Consumer Advocate

CA-SIR-1

System Planning Criteria

Please provide copies of HECO's distribution planning criteria, which are applicable to the 46 kV system.

HECO Response:

The HECO planning criteria for the subtransmission (46kV) system is attached as pages 2-5.

Hawaiian Electric Company
Engineering Standard Practices Manual

ENERGY DELIVERY/Engineering
Section 7, Engineering Department, Subsec. D, Part 11.5
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Revised February 10, 1997; For Internal Use Only

HECO-Criteria for Subtransmission Planning

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Introduction

The subtransmission system includes all land, structures, lines, and substation equipment employed with 46 kv circuits.

For purposes of these criteria, Subtransmission Circuits shall include all 46 kv circuits and equipment except those designated as Transmission in Engineering Standard Practice Section V, Subsection D, Part 11.4.

The subtransmission system shall be planned on the basis of serving the predicted peak kva on any part of the system each year.

Additions to the subtransmission system will be planned for the year in which it is predicted that:

1. The normal current carrying capacity of any subtransmission system components will be exceeded under normal conditions.

2. The emergency current carrying capacity of any subtransmission component will be exceeded during any emergency condition.

3. Voltage levels cannot be kept within required limits.

Where applicable, each case will be evaluated on an individual basis, based on operational experience and engineering design criteria before projects are budgeted.

Normal Conditions

The subtransmission system shall be planned to provide for the following normal conditions:

1. The 46 kv sources to distribution substations in the same area will be from the same 138 kv substation (but possibly different 13846 kv transformations) or source of generation, whenever practical, to allow paralleling of distribution feeders during switching operations.

2. Distribution substations with only one transformer need have only one radial 46 kv source, provided that backup is available on the distribution system.

Emergency Conditions

The subtransmission system shall be planned to consider only one 46 kv line serving a specific area being out at any one time.

The subtransmission system is not planned to provide for multiple circuit outages due to 13846 kv subtransmission power transformer outages, bus faults, crossing contacts, or structure failures.

Transformer Loading Limits

Loading limits of subtransmission power transformers shall be as follows:

1. The normal load on subtransmission power transformer shall be its zero percent lossoflife kva capability.

2. The emergency load on a subtransmission power transformer shall be its one percent lossoflife kva capability.

3. The extreme emergency loading limit of a subtransmission power transformer shall be 200 percent of its maximum nameplate rating in accordance with the ANSI Guide for Loading Mineral Oil Immersed Power Transformers Up to and Including 100 MVA with 55° C or 65° C Winding Rise.

4. Refer to Engineering Standard Practice Section V, Subsection G, Part 21.1 for power transformer normal mva ratings with different combinations of fans and pumps.

The Subransmission system shall be planned to temporarily accommodate failure of a 13846 kv transformer until the failed transformer can be replaced with either Waiau 13846 kv bus tie Transformer A or B.

If transformers which cannot be replaced with either Waiau Transformer A or B are installed, a spare transformer will be purchased.

Planning SLD's

In reviewing and evaluating proposed additions, with the Engineering Department Design Manual used as a guide, the following conditions should be considered:

1. With approval of the Vice President of Operations, circuiting diagrams may show overhead radial circuits on both sides of a street to avoid installation of an underground circuit.

2. Unless required for engineering and/or operating reasons, a singleline diagram will not show installation of a new 46 kv underground circuit.

Voltage Levels

Voltage levels are to be kept within the prescribed limits for any normal or emergency condition for which the subtransmission system is planned. Capacitor and regulator additions to the distribution system will be considered before any other capital additions for the year in which the predicted voltage at any subtransmission system bus will be below the minimum voltage level for any condition for which the subtransmission system is planned.

Application of the best combination of automatic voltage regulating equipment and transformer fixed taps shall be made to satisfy the following maximum and minimum voltage limits:

1. **Maximum Voltage**

   46 Kv System. For any system operating condition the voltage on the 46 kv system shall not exceed 48 kv; except that on any 44 kv LPGF cable, the voltage shall not exceed 46 kv.

2. **Minimum Voltage**

   With 45 kv on the Waiau or Honolulu switching station buses, or on any 13846 kv stepdown transformer secondary bus, the minimum voltage allowable on any distribution substation transformer is 38.5 kv for any emergency condition for which the subtransmission system is planned.

   This minimum voltage is based on distribution substation transformers having a primary tap setting of 5 percent boost, nameplate maximum kva at 90 percent power factor through the transformer, the transformer regulator at full boost, and 2.5 percent primary voltage drop on distribution circuits, with service voltage in the extreme zone. (With Waiau and Honolulu bus voltage at 46 kv or 46 kv on the secondary of any 13846 kv transformer, the service voltage can be brought out of the extreme zone into the tolerable zone. The extreme and tolerable zones are described in ANSI Voltage Rating for Electric Power Systems and Equipment (60 Hz), C84.1.)

   At minimum load, with no distribution substation transformer voltage drop and the transformer regulator at full buck, there will not be excessive voltage on the distribution system when using the above primary tap setting of the distribution substation transformer. (For distribution substation transformers with capacitors, a primary tap setting of 5 percent boost may not be

required to stay within the voltage limits described.)

Capacitor Limits

Capacitor applications will be in accordance with recommendations in "Review of Distribution Capacitors for Hawaiian Electric Company, July 1985", can be found in the HECO Engineering Library under Code 209, HE, 1985 July.

Current Carrying Capacity

1. **Overhead Conductor**

   Conductor for overhead subtransmission lines shall be considered to have current carrying capacity in accordance with Engineering Standard 12038, "Current Carrying CapacityOutdoor Bare Conductor." A conductor bundle with identical conductors shall have the rating of a single conductor multiplied by the number of conductors per phase in the bundle.

2. **Underground Cable**

   Cable for underground subtransmission circuits shall be considered to have current carrying capacity in accordance with Engineering Standard 211021, "Cable Ampacity Tables-Underground Data."

3. **Open Buses**

   Open buses shall be considered to have current carrying capacity in accordance with Engineering Standard 12039, "Current Carrying CapacityOutdoor Open Bus."

4. **Power Transformer Equipment**

   Subtransmission power transformer connections, switches, protective relays, and current transformers shall be rated to allow the power transformer to carry 200 percent of maximum nameplate rating under extreme emergency conditions in accordance with the ANSI Guide for Loading Mineral Oil Immersed Power Transformers Up to and Including 100 MVA with 55° C or 65° C Winding Rise. (The relay settings associated with this type of transformer shall allow the transformer to carry 200 percent of maximum nameplate rating.)

5. **Substation Equipment**

   Switches, disconnects, circuit breakers, and associated equipment shall be considered to have a current carrying capacity equivalent to their respective nominal current rating.

Other Considerations

1. Criteria for specifying circuit breakers is given in ESP VIIN21.1.

2. For coordination of responsibilities for transmission and subtransmission planning refer to ESP V-D11.4 "HECOCriteria for Transmission Planning."

CA-SIR-2

Ref: System Protection - HECO March 3, 2004 Pukele Substation Outage, pages 19 - 22

a. Does HECO utilize a Permissive Overreaching Transfer Trip (POTT) scheme on all 138 kV transmission lines on the system?

b. If no, please provide diagrams and descriptions of other protective schemes utilized on the 138 kV transmission system.

c. Does HECO utilize backup protection relays on the 138 kV lines?

   1. If so, identify the type (distance, directional overcurrent, etc.) of relays used and explain why these relays are used.

   2. If no, explain why not.

d. Please provide a protection one-line diagram for each type of protection scheme utilized on the 138 kV system.

e. Please provide a brief synopsis of each type of protection scheme utilized.

HECO Response:

a. No. The POTT scheme is applied to most 138 kV transmission lines, however, short 138 kV transmission lines use a current differential scheme.

b. A current differential scheme provides primary protection for short 138 kV transmission lines. Please see Figure 1, which is attached as page 2.

c. Yes, backup protection is used on all 138 kV transmission lines. Backup protection typically consists of a directional time over-current scheme for ground protection, and a step-distance scheme for phase protection.

   1. See the response to subpart c.

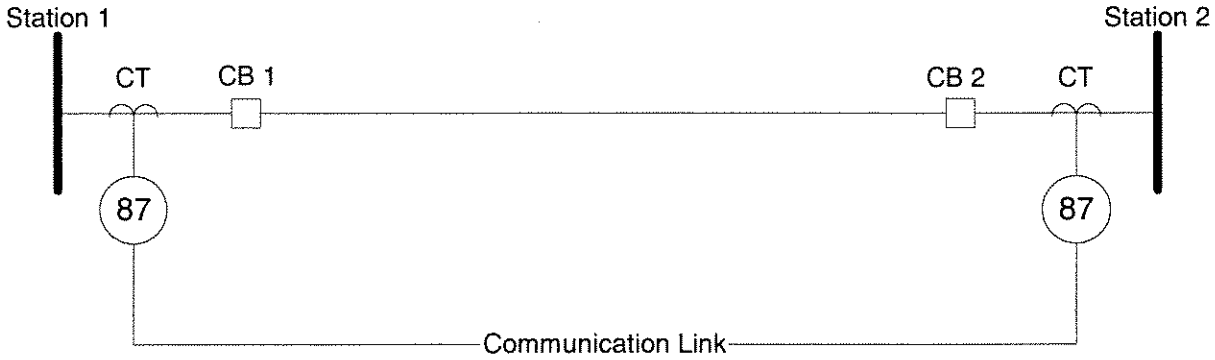
   2. Not applicable.

d. Please see Figures 1-3, attached as pages 2-4.

e. Please see Figures 1-3, attached as pages 2-4.

Figure 1:

Current Differential Scheme

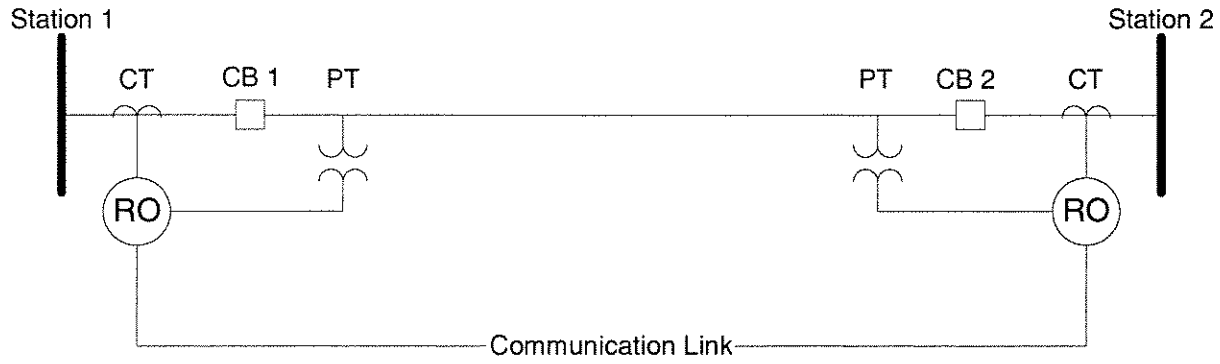


CT = Current Transformer
CB = Circuit Breaker
87 = Current Differential Relay

The current differential relays (Device 87) detect faults on the protected transmission line by measuring the current magnitude and phase angle at each end of the transmission line, and sending this information to the relay at the other end of the line over the communication link. Tripping is initiated when the calculated difference in current magnitude and phase angle between the two ends exceeds a predetermined value.

Figure 2:

Permissive Over-reaching Transfer Trip (POTT) Scheme



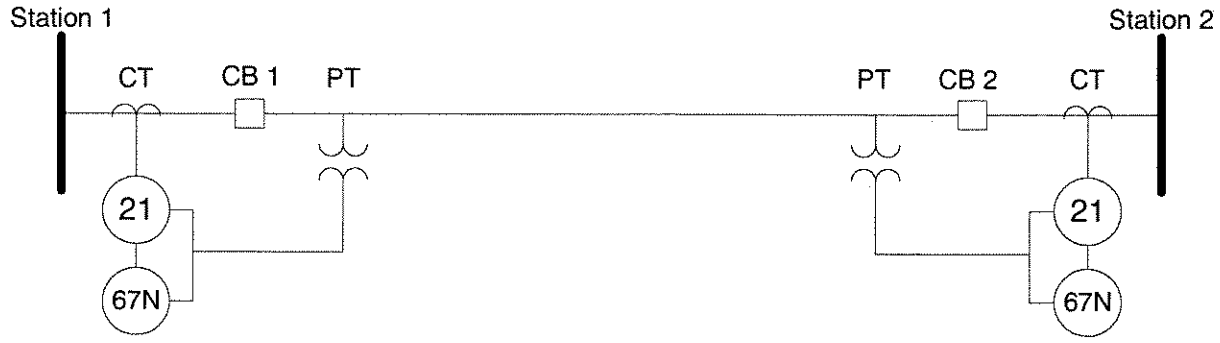
PT = Potential Transformer
CT = Current Transformer
CB = Circuit Breaker
RO = POTT Relays

The POTT scheme uses a combination of phase distance and ground directional over-current relays (Device RO) to detect faults on the protected transmission line and beyond the remote end. When a fault is detected, a permissive trip signal is sent to the relay at the other end of the line over the communication link. Tripping is initiated if a similar signal is also received from the relay at remote end.

Figure 3:

Ground Directional Time Over-current &

Phase Step-Distance Scheme



PT = Potential Transformer
CT = Current Transformer
CB = Circuit Breaker
21 = Step-Distance Relay
67N = Ground Directional Over-current Relay

The phase step-distance relays (Device 21) detect phase-to-phase and three phase faults on the protected transmission line. Tripping is initiated when the measured impedance falls below a predetermined value. The ground directional time over-current relays (Device 67N) detect ground faults on the protected transmission line. Tripping is initiated when the measured ground fault current exceeds a predetermined value in the tripping direction.

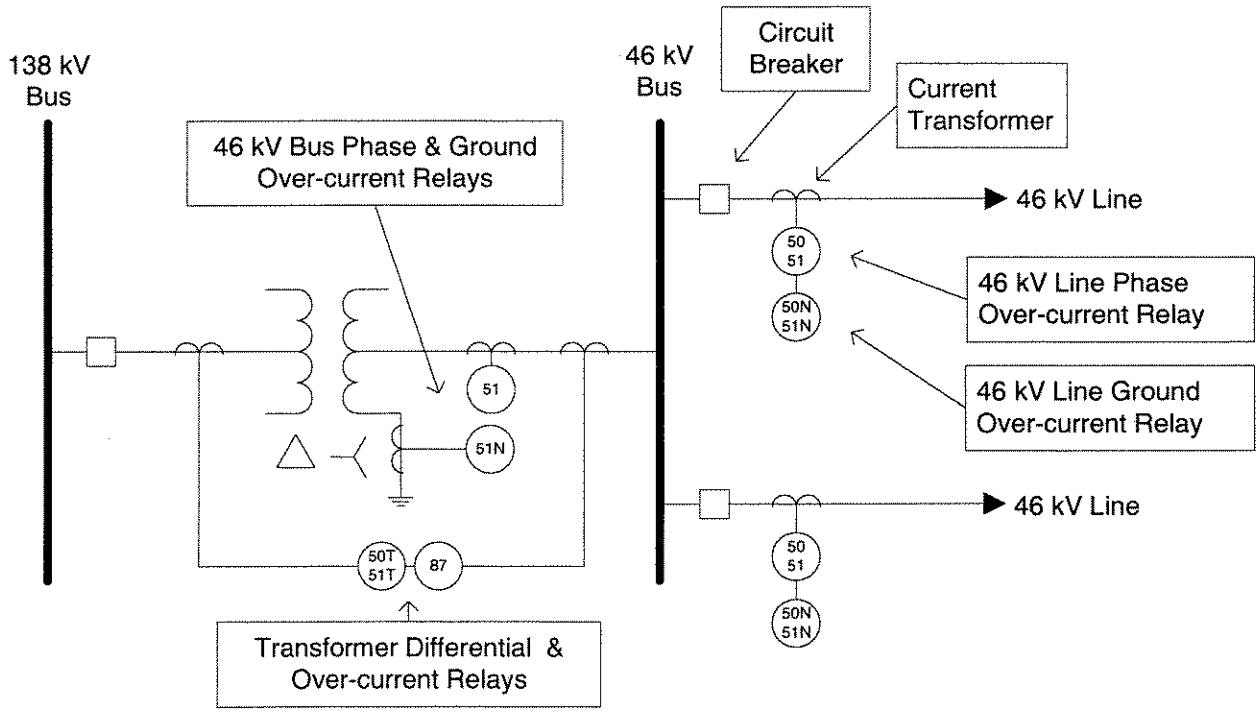
CA-SIR-3

Ref: System Protection

Please provide information regarding protection of typical 46 kV substations. This request is not meant to require HECO to complete an exhaustive effort to produce protection diagrams for each 46 kV substation. Rather, a typical one-line diagram with protection elements identified and a brief synopsis for typical substation types will be adequate.

HECO Response:

Typical 46 kV protection includes protective relays for the transformer, bus, and 46 kV radial lines, as shown in the figure below:



All 46 kV radial lines are protected by phase over-current relays (Device 50/51) and ground over-current relays (Device 50N/51N). Primary phase fault protection for the 46 kV bus sections is provided by the transformer secondary over-current relay (Device 51). An over-current relay

connected to the transformer neutral (Device 51N) provides primary ground fault protection for the bus and the transformer secondary winding. Transformer primary protection is provided by a current differential relay (Device 87). Backup transformer protection is provided by an over-current relay (Device 50T/51T).

CA-SIR-4

Ref: Response to CA-IR-22, part b.

HECO's response indicates that it would "be impractical to change from one EIS process to another EIS process mid-stream or to administer two EIS processes in parallel for the same project. The public could also perceive a company or developer's attempt to have two EISs processed simultaneously for the same objectives as trying to mislead or confuse the community." Please answer the following questions regarding the above statement:

a. The Kamoku-Pukele Revised Final EIS indicates that the EIS can be used to support "... any of the other transmission line alternatives should the proposed action not be implemented." (Page 1-3 of Final Revised EIS.) Please explain how pursuing other transmission alternatives (i.e., the complete underground solution from Pukele to Kamoku via Palolo) would have been impractical for HECO to pursue?

b. Please explain how pursuing two EISs could confuse or mislead the community?

c. Are there any existing legal or other impediments that would preclude HECO from pursuing parallel projects through the same EIS, through two simultaneous EISs, or a supplemental EIS? Explain.

d. While it is understood that HECO placed effort into pursuing other alternatives besides the partial overhead/underground Kamoku-Pukele 138 kV transmission line, does HECO now believe that it would have been prudent to pursue parallel projects to increase the chance of obtaining approval for at least one of the routes? Explain.

e. Has HECO ever pursued an EIS(s) where parallel projects were pursued?

    1. If yes, provide copies of supporting documentation or references.

    2. In addition, what was the outcome of those projects (i.e., approved, disapproved)?

    3. If no, explain why not.

f. Is HECO aware of any other EIS(s) in which parallel projects were pursued in the State of Hawaii? If yes, provide copies of supporting documentation.

g. In the case where projects do not need an EIS, does HECO typically pursue parallel projects?

    1. For example, if easement, routing, or other impacts are expected to delay or stop a project, does HECO typically pursue parallel projects simultaneously to make certain that the project is not delayed or stopped?

    2. If yes, provide copies of supporting documentation or references.

3. If no, explain why not?

HECO Response:

a. Practical difficulties relating to Company resources, community input, permitting agency review, and environmental review requirements under Chapter 343 would have made it impractical for HECO to pursue "parallel projects" (i.e., a partial underground partial overhead Kamoku-Pukele line using Waahila Ridge and a completely underground Kamoku-Pukele line through Palolo Valley) at the same time, whether through the same EIS, through two simultaneous EISs, or through a supplemental EIS. (Note that these are parallel project alternatives to achieve the same objectives, rather than parallel "projects".)

Much of the work done for the Revised Final EIS supports both alternatives, and was necessary regardless of which alternative was determined to be the preferred alternative. As a result, much of the work is still useful in supporting the East Oahu Transmission Project in the form currently proposed. Thus, the Revised Final EIS properly notes that: "This EIS can also be used to support applications for approvals and permits for any of the other transmission line alternatives should the proposed action not be implemented."

Pursuing the all underground route in parallel with the partial underground partial overhead route would not have been practical or desirable, given limits on the Company's resources, resulting confusion on the part of the public (see the response to subpart b), and the firm predisposition of regulatory agencies to focus on only one preferred alternative at a time.

Because HECO's preferred alternative for the Kamoku-Pukele 138kV Transmission Line Project utilized Waahila Ridge, there was significant interest from the Manoa community in this alternative. For example, concerns with potential visual and electric and

magnetic field (EMF) impacts were major issues expressed by the Manoa community. This generated numerous meetings, presentations, and inquiries specifically focused on the Manoa community that were above and beyond the Chapter 343 requirements. Thus, numerous visual simulations and extensive EMF models were developed to address these concerns. To fulfill these activities, resources were required which included project managers, engineers, attorneys, and consultants.

Similarly, if HECO had simultaneously pursued the 138kV all-underground alternative through Palolo Valley, it is likely that even more meetings, presentations, and inquiries would have occurred with Palolo Valley being the primary focus. For example, concerns with the location and operation of a High Pressure Fluid Filled pumping facility and traffic impacts would have been more prominent within the Palolo community. Thus, a second team of project managers, engineers, attorneys, and consultants would have likely been required to produce more drawings, simulations, and study of these issues, above and beyond the Chapter 343 requirements. With limited resources, it would not have been practical to reasonably manage a second project team for the same project objectives.

b. The preferred alternative for the Kamoku-Pukele 138kV Transmission Line Project EIS was an underground/overhead 138kV transmission line utilizing Waahila Ridge. Two all-underground 138kV alternatives evaluated in that EIS were the Kapiolani Boulevard-Palolo XLPE Underground Alternative and the Kapiolani Boulevard-Palolo HPFF Underground Alternative. Hypothetically, if HECO did a parallel EIS and considered the Kapiolani Boulevard-Palolo XLPE Underground Alternative as the preferred alternative in this second EIS, then by Chapter 343 requirements, the underground/overhead 138kV transmission line utilizing Waahila Ridge would have been identified as an alternative.

HECO would then be making contradictory arguments to justify the selection of the preferred alternative in each respective EIS. This in itself could or would create confusion for the community with HECO having two preferred alternatives for the same project objectives at the same time.

c. In effect, the question is whether there can be parallel proposed actions, with the Company intending to actually pursue only one of the proposed actions. The environmental review process is governed by the Hawaii EIS Law, HRS Chapter 343, and by Hawaii Administrative Rules Title 11, Chapter 200. The Hawaii EIS Law was enacted because the legislature found that,

> [T]he process of reviewing environmental effects is desirable because environmental consciousness is enhanced, cooperation and coordination are encouraged, and public participation during the review process benefits all parties involved and society as a whole.

HRS § 343-1.

To achieve the goal of a cooperative and coordinated environmental review process, public participation in that process must be meaningful. In order to clearly inform the public of the scope of the proposed action for which impacts are being assessed, there must be a single action proposed. If multiple or parallel actions were proposed at the same time, it would be more difficult to clearly inform members of the public of the scope of the action actually proposed and considered. HECO believes that the confusion arising from proposing multiple or parallel actions could pose a significant enough impediment to the Chapter 343 process to warrant against implementing such an approach.

HECO respectfully objects to providing a legal opinion regarding legal impediments to pursuing parallel actions, separate actions or the supplemental EIS process as requested on the grounds that the information request seeks communications between HECO and its

counsel that are protected by the attorney-client privilege. Nonetheless, without waiving the objection, HECO provides the following observations about the Chapter 343 process:

Coordination of the environmental review process is also achieved by considering the proposed action, and the alternatives to the proposed action, in a single document that evaluates the impacts of each. The environmental review process anticipates a single document that considers the proposed "action" along with its alternatives. "Action," is defined as "any program or project to be initiated by any agency or applicant." HRS § 343-2, HAR § 11-200-2. Depending on the circumstances, proceeding with separate environmental review for "parallel projects" could be deemed to be contrary to the regulatory requirement that a single document assess both the impacts of the project and an analysis of the alternatives.

An environmental assessment must "analyze alternatives, in addition to the proposed action . . . ." HAR § 11-200-9(c). See also HAR § 11-200-10(6) (requiring an "Identification and summary of impacts and alternatives considered" in an environmental assessment). An environmental impact statement must likewise involve the process of "evaluating alternatives," to assure "an early open forum for discussion of adverse effects and available alternatives, and that the decision-makers will be enlightened to any environmental consequences of the proposed action." HAR § 11-200-14. The discussion of alternatives in a draft EIS must therefore meet the following standard,

> (f) The draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected. The section shall include a rigorous exploration and objective evaluation of the environmental impacts of all such alternative actions. Particular attention shall be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental

> effects, costs, and risks. Examples of alternatives include:
>
> (1) The alternative of no action;
>
> (2) Alternatives requiring actions of a significantly different nature which would provide similar benefits with different environmental impacts;
>
> (3) Alternatives related to different designs or details of the proposed actions which would present different environmental impacts;
>
> (4) The alternative of postponing action pending further study; and,
>
> (5) Alternative locations for the proposed project.
>
> In each case, the analysis shall be sufficiently detailed to allow the comparative evaluation of the environmental benefits, costs, and risks of the proposed action and each reasonable alternative. . . .

HAR § 11-200-17(f). Depending on the differences between alternatives, pursuing a separate environmental review process for "parallel projects" could be deemed to be inconsistent with the regulatory intent that a single document consider project alternatives and allow a comparative evaluation of those alternatives. HECO notes that its EIS for the Kamoku-Pukele 138-kV Transmission Line Project examined twelve alternatives that were "determined through a public participation process and represent a decision reached jointly by HECO and a Community Advisory Committee (CAC), which was formed for this project and which was composed of members from within the study area." Kamoku Pukele Revised Final EIS, at p. 1-5.

Subchapter 10 of Title 11, Chapter 200 of the Hawaii Administrative Rules does not expressly permit a supplemental EIS for "parallel projects." The rules state that, "A supplemental statement shall be warranted when the "scope of an action has been substantially increased, when the intensity of environmental impacts will be increased, when

the mitigating measures originally planned are not to be implemented, or where new circumstances or evidence have brought to light different or likely increased environmental impacts not previously dealt with." HAR § 11-200-27. A supplemental EIS is therefore not meant to be document to allow separate consideration of "parallel projects" and avoid the regulatory requirement that the proposed action and its alternatives be considered in a single document.

A separate question arises as to whether the same EIS (with or without supplementation) can be used to pursue one of the alternative actions when the proposed action is denied by the permitting agency. With the passage of time, it makes sense to consider a new EIS process, rather than to rely on or to supplement an existing EIS, particularly since much of the procedure and cost necessary for a new EIS would be incurred in the case of a supplemental EIS. (See HECO-602, page11 and footnote 28.)

d. Even with the benefit of hindsight, HECO does not believe it would have been prudent to pursue parallel projects. As evidenced by the 2003 public input process and the request by two Palolo community groups to intervene in the current docket, pursuing an all underground 138kV line through Palolo Valley would likely draw opposition to such an alternative. Such opposition could influence the discretionary permitting and approvals processes that would be required for such an alternative. Therefore, it is speculative whether pursuing parallel projects would increase the likelihood of getting one of the projects approved.

e. HECO is not aware of past situations where HECO pursued parallel projects through one EIS or two EISs simultaneously for the same project objectives.

1. Not applicable. See the response to subpart e.

2. Not applicable. See the response to subpart e.

3. For the reasons stated in the response to CA-IR-22, subpart b, and the responses to subparts a and b above, HECO has not pursued parallel projects through one EIS or two EISs simultaneously for same project objectives.

f. HECO is not aware of other situations in the State of Hawaii where EISs were pursued for parallel projects.

g. HECO typically does not pursue (e.g., EIS preparation or permit acquisition) parallel projects for the same project objectives regardless if an EIS is required or not. However, HECO has and will study and solicit input on various alternatives to address project objectives.

1. HECO typically does not pursue parallel HECO-owned projects, but may pursue temporary or interim measures if a project could not be designed and constructed in time to meet certain project objectives. For example, in the Kunia Makai Substation #1 and #2 project (Docket No. 7040), HECO pursued and installed a temporary 46kV line to the new substation. This temporary measure was pursued because the design and construction of the permanent 46kV lines could not be completed in time to meet the new loads in the area. (An exception with respect to the parallel implementation of projects would be where both projects are needed, where the sequence in which the projects are implemented is not critical, and where there is significant uncertainty with respect to the timing of both projects.)

2. Not applicable. See the response to subpart g.

3. For the reasons stated in the response to CA-IR-22, subpart b, and the responses to subparts a and b above, HECO typically does not pursue parallel projects, even if an

EIS is not needed. However as noted in the response to subpart g.1. above, HECO may pursue temporary or interim measures in parallel with the pursuit of the preferred alternative if circumstances warrant such action.