



INTRODUCTION

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Q. Please state your name and business address.

A. My name is Colton K. Ching and my business address is 820 Ward Avenue,  
Honolulu, Hawaii.

Q. What is your present position with Hawaiian Electric Company, Inc. (“Hawaiian Electric”)?

A. I am the Director of the Transmission Planning Division in the Power Supply  
Services Department.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted written testimony and exhibits as HECO T-8.

Q. What will your rebuttal testimony cover?

A. My testimony will:

- 1) Reconfirm the need for an AES-CEIP #2 138kV transmission line and the replacement of six 138kV breakers at the Kahe 138kV Substation. In addressing this need, my testimony will include an explanation of:  
(a) the reliability concern of transmission lines exporting power from Campbell Industrial Park (“CIP”) with and without the CIP Generating Station addition, and (b) the increases in short-circuit current in the western portion of the Hawaiian Electric transmission system with the CIP Generating Station addition.
- 2) Address the claim by Southern Wine and Spirits of America, Inc. (“SWSA”) that the addition of CIP Generating Station and AES-CEIP #2 138kV transmission line will result in degradation of their power quality.

1                                    NEED FOR AES-CEIP #2 138KV TRANSMISSION LINE

2            Q.    Is the AES-CEIP #2 138kV transmission line needed only with the addition of the  
3                    CIP generating unit?

4            A.    No. As I stated in my direct testimony in HECO T-8, pages 6-7, the AES-CEIP  
5                    #2 138kV transmission line is needed now, independent of the addition of the CIP  
6                    generating unit, to address the CIP Reliability Concern.

7            Q.    Please explain the CIP Reliability Concern identified in the Campbell Industrial  
8                    Park Transmission Assessment for the Addition of New Generation at HECO's  
9                    Campbell Industrial Park Generating Site Study that was submitted in support of  
10                  the subject project?

11           A.    As I stated in my direct testimony in HECO T-8, page 5, the CIP Reliability  
12                  Concern stems from the fact that there are currently only two paths for power to  
13                  be exported from the CIP area. On occasions in which one of these two lines is  
14                  out of service for maintenance or repair, only one line will be available to export  
15                  all of the generation from the CIP area. If the one remaining line were to trip  
16                  unexpectedly, all generation from the CIP area would suddenly be lost.

17           Q.    What would be the effect of suddenly losing all power from the CIP area?

18           A.    As I stated in my direct testimony in HECO T-8, pages 5-6, should all CIP area  
19                  generation be instantaneously lost, there would be insufficient reserve capacity  
20                  available amongst the Hawaiian Electric generators at the Kahe, Waiau and  
21                  Honolulu Power Plants to provide sufficient spinning reserve to prevent a drop in  
22                  the system frequency (i.e., 60 Hz) that would result in the triggering of  
23                  underfrequency load shedding and resulting outages to customers.

24           Q.    In addition to the triggering of underfrequency load shedding, what else could  
25                  result upon the sudden loss of all power from the CIP area?

1       A.   Hawaiian Electric's underfrequency load shedding scheme is designed to protect  
2       the system and restore frequency stability upon the sudden loss of approximately  
3       315 MW of generation (the combined capacity of the two largest units on the  
4       Hawaiian Electric system). To accomplish this, Hawaiian Electric's  
5       underfrequency load shedding scheme is comprised of approximately one-third of  
6       the entire Oahu load. However, the loss of all power from the CIP area could  
7       result in up to a loss of 434 MW of generation. Therefore, the sudden loss of all  
8       power from the CIP area could result in such a large, instantaneous shortage of  
9       generation (less generation than demand at the instant) that system frequency  
10      could plummet very quickly and so severely that Hawaiian Electric's  
11      underfrequency load shedding scheme would not be sufficient to abate the  
12      frequency drop. If system frequency cannot be quickly stabilized by the  
13      underfrequency load shedding scheme, the system could become unstable, leading  
14      to a domino effect where the remaining generators at Kahe, Waiau and Honolulu  
15      Power Plants trip offline due to their inability of their auxiliary components to  
16      ride-through such a severe and prolonged frequency depression.

17     Q.   How did Hawaiian Electric deal with this risk in the past?

18     A.   In the past, sufficient reserve generation was available outside of the CIP area  
19      such that generation in the CIP area was limited to no more than 180 MW when  
20      only one of the two 138kV transmission lines exporting power from the CIP area  
21      was in-service. This operating practice ensured that the loss of all CIP generation  
22      would result in no more than the instantaneous loss of 180 MW of generation.  
23      This ensured that upon the sudden loss of all generation from the CIP area, the  
24      generation shortfall could be quickly made up through spinning generation that  
25      would prevent shedding of any customer load.

- 1 Q. Can Hawaiian Electric continue this practice in the future?
- 2 A. No. As I stated in my direct testimony, HECO T-8 pages 6-7, the reserve capacity  
3 has steadily decreased such that at today's loads, there is insufficient reserve  
4 capacity on the system to allow restricting generation from the CIP area to 180  
5 MW, and to carry 180 MW of reserve capacity on the rest of the system. In other  
6 words, restricting the output of generation in the CIP area to 180 MW at times  
7 when either the Kalaeloa-Ewa Nui 138kV Transmission Line or the AES-CEIP  
8 138kV Transmission Line is de-energized will no longer prevent the risk of a load  
9 shedding event if the remaining line were to suddenly trip out of service.
- 10 Q. What did the Division of Consumer Advocacy ("Consumer Advocate") conclude  
11 with respect to Hawaiian Electric's need for the AES-CEIP #2 138kV  
12 Transmission Line?
- 13 A. Mr. Joseph Herz, who submitted testimony on behalf of the Consumer Advocate,  
14 stated "[t]he AES-CEIP #2 138 kV transmission line provides more capacity to  
15 the CIP generating units to export power and also provides a greater reliability to  
16 HECO's transmission system during single contingency transmission line outage  
17 conditions." (CA-T-1, page 65, line 7-10.) Mr. Herz further stated that "[t]he  
18 Consumer Advocate will not oppose the Commission's approval of HECO  
19 application to commit funds for its CIP Project and construct the approximately  
20 2.2 miles of 138 kV transmission line on overhead facilities." (CA-T-1, page 74,  
21 lines 6-8.)
- 22 Q. Did either Life of the Land ("LOL") or SWSA dispute Hawaiian Electric's need  
23 for the AES-CEIP #2 138kV transmission line?
- 24 A. Neither the LOL nor the SWSA testimonies directly address the need for the  
25 AES-CEIP #2 138kV transmission line.

NEED FOR 138KV BREAKER UPGRADES

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Q. Why do six 138kV breakers at the Kahe 138kV Substation need to be upgraded?

A. As stated in my direct testimony, HECO T-8, page 15, with the proposed addition of the CIP Generating Unit and the proposed addition of an AES-CEIP #2 138kV Transmission Line, the short circuit or fault current potential on the Hawaiian Electric transmission system will increase beyond the ratings of these six 138kV breakers, thus triggering the need for their upgrade.

Q. What could happen if these six 138kV breakers are not upgraded?

A. If the CIP Generating Unit and the AES-CEIP #2 138kV Transmission Line circuit are placed into service and these six identified 138kV breakers at the Kahe 138kV Substation are not upgraded, an attempt by these underrated breakers to clear a fault could lead to the failure of the breaker from disconnecting and/or the catastrophic failure of the breaker and the equipment it is disconnecting. This failure may lead to the (1) unavailability of the portion of the generation and transmission system until the breaker is replaced, (2) destruction of the breaker itself and the destruction of equipment located adjacent to the failed breaker, (3) reliance on back-up breakers located further from the location of the fault to clear a fault, which results in a delayed clearing of the fault and a loss of a greater portion of the generation and transmission system, and (4) a delayed clearing resulting in instability problems with the generation and transmission system that may lead to widespread customer outages.

Q. Did the Consumer Advocate, LOL or SWSA dispute Hawaiian Electric's need to upgrade six 138kV breakers at the Kahe 138kV Substation?

A. The Consumer Advocate, LOL, and SWSA testimonies do not directly address the need to upgrade the six 138kV breakers at the Kahe 138kV Substation. However,

1 Mr. Joseph Herz, who submitted testimony on behalf of the Consumer Advocate,  
2 stated that “[t]he Consumer Advocate will not oppose the Commission’s approval  
3 of HECO application to commit funds for its CIP Project and construct the  
4 approximately 2.2 miles of 138 kV transmission line on overhead facilities”  
5 (CA-T-1, page 74, lines 6-8), which are the infrastructure additions that creates an  
6 increase in the short circuit or fault current potential on the Hawaiian Electric  
7 transmission system, which in turn results in the need for the six breaker upgrades.  
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9 SWSA’S CONCERN OVER POWER QUALITY DEGRADATION

10 Q. What specific concerns regarding power quality has SWSA raised?

11 A. In response to HECO/SWSA-IR-21 and CA/SWSA-IR-4, SWSA stated that, “the  
12 [power quality] concerns regarding this Project are consistent with concerns  
13 associated with all utility-grade generators: ability to maintain hertz, voltage,  
14 etc.” In addition, SWSA stated a concern over the intended cycling duty of the  
15 plant and that operation “in this manner can lead to voltage and hertz instabilities,  
16 and further concern is that customers closer to the generation source will be more  
17 significantly affected due to their proximity to the Project.”

18 Q. How will the addition of the CIP Generating Unit and AES-CEIP #2 138kV  
19 Transmission Line affect the power quality of SWSA?

20 A. Contrary to SWSA’s claim, the addition of the CIP Generating Unit and  
21 AES-CEIP #2 138kV Transmission Line to the utility infrastructure will result in  
22 an **increase** in power quality to SWSA and all of HECO’s customers. The  
23 projected increase in power quality comes from the greater level of reserve  
24 capacity made available with the addition of the CIP Generating Unit and reduced  
25 probability of overloading the transmission lines exporting power from the CIP

1 area and the reduced probability of losing all ability to export power from the CIP  
2 area through the transmission system. Without the capacity addition of the CIP  
3 Generating Unit, HECO's reserve capacity shortfall will eventually result in  
4 instances when insufficient generation is available to serve all loads at normal  
5 frequency and load shedding or suppressed frequency operation would result. To  
6 the extent that the CIP Generating Station and AES-CEIP #2 138kV Transmission  
7 Line avoids or reduces the probability of load shedding and underfrequency  
8 events from occurring will have a positive impact power quality.

9 Q. What impact does the CIP Generating Station and AES-CEIP #2 138kV  
10 Transmission Line have on voltage concerns expressed by SWSA in their  
11 response to HECO/SWSA-IR-21 and CA/SWSA-IR-4?

12 A. It appears that SWSA believes that the proposed CIP Generating Station is  
13 electrically connected directly to SWSA and other customers in the CIP area.  
14 This is incorrect. Under normal conditions SWSA, like other customers in the  
15 CIP area, is served with power from the Kahe Switchyard (located at Hawaiian  
16 Electric's Kahe Power Plant) via the Kahe-Standard Oil #1 46kV subtransmission  
17 line and the Malakole Distribution Substation. Through the coordinated operation  
18 of all generating units on the Hawaiian Electric system, Hawaiian Electric's  
19 Energy Management System ("EMS") and operator action at the Dispatch Center,  
20 and automatic load tap changers on 46kV and 12kV transformers located at  
21 transmission and distribution substation, service voltage is maintained within  
22 operating ranges during normal and contingency situations. Therefore, the  
23 addition of the CIP Generating Station and AES-CEIP #2 138kV will not have a  
24 negative impact on the service voltage to SWSA.

25 Q. Will use of the CIP Generation Unit in peaking mode create voltage and hertz

1 instabilities as claimed by SWSA in HECO/SWSA-IR-21 and CA/SWSA-IR-4?

2 A. No. To the contrary, peaking operation of the CIP Generating Unit allows greater  
3 flexibility in the operations of the Hawaiian Electric generation system to provide  
4 power that precisely meets the continuously changing demand of the system at  
5 any given time. This flexibility contributes to the ability of the system to maintain  
6 system voltage and frequency within operating ranges. In addition, the CIP  
7 Generating Unit, when operating, will add to system inertia, thereby increasing the  
8 system's resistance to frequency fluctuations upon line faults, loss of generation  
9 events and loss of load events.

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11 SUMMARY

12 Q. Please summarize your testimony.

13 A. Hawaiian Electric has a need today for an additional 138 kV transmission circuit  
14 to export generation from the CIP area to the rest of the 138 kV transmission  
15 system independent of the addition of the CIP generating unit. Because there are  
16 only two 138 kV transmission lines that export power generated in the CIP area  
17 out to the rest of the transmission grid, when one of the two lines is out of service,  
18 there is a risk that the loss of the remaining line would result in a load shed event.  
19 A previous operating practice to reduce output of generation in the CIP area to  
20 180 MW and work around this transmission limitation is no longer practical due  
21 to the increase in demand for electricity and resulting insufficient reserves in  
22 generation capacity outside of the CIP area. The addition of the proposed AES-  
23 CEIP #2 138kV Transmission Line addresses this reliability concern.

24 In addition, as can be expected with a substantial increase in needed  
25 capacity and transmission capability, the addition of the proposed CIP Generating

1 Unit and the AES-CEIP #2 138kV Transmission Line will increase the short  
2 circuit current on the Hawaiian Electric transmission system, resulting in an  
3 underrating of six 138kV circuit breakers in the Kahe 138kV Substation.  
4 However, this can be addressed by replacing these six 138kV breakers, Nos. 128,  
5 131, 132, 170, 171, and 246, with new breakers of higher rating to avoid a  
6 potential for circuit breaker failure and resulting risk to the generation and  
7 transmission system that stems from prolonged short circuit faults.

8 Lastly, the addition of the proposed CIP Generating Unit and the  
9 AES-CEIP #2 138kV Transmission Line will have a positive impact to the system  
10 in maintaining adequate power quality for SWSA and all of Hawaiian Electric's  
11 customers.

12 Q. Does this conclude your testimony?

13 A. Yes, it does.

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Witness HECO RT-8 does not have any exhibits.