HECO T-2
DOCKET NO. 03-0XXX

TESTIMONY OF
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HAWAIIAN ELECTRIC COMPANY, INC.

Subject: Description of the Proposed Alternative and Project Background

INTRODUCTION

Q. Please state your name and business address.

A. My name is Kerstan J. Wong and my business address is 820 Ward Avenue, Honolulu, Hawaii.

Q. What is your present position with the Hawaiian Electric Company, Inc. ("HECO")?

A. I am a Project Manager in the Project Management Division in the Energy Delivery Process Area. My educational background and experience are provided in HECO-200.

Q. What is the scope of your testimony?

A. My testimony will describe the East Oahu Transmission Project alternative proposed in the Application and address the background of the East Oahu Transmission Project beginning from its inception in 1991 to present.

Q. Please describe the overall scope of work for the project alternative proposed in the Application.

A. The overall scope of work for the proposed alternative is separated into two phases. Phase 1 involves the construction of several new 46kV underground circuits in and around the Ala Moana, McCully, Moiliili, and Kapahulu areas. In addition, a new 138kV to 46kV transformer would be installed at the existing Kamoku Substation and equipment modifications would be required at various distribution substations located in urban Honolulu and Waikiki. Phase 2 involves the construction of three new 46kV circuits from the existing Archer Substation to McCully Street. Phase 2 also includes the installation of a new 138kV to 46kV transformer at the Archer Substation. This project alternative was initially evaluated and presented to the community in 2003 as an alternative known as the

Kamoku 46kV Underground Alternative – Expanded where Phases 1 and 2 would be implemented simultaneously. After further evaluation, it was recommended that Phase 1 be installed before Phase 2. Thus the alternative is now known as the "46kV Phased Project" to distinguish it from the Kamoku 46kV Underground Alternative – Expanded. The locations of the proposed new 46kV underground circuits and the existing substations included in the work scope of the 46kV Phased Project are shown in HECO-201.

PHASE 1

Q. Please briefly describe each of the several new 46kV underground circuits proposed in Phase 1 of the 46kV Phased Project.

A. In Phase 1, two new 46kV circuits would be installed between the existing Makaloa and McCully Substations. One new 46kV circuit would be installed in the intersection of Pumehana Street and Date Street, near the Lunalilo Elementary School. Two new 46kV circuits would be added out of the existing Kamoku Substation onto Date Street. And one new 46kV circuit would be installed on Winam Avenue from Hoolulu Street to Mooheau Avenue, in Kapahulu. The route of these 46kV underground circuits for Phase 1 of the 46kV Phased Project is further covered in Mr. Morikami's testimony, HECO T-7.

Q. Please specifically describe the location and route of the two new 46kV underground circuits between the existing Makaloa and McCully Substations.

A. A single new ductline for the two new 46kV underground circuits would be constructed beginning at HECO's existing Makaloa Substation. Makaloa Substation is located at the intersection of Makaloa Street and Amana Street. The ductline would exit Makaloa Substation and head in the Diamond Head direction

along Makaloa Street, past the Daiei store on the corner of Makaloa Street and Kaheka Street, until the intersection of Makaloa Street and Kalakaua Avenue. The ductline would then head in the makai direction along Kalakaua Avenue for a short distance until the intersection with Fern Street, and then proceed in the Diamond Head direction along Fern Street until the intersection of Fern Street and Hauoli Street. The ductline would then head in the makai direction along Hauoli Street until turning onto Lime Street in the Diamond Head direction. The ductline would then continue a short distance along Lime Street and end at a new manhole fronting McCully Substation, located at the intersection of Lime Street and Pumehana Street. From this new manhole on Lime Street, the two new circuits branch off into two separate ductlines. The first circuit extends to an existing manhole within the McCully Substation to interconnect to an existing 46kV underground circuit. The second circuit extends to an existing pole on Pumehana Street to interconnect to an existing 46kV overhead circuit. Color copies of photographs showing the specific route of the proposed new 46kV underground circuits and the location of the existing Makaloa and McCully Substations are included in HECO-202.

Q. How long are the proposed new ductline between the Makaloa and McCully Substations and the two new ductlines that branch off from the main ductline near McCully Substation?

A. The total length of the proposed new ductline between Makaloa and McCully Substations is approximately 3,450 feet. One of the ductlines that branch off from the main ductline is approximately 50 feet. The other ductline is approximately 200 feet.

Q. Please specifically describe the location and route of the new 46kV underground

circuit installed in the intersection of Pumehana Street and Date Street in Phase 1 of the 46kV Phased Project.

A. A single new ductline for the 46kV underground circuit is proposed in the McCully area (near Lunalilo Elementary School) to connect the existing Archer 41 overhead 46kV circuit on Pumehana Street with the existing Pukele 2 overhead 46kV circuit at the intersection of Date Street and Pumehana Street also near Lunalilo Elementary School. A color copy of a photograph showing the specific location of the proposed new 46kV underground circuit is included in HECO-203.

Q. How long is the proposed new ductline connecting the existing Archer 41 and Pukele 2 overhead 46kV circuits in the intersection of Pumehana Street and Date Street?

A. The total length of the proposed new ductline is approximately 130 feet.

Q. Please specifically describe the location and route of the two new 46kV underground circuits exiting Kamoku Substation on Date Street in Phase 1 of the 46kV Phased Project.

A. Two new 46kV underground circuits in separate ductlines are proposed from the new 138kV to 46kV transformer to be installed within the existing Kamoku Substation to the existing Pukele 4 overhead 46kV circuit located on the mauka side of Date Street. The Kamoku Substation is located in Moiliili on the makai side of Date Street, near the intersection of Date Street, Kamoku Street and Kapiolani Boulevard. A color copy of a photograph showing the specific location of the two proposed 46kV underground circuits is included in HECO-204.

Q. How long are each of the two proposed new ductlines exiting the Kamoku Substation and extending across Date Street to the existing Pukele 4 circuit?

A. One of the proposed new ductlines is approximately 30 feet in length, and the

other ductline is approximately 300 feet.

Q. Please specifically describe the location and route of the proposed new 46kV underground circuit to be installed on Winam Avenue to Mooheau Avenue in Phase 1 of the 46kV Phased Project.

A. A single new ductline for the 46kV underground circuit is proposed in the Kapahulu area to connect the existing Pukele 8 overhead 46kV circuit on Winam Avenue with the existing Pukele 4 overhead 46kV circuit on Mooheau Avenue. The ductline would begin at an existing wood pole on Winam Avenue, near the intersection of Winam Avenue and Hoolulu Street, and proceed in the mauka direction along Winam Avenue to the intersection with Mooheau Avenue. The ductline would extend to an existing wood pole on Mooheau Avenue, near the intersection with Winam Avenue. A color copy of a photograph showing the specific location of the proposed new 46kV underground circuit is included in HECO-205.

Q. How long is the proposed new ductline connecting the existing Pukele 8 and Pukele 4 overhead 46kV circuits?

A. The total length of the proposed new ductline along Winam Avenue, from the area of Hoolulu Street to Mooheau Avenue, is approximately 420 feet.

Q. Please briefly describe the installation of the new 138kV to 46kV transformer at the Kamoku Substation proposed in Phase 1 of the 46kV Phased Project.

A. Installation of one new 138kV to 46kV transformer and associated circuit breakers, switchgear, and protective relaying is proposed at the existing Kamoku Substation. Kamoku Substation is a fully enclosed structure and the proposed new transformer and all related equipment will be contained within the substation walls and out of public sight. Kamoku Substation was designed and constructed

to accommodate the installation of transformers like the proposed 138kV to 46kV transformer, and is presently serving customers through a 138kV to 25kV transformer installed and energized in 2002. Some interior site development work, such as a transformer pad and vault walls, to accommodate the installation of the new transformer and related equipment will be necessary. A black and white copy of a photograph showing the recently installed 138kV to 25kV transformer and related equipment within the Kamoku Substation is included in HECO-206. This photograph is a good representation of the scope of work and view of the proposed new 138kV to 46kV transformer after it is installed.

Q. Please identify the various distribution substations located in urban Honolulu and Waikiki where equipment modifications would be required in Phase 1 of the 46kV Phased Project.

A. The distribution substations are Ena, Waikiki, Kuhio, Kapahulu, Makaloa, McCully and Kewalo. The location of these existing substations is shown on HECO-207.

Q. Please summarize the proposed equipment modifications.

A. The proposed equipment modifications generally involve the replacement of existing switches, bus sections, or hydraulic operators, and in the case of the existing McCully and Makaloa substations, the installation of new 46kV termination equipment, switches, and associated equipment and steelwork. In addition, new 46kV switch interrupters would be attached to existing 46kV switches at Kuhio, Waikiki, Ena, and Kapahulu substations. All equipment modifications would be contained within the fence line of the substations and would have very little if any land use impact at these existing sites.

Q. Does that complete the description of the overall scope of work for Phase 1 of the

46kV Phased Project?

A. Yes, it does.

PHASE 2

Q. Regarding Phase 2 of the 46kV Phased Project, please specifically describe the location and route of the three new 46kV underground circuits from the Archer Substation to McCully Street.

A. Main Ductline

Phase 2 involves the installation of three new 46kV underground circuits identified as Archer 45, Archer 47 and Archer 48. It is proposed that the three new circuits be installed in a single new ductline beginning at HECO's existing Archer Substation. Archer Substation is located within HECO's Ward Avenue complex in Kakaako. HECO's Ward Avenue complex is located across from the Blaisdell Center and is situated within the city block bounded by Ward Avenue, Kapiolani Boulevard, Cooke Street and King Street. The new ductline would exit the Archer Substation and traverse the Ward Avenue complex to Cooke Street, where it would then run in the mauka direction along Cooke Street until the intersection of Cooke Street and King Street. Once on King Street, the single new ductline containing all three circuits would proceed in the Diamond Head direction until a new manhole to be installed in the roadway area fronting the McCully Times Supermarket.

Archer 45 Ductline

At the new manhole fronting the McCully Times Supermarket, the ductline for the first 46kV circuit (Archer 45) continues in the Diamond Head direction on King Street until McCully Street. At McCully Street, the ductline heads in the mauka

direction until it crosses Young Street and terminates at the base of an existing pole, which carries the existing Pukele 7 overhead 46kV circuit. The new Archer 45 underground 46kV circuit would be connected to the existing Pukele 7 overhead circuit at this location.

Archer 48 Ductline

At the new manhole fronting the McCully Times Supermarket, the ductline for the second 46kV circuit (Archer 48) branches off from the main ductline and terminates at the base of an existing pole fronting the McCully Times Supermarket parking lot, which carries the existing Pukele 5 overhead 46kV circuit. The new Archer 48 underground 46kV circuit would be connected to the existing Pukele 5 overhead circuit at this location.

Archer 47 Ductline

At the new manhole fronting the McCully Times Supermarket, the ductline for the third 46kV circuit (Archer 47) branches off from the main ductline and terminates at the base of an existing pole fronting the American Savings Bank (shares the same parking lot as the McCully Times Supermarket), which also carries the existing Pukele 5 overhead 46kV circuit. The new Archer 47 underground 46kV circuit would be connected to the existing Pukele 5 overhead circuit at this location.

Color copies of photographs showing the specific route of the proposed new 46kV underground circuits for Phase 2 of the 46kV Phased Project and the location of the termination points for each circuit are included in HECO-208. The route of these 46kV underground circuits for Phase 2 is further covered in Mr. Morikami's testimony, HECO T-7.

Q. How long are the proposed new main ductline between the Archer Substation and

the area fronting the McCully Times Supermarket via King Street and the other new ductlines that branch off from the main ductline?

A. The total length of the proposed new main ductline from Archer Substation to the area fronting the McCully Times Supermarket is approximately 8,325 feet. The length of the ductline for the first 46kV circuit (Archer 45) that continues on in the Diamond Head direction to McCully Street then Young Street is approximately 1,450 feet. The length of the ductline for the second 46kV circuit (Archer 48) is approximately 40 feet. The length of the ductline for the third 46kV circuit (Archer 47) is approximately 50 feet.

Q. Please briefly describe the installation of the new 138kV to 46kV transformer at the Archer Substation proposed in Phase 2 of the 46kV Phased Project.

A. Installation of one new 138kV to 46kV transformer and associated circuit breakers, switchgear, and protective relaying is proposed at the existing Archer Substation. Archer Substation is a fully enclosed structure and the proposed new transformer and all related equipment will be contained within the substation walls and out of public sight. Archer Substation is designed and constructed to accommodate the installation of transformers like the proposed 138kV to 46kV transformer, and is presently serving customers through existing 138kV to 46kV transformers installed at the substation. Some interior site development work, such as a transformer pad and vault walls, to accommodate the installation of the new transformer and related equipment will be necessary. A black and white copy of a photograph showing the existing 138kV to 46kV transformers and related equipment within the Archer Substation is included in HECO-209. This photograph is a good representation of the scope of work and view of the proposed new 138kV to 46kV transformer after it is installed.

Q. Does that complete the description of the overall scope of work for Phase 2 of the 46kV Phased Project?

A. Yes, it does.

EMF - PRUDENT AVOIDANCE

Q. How will "prudent avoidance" in regards to electric and magnetic fields ("EMF"), as defined by the Commission and the Hawaii Department of Health, be applied to the 46kV Phased Project?

A. Engineering Design

For underground ductlines that contain multiple circuits like the two new 46kV circuits between the existing Makaloa and McCully Substations for Phase 1 and the three new 46kV circuits on King Street for Phase 2, EMF mitigation can be achieved relatively inexpensively through engineering design. As discussed in J. Michael Silva's testimony T-10, this is done through engineering design by optimizing cable placement and phasing arrangement within the ductline to create a canceling effect among the magnetic fields. The ductline configurations proposed by J. Michael Silva for EMF mitigation will be incorporated into the detailed engineering designs of the ductlines for the project.

Route Planning

As discussed in J. Michael Silva's testimony, HECO T-10, EMF levels were calculated for various perpendicular distances away from the center line of the proposed ductlines, which show a rapid decrease in EMF levels with distance. Because EMF levels from power lines drop off rapidly with distance, generally as a function of the inverse of the distance squared for overhead lines and even faster for underground lines, further EMF mitigation might be achieved by locating the

lines closer to the middle of the roadways to reduce EMF levels at the near edge of the roadways. However, this would require detailed engineering and consultation with City permitting agencies to determine if physical space is available to locate the 46kV ductlines closer to the middle of the roadways and whether locating the lines there would cause conflicts with future facilities planned by government or private entities.

PROJECT BACKGROUND

Q. Please summarize the scope of the remainder of your testimony.

A. In summary, the remainder of my testimony will describe the background of the East Oahu Transmission Project, beginning with the inception of the project, the underlying project objectives, the major planning and permitting actions taken, project approvals pursued and key agency decisions rendered over the course of the project. I will also cover the public input process and its evolution throughout the project history. My testimony will then close with a discussion of HECO's development and evaluation of project alternatives following the Board of Land and Natural Resources (BLNR) rejection of the previously proposed alternative to use existing easements for an overhead 138kV circuit on Waahila Ridge.

Q. When did the East Oahu Transmission Project begin?

A. The East Oahu Transmission Project began in 1991 when a transmission planning study entitled *East Oahu 138KV Requirements* (HECO, July 1991) identified a number of issues associated with the 138kV transmission system serving the eastern half of Oahu. This study was updated in August 1992 in a study entitled *East Oahu 138KV Requirements Updated.* I will refer to this updated study as the *1992 East Oahu 138kV Requirements Study.* HECO-210 depicts the overall east

Oahu power demand area, consisting of the Koolau power demand area, the Pukele power demand area, and the Downtown power demand area.

Q. What key transmission system issues were identified in the *1992 East Oahu 138kV Requirements Study*?

A. The following key concerns are among those that were identified in the study and remain relevant to the project today: 1) Transmission overload concern with the transmission lines feeding the combined Koolau and Pukele service areas; 2) Transmission overload concern with the transmission lines feeding the Downtown area (Honolulu Power Plant was assumed to be retired in 1994); 3) Reliability concern with the Pukele Substation, the most heavily loaded 138kV substation on HECO's system (at the time, 19% of island power demand), because there are only two transmission lines that provide power to Pukele; and 4) Adequate 138kV sources required for the proposed new Kewalo and Kamoku Substations, both planned for addition to meet a forecasted growth in electrical load in the surrounding areas.

Q. What did the *1992 East Oahu 138kV Requirements Study* recommend to address the transmission concerns noted above?

A. The study evaluated three plans (A, B, and C) involving the installation of 138kV transmission lines to address these concerns. The study recommended that Plan C be implemented, which included the following: 1) Installation of an underground 138kV transmission line between the Archer Substation and the Pukele Substation via the proposed new Kewalo and Kamoku Substations; and 2) Installation of an underground/overhead 138kV transmission line between the existing Halawa and School Street Substations.

Q. Did the study identify whether Waahila Ridge was a possible route for the

recommended 138kV transmission line between the Kamoku and Pukele Substations?

A. Yes. The study noted that a variation of Plan C is to build a portion of the recommended 138kV underground transmission line between the Kamoku and Pukele Substations overhead, utilizing existing 46kV right-of-ways on Waahila Ridge to reduce project costs. The study further recommended that studies be initiated to determine the feasibility of utilizing Waahila Ridge and to confirm whether the installation of a transmission line between the Halawa and School Street Substations was required to address the Downtown overload concern. Later studies would determine that with the addition of a third line to the Pukele Substation, the Downtown overload concern would be addressed and the need for a new Halawa-School 138kV transmission line was deferred beyond the 20-year planning horizon.

Q. What immediate actions were taken following the *1992 East Oahu 138kV Requirements Study* recommendations?

A. Further internal analysis of the transmission concerns and the forecasted growth in electrical demand in the Waikiki, Ala Moana, and Kakaako areas confirmed that constructing a 138kV transmission line between the existing Archer and Pukele Substations, via the proposed Kewalo and Kamoku Substations, was the best means to address all of the identified needs. However, the distribution needs driven by the forecasted growth in electrical demand (large new loads anticipated in the Kakaako, Ala Moana, and Waikiki areas) required immediate action. Therefore, separate transmission line projects were initiated, each addressing their respective near-term load growth issues and long-term transmission system needs. The implementation of each project would be timed as the load growth forecast

warranted.

Q. Please identify the separate transmission line projects that were initiated by HECO following the *1992 East Oahu 138kV Requirements Study*.

A. The first project was identified as the Kewalo 138-25kV Transformers A&B project (Docket No. 7526, opened in November, 1992), which consisted of the development of the Kewalo Substation and the installation of two underground 138kV transmission lines between the existing Archer Substation and the proposed Kewalo Substation. This project was put into service in February, 2003, and today serves distribution loads in the Kakaako and Ala Moana areas. The second project was identified as the Kewalo-Kamoku 138kV Transmission Line project (Docket No. 7602, opened in February, 1993), which consisted of the development of the Kamoku Substation and the installation of an underground 138kV transmission line between the proposed Kewalo and Kamoku Substations. This project was put into service in September, 2002, and today serves distribution loads near the Waikiki and Ala Moana areas. The third project was identified as the Kamoku-Pukele 138kV Transmission Line, which consisted of the installation of a 138kV transmission line between the proposed Kamoku Substation and the existing Pukele Substation.

Q. What specific actions were taken with regard to the Kamoku-Pukele 138kV Transmission Line?

A. In early 1993, HECO embarked on an involved public scoping and public input process and initiated a Kamoku-Pukele 138kV transmission line routing study. As recommended in the *1992 East Oahu 138kV Requirements Study*, HECO studied the feasibility of utilizing Waahila Ridge to install a portion of the proposed 138kV transmission line overhead between the Kamoku and Pukele Substations.

HECO determined that there were no permitting or technical constraints precluding the consideration of Waahila Ridge for an overhead transmission line. However, because a significant portion of Waahila Ridge is in the State Conservation District, a Conservation District Use Permit ("CDUP") would need to be granted by the State Board of Land and Natural Resources ("BLNR") in accordance with Hawaii Revised Statutes ("HRS") Chapter 183C. An Environmental Impact Statement ("EIS") pursuant to HRS Chapter 343 would also be required for the use of conservation district lands.

Q. What was the purpose of the public scoping and input process initiated by HECO in 1993?

A. The purpose of the public scoping and input process was to inform the public about the project, the route selection process, the EIS process and the opportunities for public participation. The public scoping process was also used to gather public concerns and answer questions about the project, and identify topics to address in the EIS.

Q. What did the public scoping and input process consist of?

A. Key elements of the public scoping and input process consisted of: 1) a Community Advisory Committee ("CAC"); 2) public and agency briefings; and 3) the official EIS consultation, scoping and review process.

Q. Please describe the CAC and its purpose.

A. In early 1993, in conjunction with the Kamoku-Pukele 138kV transmission line routing study, a Community Advisory Committee ("CAC") was formed of representatives from the five neighborhood boards in the project area (Palolo; Manoa; Diamond Head/Saint Louis Heights/Kapahulu; McCully/Moiliili; and Kaimuki). Members of the CAC were solicited through their respective

neighborhood board and appointed by the chairs of each board. The full CAC consisted of 12 community members, two HECO staff members, and three staff members from CH2M HILL. CH2M HILL is a planning and permitting consultant retained by HECO to assist on the project and prepare the EIS. The CAC was established by HECO for the purpose of obtaining formal input from the directly affected communities on transmission line alternatives and routing options under consideration, and to maintain continuous dialogue with the larger communities through the neighborhood board process.

Q. What occurred during the CAC process?

A. An initial series of 11 CAC meetings and two public meetings were held during the 1993 route selection process before this phase of the project was put on hold in order to conduct an involved project alternatives study. Accordingly, seven CAC meetings were then held between June 1994 and February 1995 to evaluate various alternatives that would either defer or eliminate the construction of a 138kV transmission line between the Kamoku and Pukele Substations. The exhaustive evaluation of alternatives included both transmission line and non-transmission line alternatives, culminating in the preparation of various studies, including: 1) the *Kamoku-Pukele 138kV Transmission Line Alternatives Study* (CH2M HILL, June 1995, Updated April 2000); 2) the *Kamoku-Pukele 46kV Alternatives Study* (HECO, August 1994); and 3) the *Kamoku Substation Siting Study* (HECO, June 1994).

Q. Please briefly identify the various alternatives studied.

A. HECO identified fourteen alternatives utilizing 138kV transmission lines and two alternatives utilizing 46kV sub-transmission lines to address the east Oahu transmission concerns previously noted. In addition, HECO committed to study

any non-transmission line alternative that the CAC suggested, including several HECO initiated alternatives. Photovoltaic and wind energy, fuel cells, and pump-storage facilities were some of the alternatives evaluated with the CAC. As a follow-up, a study was conducted in 2000 to determine the feasibility of utilizing distributed generation to address the east Oahu transmission concerns. The project alternatives evaluated over the course of the entire project are covered in Ms. Ishikawa's testimony, HECO T-4.

Q. What happened next after completing the study of project alternatives described above?

A. Following the completion of the alternatives studies, HECO restarted the Kamoku-Pukele routing study and EIS process. The alternatives studies served to confirm to HECO that a 138kV transmission line connecting the two substations was the best alternative to meet the identified transmission concerns. The CAC was again convened in September 1995 to assist in identifying alternative 138kV transmission line alignments between the Kamoku and Pukele Substations. The CAC was also tasked to identify those evaluation objectives that were believed to be important to the community, and to evaluate various alternatives alignments that met the evaluation objectives. Over the course of six more CAC meetings, the members developed 38 alternative overhead and underground alignment segments to evaluate. The CAC also developed 18 separate evaluation resources covering social, environmental, technical, and cost considerations. The CAC members then weighted the resource areas and individually assessed how each alternative alignment segment impacted each resource area. A number of segments were identified as unfeasible through this process, resulting in the alternative alignments and technologies presented for detailed evaluation in the

EIS.

Q. Please describe the public and agency briefings that were a part of the overall public scoping and input process.

A. In addition to the CAC meeting process, HECO held more than 150 project briefings for public agencies, neighborhood boards, elected officials, and community organizations between 1992 and the publication of the *May 1998 Kamoku-Pukele Transmission Line Project Draft EIS* ("May 1998 Draft EIS"). The briefings were designed to provide information on the status of the project and to receive comments from the interested parties. A list of some of the meetings held since 1992 concerning the Kamoku-Pukele 138kV Transmission line project proposal over Waahila Ridge is contained in Appendix M1, Volume 4 of the *September 2000 Kamoku-Pukele Revised Final EIS* ("Revised Final EIS"). The Revised Final EIS contains twenty-six volumes. Volumes 1A, 1B, 2 and 3 are Exhibit 4 to the PUC Application. Volume 4, which contains Appendix M1, is available at HECO's Regulatory Affairs office.

Q. What ultimately resulted from the routing study, CAC consultation process, and public and agency briefings described above?

A. The culmination of the effort was HECO's selection in 1995 of a partial underground, partial overhead proposal for a 138kV transmission line between the Kamoku and Pukele Substations. The proposed action selected would utilize underground solid dielectric XLPE cable technology from the Kamoku Substation through the University of Hawaii's Lower Campus and conventional overhead technology over Waahila Ridge to the Pukele Substation.

Q. Please describe the specific route of the 138kV transmission line alternative selected by HECO in 1995.

A. The specific route selected for the 138kV transmission line would have the line exit the Kamoku Substation on Date Street and proceed underground along Kapiolani Boulevard. The transmission line would pass under the H-1 Freeway within the Old Waialae Avenue Extension Bridge, where it would enter the University of Hawaii's Lower Campus at the Waialae Gate. Within the lower campus, the transmission line would proceed underground along the access roads to the mauka side of Dole Street, where it would transition to an overhead alignment near the National Marine Fisheries Service building. The transmission line would continue overhead generally along the easements for the existing Pukele 7 and 8 46kV subtransmission line on Waahila Ridge, passing through the Conservation District and the Waahila Ridge State Recreation Area. Existing wooden poles along the Waahila Ridge easements would be replaced with taller steel poles designed to accommodate both the 138kV and 46kV circuits. The transmission line would then continue down the back of Waahila Ridge to the Pukele Substation located at the back of Palolo Valley. The alignment of the proposed action is shown in Figure ES-4 of the Revised Final EIS attached here as HECO-211.

Q. After selecting a preferred route alignment, what was HECO's next step in the project planning and permitting process?

A. As described above, a significant portion of Waahila Ridge including part of the proposed route alignment is within the State Conservation District. Thus, on November 16, 1995, HECO filed an application for a Conservation District Use Permit ("CDUP") with the Department of Land and Natural Resources ("DLNR") in accordance with HRS Chapter 183C. Before the Board of Land and Natural Resources ("BLNR") could render a decision on the CDUP application, an EIS

would need to be submitted by HECO and accepted by the DLNR pursuant to HRS Chapter 343. The EIS preparation notice for the Kamoku-Pukele 138kV Transmission Line project was published by the Office of Environmental Quality Control ("OEQC") in the Environmental Bulletin on December 23, 1995. The official EIS consultation, scoping and review process then proceeded.

Q. Please describe the official EIS consultation, scoping and review process that was a part of the overall public scoping and input process undertaken by HECO for the project?

A. The official deadline for receiving scoping comments on the May 1998 Draft EIS was placed at January 22, 1996. However, due to the large public interest in the project, the DLNR extended the public scoping comment period to February 22, 1996. On January 22, 1996, HECO held a public meeting for the purpose of soliciting additional public input into the scoping process. The meeting was attended by more than 150 individuals, with more than 30 providing spoken comments. Appendix M of the Revised Final EIS contains voluminous public participation materials produced during the scoping and development process of the EIS. These materials include: 1) a list of meetings and briefings held as part of the EIS consultation, project scoping and review process; 2) agency and public comment letters received during the EIS scoping process; 3) a summary of the public scoping meeting and the materials distributed to the public; 4) neighborhood board resolutions related to the proposed project; and 5) response letters and materials sent to the consulted parties during the EIS scoping process. Ultimately, the consulted party list included an extensive list of agencies, groups, and individuals. Through the consultation and public input process, we were able to identify community issues to address in the preparation of the Draft EIS.

Q. What are the most significant aspects of preparing a Draft EIS under HRS Chapter 343?

A. The most significant aspects in preparing the Draft EIS are the public input and EIS scoping process, evaluation of alternatives to the proposed action, and development of resource studies and mitigation measures. The public input and EIS scoping process, and the evaluation of project alternatives is described in my testimony above.

Q. Please explain what actions were taken to address resources studies and mitigation measures?

A. Based on the input received from the CAC and the public and agency consultations, the following resource areas were identified for study in the EIS: climate, natural hazards, geology and soils, topography, water resources, air quality, noise, flora, fauna, archaeological resources, cultural resources, visual resources, land use and ownership, social and economical development, tourism, property values, recreational facilities, public services and public safety, traffic and transportation, utilities, and EMF. In addition to HECO in-house resources, fourteen specialty consultants were hired to conduct extensive study of these resource areas and propose mitigation measures as needed.

Q. What other factors were considered and analyzed as the Draft EIS was under development?

A. In 1997, the State Legislature adopted Act 95, which amended HRS Section 269-27.6. Act 95 requires the PUC to consider, among others, the following key factors in determining the overhead or underground construction of 138kV transmission lines: amortized capital costs, amortized usable life costs, EMF, visual impacts to certain areas, and public sentiment to overhead transmission

lines. When the EIS process was started, most of the Act 95 factors were already going to be addressed in the EIS. With the passage of Act 95, consideration of these factors became obligatory and the degree of study and analysis of these factors increased significantly in the preparation of the Draft EIS. HECO-212 is a summary of these factors and the resultant actions that occurred to address these factors.

Q. What actions were taken to evaluate the amortized capital costs?

A. The capital costs for eleven 138kV transmission line alternatives were analyzed over a 50-year period starting from the project in-service date. The 50-year period was based on the alternatives that had the longest expected life, which was the all-underground alternatives utilizing high pressure fluid filled ("HPFF") cable systems.

Q. What actions were taken to evaluate the amortized usable life costs?

A. The usable life costs for eleven 138kV transmission line alternatives were analyzed over a 50-year period starting from the project in-service date. The 50-year period was based on the alternatives that had the longest expected life, which as previously noted was the all-underground HPFF cable systems. The usable life costs included projected future alignment changes, life-cycle replacements, operation and maintenance, relative transmission losses, and distribution line overhead to underground conversions for visual mitigation of the overhead 138kV alternatives.

Q. What actions were taken to evaluate EMF?

A. Three major actions were taken to address EMF. The first action was to identify and evaluate various federal and state regulations, guidelines, and policies regarding EMF exposure from power lines. The second action was to identify and

evaluate various major national and international studies regarding EMF exposure from power lines. The third action was to develop detailed EMF exposure models for all eleven 138kV transmission line alternatives. To aid the layperson in assessing exposure levels of each 138kV transmission line alternative, graphical representations of the potential EMF exposure impacts were developed from the exposure models.

Q. What actions were taken to assess the visual impacts of the 138kV alternatives that involved overhead lines?

A. Based on the input received from the CAC meetings, 29 view locations were identified for analysis. These view locations were representative of the most sensitive viewer groups and the areas of greatest potential impact. From the 29 view locations, 112 before and after photographic color simulations of the proposed action were developed to allow the public to assess the visual impacts. The process used to develop these photographic simulations of the proposed transmission line on Waahila Ridge was very involved, utilizing photographs of the existing conditions scanned into the computer and merging a properly scaled three-dimensional computer generated model of the project with the scanned image. Special attention to color, shadows and other details was the final step in producing the photo simulations of the project. To insure that the simulations accounted for various lighting conditions, several simulations were developed with the scale of the 138kV conductors exaggerated. Several simulations were also done under evening conditions to assess the impact of the project during a moonlit night. Furthermore, a professional color consultant was retained to experiment and recommend pole colors to reduce the visual impacts of the poles from distant views.

Q. What actions were taken to address the public sentiment to overhead transmission lines versus underground transmission lines?

A. Beyond the CAC meetings and the official EIS consultation, scoping and review process described in my testimony above, we were able to assess public sentiment through the following: 1) 15 formal presentations were made to the five neighborhood boards directly impacted by the project; 2) over 30 formal presentations were held for neighborhood boards indirectly impacted by the project; 3) over 45 formal presentations were made to various community and industry groups; 4) over 100 documented inquires were received on the project outside of the EIS process; and 5) over 100 documented inquiries were received from various government and elected officials outside of the EIS process.

Q. Were the transmission requirement studies updated?

A. Yes. Due to the passage of time, and changes in a number of factors affecting the East Oahu transmission requirements, HECO updated the findings in the *1992 East Oahu 138kV Requirements Study* and the *1994 Kamoku-Pukele 46kV Alternatives Study* in a study completed in March 1998 entitled the *East Oahu Transmission Requirements Update Study*. This update study continued to recommend that Pukele Substation be connected by a 138KV transmission line to the Southern Transmission Corridor (which HECO planned to extend from Archer Substation through Kewalo Substation to the substation to be developed at Kamoku). The 1998 update study is included in Appendix C2, Volume 2 of the Revised Final EIS.

Q. Please describe the overall EIS process following the compilation of the Draft EIS.

A. HECO-213 is a summary of the relevant Chapter 343 factors for the EIS process

and the resultant actions to address these factors. A two volume Draft EIS was issued for public comment in May 1998. Based on the consulted parties list, 370 sets of the Draft EIS were distributed. Public comment in the form of 180 letters and approximately 3,000 pre-printed postcards were received during the Draft EIS statutory comment period. All of the letters and postcards were responded to and in December 1998, a three volume Final EIS was submitted to the DLNR, the EIS accepting authority, and copies were issued to the consulted parties.

Q. Did the DLNR accept the December 1998 Final EIS?

A. No. In January 1999, the DLNR unexpectedly issued a Non-Acceptance of the Final EIS on the following grounds: 1) the Final EIS did not address the presence and potential impacts of the proposed action on a few individual *Acacia koai'a* trees adjacent to the transmission line alignment; 2) comments on many of the approximately 3,000 pre-printed postcards submitted to the DLNR by Malama o Manoa during the Draft EIS comment period were substantive and that the written responses that were provided required a greater level of discussion; and 3) copies of the responses letters mailed to the postcard writers were not reproduced in the publication of the December 1998 Final EIS. The rejection was unexpected, particularly because the process for handling responses to the voluminous pre-printed postcard comments, and the standard to which those responses would be held upon review by the accepting agency for the EIS, was new and unprecedented. The resulting process and standard established by the rejection of the EIS substantially added to the burden of doing an EIS by tremendously increasing the cost and time for preparation. It also provided a relatively simple and inexpensive mechanism to organized project opponents that could be used to overburden and delay the EIS process, and to attempt to create a basis for a

finding of procedural or substantive defect.

Q. What actions were taken by HECO in response to the DLNR rejection of the Final EIS?

A. A meeting was requested with the Deputy Attorney General in charge to clarify the basis of the non-acceptance of the Final EIS. The Deputy Attorney General felt that a response that referred a postcard writer to sections of the Final EIS that were responsive to the comment, even though the comment was very broad (e.g. "I'm concerned about the environment"), was not acceptable. Therefore, it was clarified that all postcard comment responses would have to be comprehensive enough so that the recipient of a response did not have to refer to or review the Final EIS. Another clarification was that providing only a summary in the Final EIS of the approximately 3,000 postcard responses was not enough. Although the postcard response summary adequately portrayed the substance of the responses, the summary itself was apparently insufficient evidence that each postcard author in fact had received a response letter. It was concluded that a copy of each response letter to each postcard should have been included in the Final EIS and the failure to do so rendered the document defective.

Q. Did HECO take action to remedy the identified defects in the Final EIS?

A. Yes. The identified deficiencies were remedied resulting in the 3 volume December 1998 Final EIS swelling to the 10 volume September 1999 Revised Draft EIS. The Revised Draft EIS was issued for public comment on October 23, 1999. Based on the consulted parties list, 370 sets of the 10 volume Revised Draft EIS were distributed. The prior effort by organized project opponents to overwhelm the EIS process by circulating and collecting thousands of pre-printed postcards at neighborhood shopping centers and then submitting the postcards en

mass was again duplicated, resulting in the submission of another 3,700 postcard comments. In addition, approximately 600 comment letters were received during the Revised Draft EIS 45-day comment period. Although the comment letters varied in length and substantive detail, some of the comment letters were exceedingly long, such as the 260-page comment letter submitted by Life of the Land, with 923 individually numbered comments. In total, there were over 10,000 individual comments that, according to the prior determination of the Deputy Attorney General, each required an individualized response before the Revised Final EIS would be acceptable.

Q. Please describe HECO's efforts to complete a Revised Final EIS following the draft EIS comment period.

A. Given the basis for rejection of the earlier Draft EIS and the duplicated effort by organized project opponents to overwhelm the EIS comment process, the preparation of the Revised Final EIS was a massive, time consuming and costly undertaking. It took approximately nine months of nearly non-stop work by a team of HECO personnel and consultants dedicated solely to the task of preparing the Revised Final EIS and responding to each individual comment in every postcard and comment letter. The end result was an unprecedented 26 volume Revised Final EIS issued to the consulted parties in September 2000. In December 2000, the DLNR accepted the Revised Final EIS.

Q. Was the acceptance of the December 2000 Revised Final EIS by the DLNR challenged on judicial appeal?

A. Yes. In January 2001, Life of the Land, The Outdoor Circle, Ilio'ulaokalani Coalition, Inc., and Karla Kral (a Palolo resident) filed a lawsuit in Circuit Court challenging the DLNR acceptance of the Revised Final EIS. The lawsuit sought,

among other things, relief in the form of a judicial declaration that the Revised Final EIS is inadequate and null and void. In December 2001, the plaintiffs filed pretrial statements. HECO filed its responsive pretrial statements in February 2002. A trial date has not been set and the plaintiffs have failed to take any action in the lawsuit beyond the filing of pretrial statements. Although the lawsuit is technically still pending, it is no longer relevant to this project. The Kamoku-Pukele 138kV Transmission Line project alternative using Waahila Ridge, which was the proposed action in the Revised Final EIS, is no longer a viable project alternative following the BLNR's rejection of HECO's CDUP application. .

Q. After the DLNR acceptance of the September 2000 Revised Final EIS, what actions were taken on the pending application for a CDUP?

A. HECO-214 is a summary of the CDUP process (governed by Chapter 183C) and the resultant actions taken. After the September 2000 Revised Final EIS was accepted by the DLNR, the BLNR held a public hearing on the CDUP application in March 2001. At the public hearing, several parties requested a contested case hearing on the application. The BLNR appointed retired judge John McConnell to sit as Hearing Officer for the contested case. Life of the Land, The Outdoor Circle, and Malama o Manoa filed written petitions to participate as intervenors in the contested case hearing.

Q. Please describe the contested case hearing on the CDUP application.

A. The contested case hearing was held on November 1-9, 2001. Twenty-six witnesses provided testimony on behalf of HECO. For the intervenors, six witnesses provided testimony on behalf of Life of the Land, seven witnesses on behalf of The Outdoor Circle, and thirteen witnesses on behalf of Malama o Manoa. The primary issues raised by the intervenors included an alleged lack of a

"need" for the project, and the visual and cultural impacts of the project on the conservation district. The Hearing Officer issued a pre-hearing order stating that the contested case hearing was not the Public Utilities Commission, and we are not going to turn this into a PUC proceeding or invade that jurisdiction of the PUC. Nonetheless, much of the intervenors case during the hearing focused on the project "need."

Q. Following the close of the contested case hearing, what action did the Hearing Officer recommend the BLNR take on the pending CDUP application?

A. On February 9, 2002, the Hearing Officer issued a report recommending that the BLNR deny the CDUP application for the proposed alignment atop Waahila Ridge. Among the reasons stated for his recommendation, the Hearing Officer concluded that the public benefit for the Kamoku-Pukele transmission line was substantially overstated by HECO and speculative. He further concluded that HECO failed to establish that there is a need that outweighs the transmission line's adverse impacts on conservation district lands and that there are practical alternatives that could be pursued, including an all-underground route through Palolo outside the conservation district lands. There were also findings that the visual impacts could not be satisfactorily mitigated and that alternatives such as live-line maintenance of the existing 138kV transmission lines traversing the Koolau Range could address the transmission system concerns in east Oahu.

Q. Did HECO take exception to the Hearing Officer's recommendation of denial?

A. Yes. HECO took exception to the Hearing Officer's recommendation based on the following main points: 1) The Hearing Officer exceeded his statutory authority and jurisdiction in determining whether the project was needed; 2) The Hearing Officer erroneously focused primarily on the visual impacts in justifying

why the project failed to comply with HAR § 13-5-30 (c); 3) The Hearing Officer erroneously failed to apply HECO's proposed mitigation measures to mitigate visual impacts; and 4) The Hearing Officer erroneously determined that practicable alternatives exist to the project.

Q. What were the subsequent actions of the BLNR following the Hearing Officer's recommendation?

A. On April 11, 2002, the BLNR held a public hearing at which the parties to the contested case hearing presented their oral closing arguments on the CDUP application. In June 2002, the BLNR denied HECO's application for a CDUP by a 4 to 1 vote based largely on the recommendations made by the Hearing Officer.

Q. What effect did the BLNR's denial of the CDUP application have on the proposed alternative to construct a 138kV overhead line on Waahila Ridge?

A. The BLNR's denial of the CDUP application effectively eliminated the originally proposed combination underground/overhead 138kV transmission line alignment using Waahila Ridge from further consideration. This left HECO to evaluate its remaining options to address the transmission system concerns affecting the east Oahu area.

Q. What did HECO do following the elimination of an overhead route alignment on Waahila Ridge?

A. As described in Mr. Joaquin's testimony, HECO T-1, an Executive Team was formed to provide executive oversight to ensure that the project moved forward to address the continuing east Oahu transmission concerns. With the passage of time since the inception of the project, resolution of the original transmission concerns were becoming critical (an August 2002 updated long-term load forecast showed that the transmission lines serving the Koolau Substation could begin to overload

in 2005). The Executive Team thus directed project engineers to identify and study alternatives to address the east Oahu transmission system concerns, and report back to the Executive Team. As discussed in Ms. Ishikawa's testimony, HECO T-4, various planning studies were updated and several new studies were initiated to identify and evaluate various alternatives. In addition, as discussed in Mr. Alm's testimony, HECO T-12, the Executive Team felt that public input should be sought on the identified viable alternatives before a final selection is made. Therefore, a public input process was developed.

Q. What viable alternatives were identified for further consideration?

A. The project engineers identified three viable transmission system alternatives for further consideration: 1) the Kamoku-Pukele 138kV Underground Alternative (via Palolo); 2) the Kamoku 46kV Underground Alternative; and 3) the Kamoku 46kV Underground Alternative – Expanded.

Q. How was public input sought on the three viable alternatives?

A. As discussed in Mr. Alm's testimony, HECO T-12, five public meetings were held at different locations on Oahu in June and July 2003, which were facilitated and documented by an independent facilitation team. The three transmission system alternatives were presented at the meetings by HECO in a PowerPoint presentation that covered the following points:

1. General description of HECO's power system on Oahu.
2. Conceptual description of the East Oahu transmission problems.
3. Description of the proposed line routing for each alternative.
4. Description of the potential impacts associated with each alternative and possible mitigation measures.
5. Conceptual description on the effectiveness of each alternative in

addressing the transmission problems.

6. A comparison of the alternatives.

Q. How was the Kamoku 46kV Underground Alternative – Expanded selected as the proposed project?

A. As discussed in Mr. Joaquin's testimony, HECO T-1, the Executive Team reviewed the various updated and new studies as well as the independent report on the alternatives from the public input process. From the various studies, reports, and discussions, major factors were identified and placed in a decision matrix, which was used as a tool by the Executive Team to analyze each alternative and to compare against one another. The major factors considered in evaluating the alternatives were effectiveness, timeliness, construction and other impacts (visual and EMF), and public sentiment. Given these considerations, the Executive Team selected the Kamoku 46kV Underground Alternative – Expanded and further recommended that it be implemented in two phases ("46kV Phased Project"). My testimony above describes the selected project alternative that is the subject of this PUC application. The other two alternatives evaluated by the Executive Team are described in my later testimony in HECO T-6.

SUMMARY

Q. Please summarize your testimony.

A. Proposed Project

The overall scope of work for the 46kV Phased Project is separated into two phases. Phase 1 involves the construction of several new 46kV underground circuits in and around the Ala Moana, McCully, Moiliili, and Kapahulu areas. In addition, a new 138kV to 46kV transformer would be installed at the existing

Kamoku Substation and equipment modifications would be required at various distribution substations located in urban Honolulu and Waikiki. Phase 2 involves the construction of three new 46kV circuits from the existing Archer Substation to McCully Street. Phase 2 also includes the installation of a new 138kV to 46kV transformer at the Archer Substation.

"Prudent Avoidance" in regards to electric and magnetic fields ("EMF"), as defined by the Commission and the Hawaii Department of Health, will be incorporated into the design and routing of the proposed new 46kV underground lines.

Project Background

The East Oahu Transmission Project began in 1991 when a number of issues associated with the 138kV transmission system serving the eastern half of Oahu were identified. The key issues that were identified in 1991 and still remain relevant today are: 1) Transmission overload concern with the transmission lines feeding the combined Koolau and Pukele service areas; 2) Transmission overload concern with the transmission lines feeding the Downtown area (Honolulu Power Plant was assumed to be retired in 1994); 3) Reliability concern with the Pukele Substation, the most heavily loaded 138kV substation on HECO's system (at the time, 19% of island power demand), because there are only two transmission lines that provide power to Pukele; and 4) Adequate 138kV sources required for the proposed new Kewalo and Kamoku Substations, both planned for addition to meet a forecasted growth in electrical load in the surrounding areas.

After evaluating numerous alternatives through technical studies and an extensive public input process, the Kamoku-Pukele 138kV Transmission Line via Waahila Ridge was pursued. A permit for the overhead section of the project was

required from the BLNR. After two environmental impacts statements (1998, 2000), the adoption of Act 95 by the State Legislature that added additional factors to consider for 138kV transmission line projects, and a contested case hearing before BLNR, the permit was denied. This action essentially eliminated the only practical overhead 138kV transmission line alternative to pursue for the project.

Various planning studies were updated and several new studies were initiated to evaluate past alternatives as well as identify new ones. The following three viable alternatives were identified for further consideration and presented to the community through a public input process in June and July 2003: 1) the Kamoku-Pukele 138kV Underground Alternative (via Palolo); 2) the Kamoku 46kV Underground Alternative; and 3) the Kamoku 46kV Underground Alternative – Expanded.

After evaluating the alternatives against major factors such as effectiveness, timeliness, construction and other impacts, and public sentiment, the Executive Team selected the Kamoku 46kV Underground Alternative – Expanded. It was further recommended that it be implemented in two phases. This 46kV Phased Project is the subject of this Application.

Q. Does this conclude your testimony?

A. Yes, it does.