are shown during the months of March, April and May where wind has a lower capacity factor and the PV+BESS do not have enough energy to load shift and meet unserved demand.

Probabilistic Analyses – Expected Unserved Energy



- The daily chart of the Base Case with 9 MW ICE
- 34 MWh of unserved energy observed late at night and early the next morning, driven by maintenance outages of thermal units.
- All BESS at 100% state of charge (SoC) after hour 17 but there is still not enough energy to serve the load overnight.

Probabilistic Analyses – Expected Unserved Energy



- The daily chart of the Base Case with 9 MW ICE
- 105 MWh of unserved energy observed late at night and early the next morning, driven by maintenance outages of thermal units.
- All BESS at 100% SoC after hour 17 but there is still not enough energy to serve the load overnight.

Production Cost Modeling and Operations of the Procurement Plan Capacity Factor of Firm Units - 18 MW ICE

Year	9 MW ICE Unit 1	9 MW ICE Unit 2	Hana	Kahului1	Kahului2	Kahului3	Kahului4	Maalaea 01	Maalaea 02	Maalaea 03	Maalaea 04	Maalaea 05	Maalaea 06	Maalaea 07
2027	0%	0%	1%	N/A	N/A	N/A	N/A	0%	0%	0%	1%	0%	0%	0%
2028	0%	0%	1%	N/A	N/A	N/A	N/A	0%	0%	0%	2%	0%	0%	0%
2029	0%	0%	1%	N/A	N/A	N/A	N/A	0%	0%	0%	2%	0%	0%	0%
2030	2%	2%	1%	N/A	N/A	N/A	N/A	1%	0%	1%	N/A	N/A	N/A	N/A
2031	6%	6%	1%	N/A	N/A	N/A	N/A	1%	0%	1%	N/A	N/A	N/A	N/A
2032	1%	2%	1%	N/A	N/A	N/A	N/A	1%	0%	1%	N/A	N/A	N/A	N/A
2033	1%	1%	1%	N/A	N/A	N/A	N/A	1%	1%	1%	N/A	N/A	N/A	N/A
2034	2%	2%	1%	N/A	N/A	N/A	N/A	0%	0%	0%	N/A	N/A	N/A	N/A
2035	2%	2%	1%	N/A	N/A	N/A	N/A	1%	0%	1%	N/A	N/A	N/A	N/A

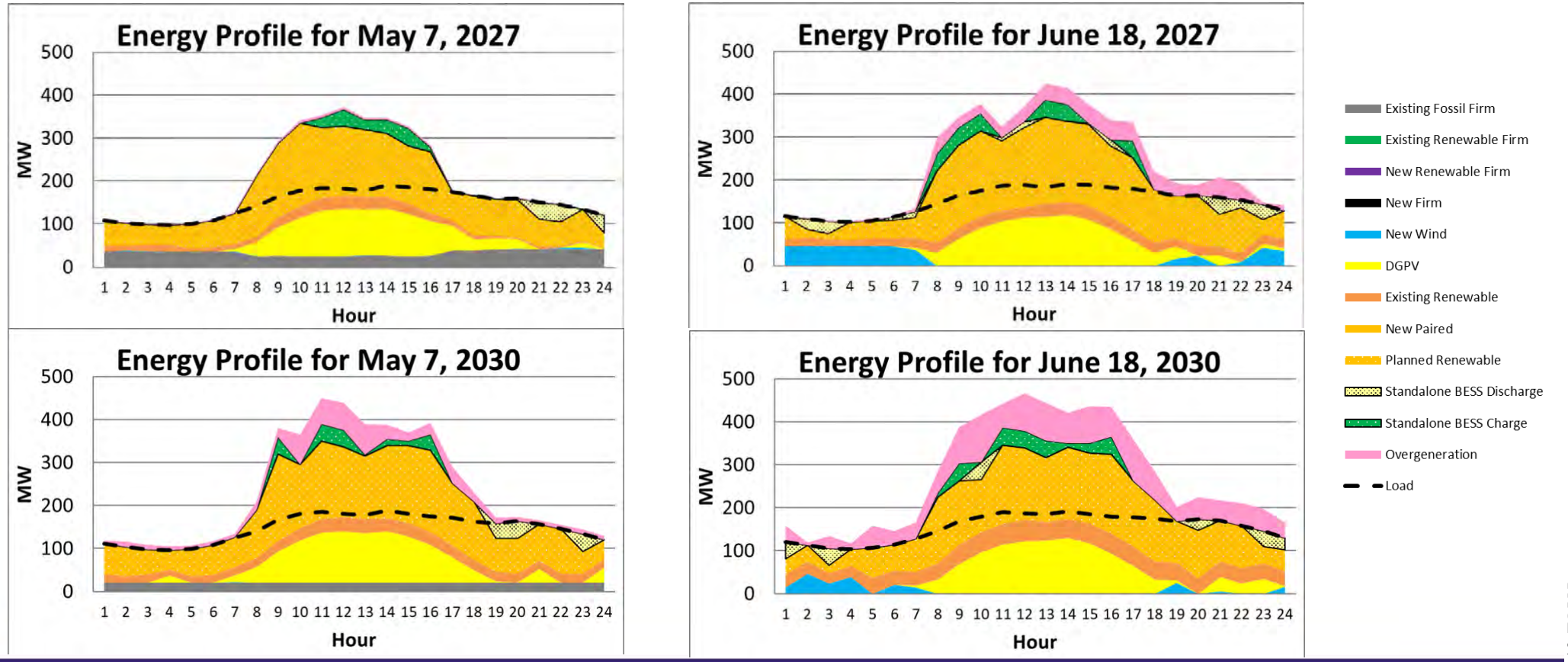
The utilization of new and existing thermal generating units is expected to be low due to the high amounts of variable renewables and storage that are added to the portfolio. The capacity factors shown in these tables support that firm thermal units will primarily act as standby capacity.

Production Cost Modeling and Operations of the Procurement Plan
Capacity Factor of Firm Units - 18 MW ICE

Year	Maalaea 08	Maalaea 09	Maalaea 10	Maalaea 11	Maalaea 12	Maalaea 13	Maalaea X1	Maalaea X2	Maalaea 14cc	Maalaea 15cc	Maalaea 16cc	Maalaea 17cc	Maalaea 18cc	Maalaea 19cc
2027	0%	0%	N/A	N/A	N/A	N/A	0%	0%	41%	55%	38%	6%	0%	0%
2028	0%	0%	N/A	N/A	N/A	N/A	0%	0%	41%	54%	37%	5%	0%	1%
2029	0%	0%	N/A	N/A	N/A	N/A	0%	0%	40%	56%	39%	5%	0%	1%
2030	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	40%	55%	39%	1%	0%	0%
2031	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	38%	49%	36%	1%	0%	0%
2032	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	39%	55%	39%	0%	0%	0%
2033	N/A	N/A	N/A	N/A	N/A	N/A	1%	1%	41%	56%	38%	0%	0%	0%
2034	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	41%	56%	40%	0%	0%	0%
2035	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%	41%	57%	40%	0%	0%	0%

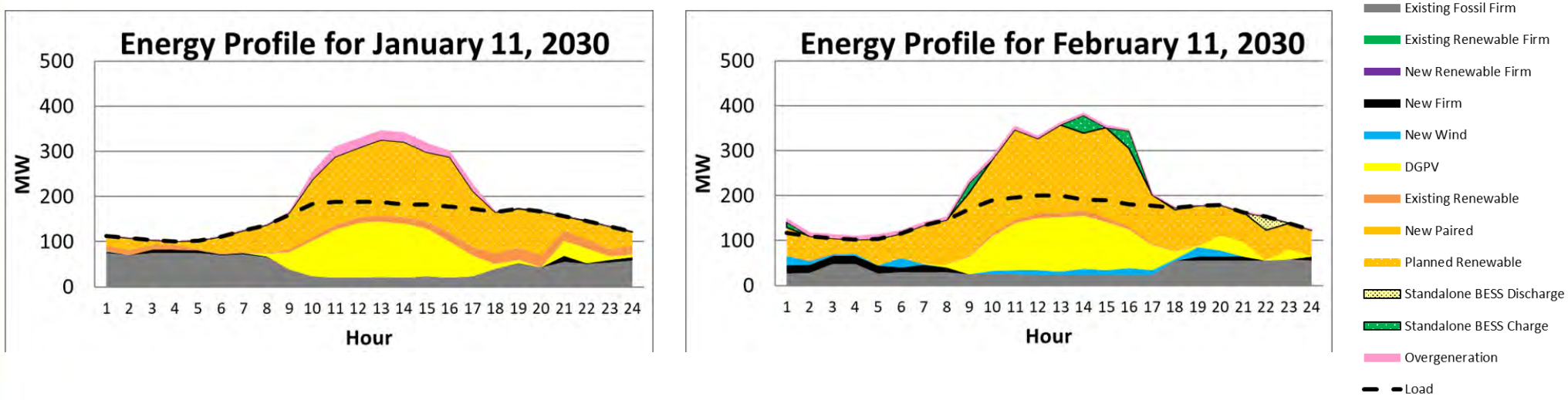
Production Cost Modeling and Operations of the Procurement Plan
Daily Charts - 18 MW ICE

Hourly dispatch of resources in a day



Production Cost Modeling and Operations of the Procurement Plan
Daily Charts - 18 MW ICE

The new ICE additions runs minimally during the peak and overnight, primarily acting as standby generation.



Recommended Actions and Next Steps

Recommended Actions and Next Steps

- Continue to displace fossil fuel through acquisition of low cost, low carbon renewable energy, starting with 240 GWh through the Stage 3 RFP in Docket No. 2017-0352
- Continue to pursue customer adoption of DER (i.e., Battery Bonus) through new programs and advanced rate design, consistent with the outcomes of the DER Docket No. 2019-0323
- Pursue generation modernization as soon as practicable to mitigate present reliability risks. Firm renewable generation needs include 18 MW in the near term, starting with the Stage 3 RFP in Docket No. 2017-0352. A total of 40 MW of new firm generation may be prudent to mitigate uncertainty in planned renewable projects that are expected to come into service over the same timeframe
- Pursue development of renewable energy zones to facilitate interconnection of additional renewable energy in collaboration with communities and project partners
- Consider procurement of energy efficiency in amounts up to the forecasted target to reduce supply side needs
- Continue to pursue managed EV charging programs, time-of-use rates, DER, and energy efficiency
- Incorporate system security and system stability analyses, which may yield additional resource needs to mitigate risks associated with a high renewable energy system