HAWAIIAN ELECTRIC

WILDFIRE MITIGATION PLAN

Hawaiian Electric Company

January 2023

EXECUTIVE SUMMARY

Considering the devasting California wildfires of 2018 and Hawaiian Electric's own experiences with wildfires in 2019, Hawaiian Electric has taken a proactive approach to address wildfire risks. The risk of Hawaiian Electric facilities causing wildfires in Hawaii is significantly less than California as discussed further in Section 2 of this Plan. This is due to Hawaiian Electric having fewer facilities in high-risk wildfire areas and Hawaii's dry areas having very few tall trees, which is a major fuel source for wildfires, as compared to California. Nevertheless, there are certain areas in Hawaii that are more at risk for wildfires than other areas. This Plan should be periodically reviewed and updated as climate conditions, better data, new technologies, regulations, or electric utility industry trends warrant.

A primary objective of this Plan is to minimize the probability of Hawaiian Electric's facilities becoming the origin or contributing source of ignition for a wildfire. Another objective of this Plan is to mitigate Hawaiian Electric facilities from contributing to the severity and breadth of a wildfire. This Plan provides the framework for a comprehensive and coordinated wildfire mitigation strategy across Oahu, Maui County and Hawaii Island, from which common technology, equipment, and procedures are developed and implemented to meet the objectives. It is recognized that Oahu, Maui County, and Hawaii Island have different system, geographic, environmental, and resource availability factors to contend with in managing the respective grids. Thus, this Plan allows flexibility to have differences in the use of technology and equipment and different procedures among the three service territories. Each department/division will

develop their own specific implementation procedures, timelines, and budgets to support the Plan per the Company's priorities.

In Hawaii, the western (or leeward) sides of most of the main Hawaiian Islands appear to historically have experienced more wildfires as shown in the "Ignition Density Maps" from the Pacific Fire Exchange, www.pacificfireexchange.org. Using these maps as a first step, in 2019 and 2020, Hawaiian Electric conducted both ground and Unmanned Aerial System ("UAS" aka "drone") inspections of its facilities and surrounding vegetation in potential wildfire areas. The inspections conducted revealed that the vegetation in these areas were generally grasses, brush, shrubs, and few trees. Trees that did exist were much shorter than the height of the conductors.

The 2019 and 2020 inspections combined with Hawaiian Electric's experiences with wildfires formed the basis to identify Priority Areas for this Plan to focus on the following areas:

Oahu – Waianae Coast, Makakilo/Kapolei, Central Oahu, East Honolulu, Aikahi, and Waialua.

Maui County – West Maui, Olowalu, and Maalaea.

Hawaii Island – Waikoloa Village, Naalehu, Kohala, and Pohakuloa.

Additional inspection performed in 2021 and 2022 identified the following additional Priority Areas:

Maui County – Kihei/Wailea, Molokai and Lanai.

Hawaii Island – Kawaihae and Honokaa.

The Priority Areas identified should not preclude Hawaiian Electric from implementing wildfire mitigation actions in other areas of its service territory as incidents or inspections dictate.

Inspection Plan

The current traditional preventive maintenance inspection programs for the transmission systems should continue (e.g., “fly-by” inspections). In potential wildfire areas, as circumstances warrant (e.g., extraordinary drought conditions or if a fire incident occurred), infrared and corona cameras, Light Imaging, Detection, and Ranging (“LiDAR”), or UAS should be utilized to identify any potential issues with the transmission facilities that may not be revealed through current inspection programs. It is recommended that inspections on the sub-transmission and distribution systems should be conducted every 3 to 5 years in the wildfire areas utilizing LiDAR and UAS technologies as appropriate. Because Hawaii’s wildfire risk is significantly less than California, a 3 to 5-year inspection cycle is reasonable. The current maintenance inspection programs for substations should continue, which is focused on the equipment and facilities within the substation fencing. However, inspections of substations in potential wildfire areas should include the type and condition of the vegetation on the perimeter of the substation. Vegetation that is overgrown and dry should be addressed as soon as practical.

Vegetation Management Plan

As noted previously, the type of vegetation in the Hawaii wildfire areas are primarily grasses, shrubs, and few trees, which rarely grow into conductors. Thus, it is not recommended that vegetation management plans be adjusted in the wildfire areas.

Further trimming of the already low-lying vegetation will not likely produce any appreciable results in the potential wildfire areas.

System Hardening Plan

System Hardening can be categorized into three prioritized tiers with the 1st tier being of highest priority. The 1st tier involves addressing conductor sag, tension, and clearance issues with overhead conductors in potential wildfire areas to minimize conductor contact with vegetation or between conductors. Solutions to address these issues could include re-tensioning conductors, replacing cross-arms (to provide greater spacing between conductors), or changing horizontal conductor configurations to vertical or delta (to reduce probability of swing shorts).

The 2nd tier involves replacement of facilities, which may include replacement of poles, structures, hardware, conductors, shield wires and guy wires. A particular asset that the major California utilities are replacing in potential wildfire areas are single strand copper conductors. Single strand copper conductors tend to be “stiff” and break during vibrations from wind and break easier when in an aged condition as compared to multi-stranded aluminum conductors or multi-stranded copper conductors. It is recommended that Hawaiian Electric implement the practice of replacing single strand copper conductors as well, given Hawaii’s corrosive environment.

The 3rd tier of hardening involves mitigating the intensity of ignition from conductors failing or contacting each other. The utilization of smart reclosers or smart fuses on distribution circuits provides this level of mitigation and provides a way to isolate portions of long circuits that enter into wildfire areas from non-wildfire areas. Smart reclosers or smart fuses operate at such a high speed (i.e., fractions of a second)

that the intensity of sparks from a conductor contact is diminished significantly. Consideration should be given to block automatic reclosing on wildfire area circuits during “red flag” weather conditions. For non-wildfire area circuits, automatic reclosing should be enabled for reliability purposes.

Some of the major California utilities are replacing existing overhead conductors with insulated conductors such as tree wire or spacer cable. These technologies are excellent in preventing sparks if tall vegetation is in or adjacent to the line right-of-way. But as noted previously, the type of vegetation in the Hawaii wildfire areas are grasses, shrubs with few tall trees. Thus, tree wire or spacer cable would not be cost-effective in the Hawaii wildfire areas as opposed to other hardening solutions.

Oahu System Hardening Plan

For Oahu, there are six Priority Areas identified as potential wildfire areas where Hawaiian Electric facilities exist. These areas are:

Priority Area #1 – West Oahu (Makaha Valley to Kahe Valley)

Priority Area #2 – East Honolulu (Aina Haina to Hawaii Kai)

Priority Area #3 – Kapolei (along Railroad track)

Priority Area #4 – Aikahi/Mokapu

Priority Area #5 – Central Oahu (Kunia – Waikele area)

Priority Area #6 – Waialua

For these Priority Areas, smart reclosers and smart fuses will be installed on certain 12kV circuits, single strand copper conductors in the dry vegetation areas will be replaced with standard aluminum conductors, certain wood 12kV and 46kV poles and structures will be replaced/upgraded, and 46kV line conductor clearance issues will be

addressed. Priority Areas #1, #3, and #4 hardening work have been completed. Priority Area #2 work is in progress. And Priority Areas #5 and #6 are in the scoping and planning stages.

Maui County System Hardening Plan

For Maui County, there are six Priority Areas identified as potential wildfire areas where Hawaiian Electric facilities exist. These areas are:

Priority Area #1 – West Maui (Lahaina to Kapalua)

Priority Area #2 – Maalaea

Priority Area #3 – Olowalu

Priority Area #4 – Kihei/Wailea

Priority Area #5 – Molokai

Priority Area #6 - Lanai

For Priority Areas #1, #2, and #3, certain 69kV transmission system wood structures, hardware, guy wires, and conductors will be replaced. The existing 69kV shield wires will be replaced with Optical Ground Wire ("OPGW"). While standard shield wire would be sufficient in this instance, the incremental additional cost of utilizing OPGW is worth the additional telecommunication benefits to support the Grid Modernization initiative, utility-scale renewable energy interconnections and reliability improvements. For the distribution systems, existing fuses will be replaced with smart fuses on certain 12kV circuits and copper conductors in the dry vegetation areas will be replaced with standard aluminum conductors. In addition, for Olowalu, a portion of the existing 12kV circuit that is inaccessible will be relocated and sub-standard concrete poles will be replaced with standard wood poles. For Priority Areas #4, #5, and #6, certain wood

poles would be replaced, smart reclosers and smart fuses will be installed on certain 12kV circuits, and copper conductors in the dry vegetation areas will be replaced with standard aluminum conductors,

Priority Areas #1, #2, and #3 are in progress. Priority Areas #4, #5, and #6 are in the scoping and planning stages.

Hawaii Island System Hardening Plan

For Hawaii Island, there are six Priority Areas identified as potential wildfire areas where Hawaiian Electric facilities exist. These areas are:

Priority Area #1 – Waikoloa Village

Priority Area #2 – Naalehu

Priority Area #3 – Honokaa

Priority Area #4 – Kawaihae

Priority Area #5 – Kohala

Priority Area #6 – Pohakuloa, Saddle Road

For these Priority Areas, smart fuses will be installed on certain 12kV circuits, and any defective switches or other hardware will be replaced.

Situational Awareness Plan

Two significant tools that the major California utilities are utilizing for situational awareness are weather stations and live-feed cameras.

Weather Stations

The two primary weather parameters that contribute to wildfire conditions are wind speed and moisture in the air or relative humidity (ratio of water vapor and water pressure). The major California utilities have installed their own weather stations

instead of solely relying on publicly accessible weather stations such as stations operated by the National Weather Service. By installing their own weather stations, the California utilities can more strategically and precisely monitor their respective service territories.

For Hawaii's tropical climate, both wind speed and relative humidity should be considered for potential wildfire conditions. It is recommended that Hawaiian Electric strategically place a limited amount of weather stations in or near potential wildfire areas. These weather stations could be set with simple threshold criteria for relative humidity and wind speed to alert System Operations Dispatch Centers of conditions ripe for a potential wildfire. It is recognized that across the three Hawaiian Electric service territories there are different environmental conditions (e.g., Pohakuloa on Hawaii Island has low relative humidity on a daily basis). Thus, threshold criteria for relative humidity and wind speed may have to be specific to certain areas.

Video Cameras

Video cameras provide one of the best means to have physical surveillance on what is happening in the service territory. Visual situation awareness will determine if there are any physically compromised electrical facilities or whether a fire is occurring near the electrical facilities.

Secondary Line Monitoring

Hawaiian Electric has extensively deployed Grid 20/20's OptaNode line monitoring devices on Oahu and Maui. The OptaNode device can also be set up to provide notifications on loss of power. More recently, the OptaNode device can be equipped to detect heat, smoke, humidity, and temperature. In 2021, Hawaiian Electric

partnered with the Honolulu Fire Department (“HFD”) to conduct a live-burn test of the heat and smoke detection capabilities of the OptaNode device. The test was successful as the OptaNode device was able to detect heat and smoke from the live burn. Furthermore, Hawaiian Electric is working with Grid 20/20 to also allow the OptaNode devices to provide notifications when there are significant voltage imbalances, which could be an indication of a downed conductor.

In Hawaii, many of the distribution circuits in potential wildfire areas are in less populated areas. Thus, Hawaiian Electric will leverage the outage, heat, and smoke notification features for circuits in potential wildfire areas so dispatchers can respond to outages or notify the fire department of potential fires.

Fault Current Indicators with Communications

The major California utilities are deploying Fault Current Indicators (“FCIs”) with communications in potential wildfire areas. This allows dispatchers to have better knowledge of where faults have occurred and can more accurately dispatch troublemen to the probable location of a fault. It is recommended that Hawaiian Electric also deploy FCIs for portions of 46kV and 34.5kV lines in potential wildfire areas.

Oahu, Maui County, and Hawaii Island Situational Awareness Plans

For the Priority Areas, weather stations and cameras will be installed at certain Hawaiian Electric owned facilities and information with exception notification (Red Flag condition) telemetered back to System Operations. Weather stations have been installed at Kahe on Oahu and Mahinahina, Puukolii, and Napili Substations in West Maui. Three additional weather stations on Oahu are in progress. Weather stations in Olowalu on Maui and Waikoloa Substation on Hawaii Island are in the planning stage.

Video camera installations are in the planning stages for Oahu, Maui County, and Hawaii Island. A pilot thermal camera is installed at Kahe on Oahu and results are still being evaluated.

For certain 12kV circuits in the Priority Areas, Grid 20/20's OptaNode line monitoring devices with their outage, heat, and smoke notification feature enabled will be installed. The Waianae Coast OptaNodes are planned to be installed by the end of 2022. Planning for installing the OptaNode devices on certain circuits in Maui County and Hawaii Island are in the planning stage.

And for Oahu only at this time, FCIs with cellular communications will be installed on certain sub-transmission 46kV lines.

Operations Plan

Based on news reports, Pacific Gas & Electric's practice to preemptively turn off circuits in certain areas if conditions were ripe for a wildfire was not well-received by certain customers affected. For Hawaii, it is not recommended that Hawaiian Electric adopt this practice. As noted previously, the type of vegetation in the potential wildfire areas in Hawaii would not likely cause the same catastrophic level of wildfires that California has experienced. In addition, a lot of the Hawaiian Electric distribution circuits meander through non-wildfire areas and then through potential wildfire areas. Thus, preemptively turning off circuits would impact customers that may not be in potential wildfire areas. However, it is recommended that certain other operational practices and protocols be adopted by Hawaiian Electric.

Given the proposed System Hardening Plans and Situational Awareness Plans, the weather stations and video cameras will monitor potential wildfire areas and will

notify System Operations personnel of impending risks on an exception basis. In general, if relative humidity is less than 50% and the average wind speed is 25 miles per hour, then a “Red Flag” condition will likely exist. It is recommended that the following actions be taken in potential wildfire areas. However, it is recognized that across the three Hawaiian Electric service territories there are different environmental conditions (e.g., Pohakuloa on Hawaii Island has low relative humidity on a daily basis). Thus, threshold criteria for relative humidity and wind speed may have to be specific to certain areas. System Operations should modify the recommended actions as needed to address the unique circumstances of each service territory.

- Temporarily disable reclosing capabilities for circuit breakers and reclosers for circuits predominately in the wildfire areas.
- No circuit breakers, reclosers or switches should be manually closed until there is confirmation that fault conditions do not exist; and
- A troubleman should be dispatched to investigate any outage.

New Technologies

The electric utility industry continues to evaluate and pilot various new technologies to mitigate wildfires. Some of the areas that Hawaiian Electric should continue to monitor include work related to Predictive Maintenance, Protective Relaying, “Sparkless” Fuses and Situational Awareness tools. If new technologies in these areas have matured to a point where doing a pilot project would not be cost prohibitive and will not put the system at risk, then Hawaiian Electric should pursue such opportunities.

Stakeholder Communication Plan

In terms of wildfire, there are generally four key external stakeholder groups that would have an interest in this Plan – Government Agencies, Communities in wildfire areas, Large Landowners and Land Managers, and Wildfire Special Interest groups. Each group would have different interests and agendas regarding wildfire as it relates to Hawaiian Electric's facilities. Hawaiian Electric's Government and Community Relations areas will be relied upon to develop the appropriate strategies to engage these groups.

Response Plan

In the worst-case scenario, where a wildfire is raging out of control and containment is uncertain, Hawaiian Electric could activate and leverage its Incident Management Team ("IMT"). Hawaiian Electric has adopted the National Incident Management System ("NIMS") as the framework for its IMT. One of the main advantages of adopting the NIMS framework is that it can be applied to any disaster, including wildfire response. Another advantage of NIMS is that it facilitates more effective inter-agency coordination in responding to disasters.

HAWAIIAN ELECTRIC

WILDFIRE MITIGATION PLAN

Considering the devasting California wildfires of 2018 and Hawaiian Electric's own experiences in 2019, Hawaiian Electric has taken a proactive approach to address wildfire risks. This included participating in the Edison Electric Institute (EEI) Wildfire Mitigation Task Force, which provided an excellent forum for utilities to share information and best practices. This EEI forum and reviewing the Pacific Gas & Electric, Southern Cal Edison, and San Diego Gas & Electric state-mandated wildfire mitigation plans, was the basis for developing a Hawaiian Electric Wildfire Mitigation Plan in 2020-2021. This current Hawaiian Electric Wildfire Mitigation Plan is an update from the April 2021 final draft version.

The risk of Hawaiian Electric facilities causing wildfires in Hawaii is significantly less than California as discussed further in Section 2. This is due to Hawaiian Electric having fewer facilities in high-risk wildfire areas and Hawaii's dry areas having very few tall trees, which is a major fuel source for wildfires, as compared to California. Nevertheless, there are certain areas in Hawaii that are more at risk for wildfires than other areas. In Hawaii, information, data, and modeling to address wildfire risk is scarce. Thus, this Plan should be periodically reviewed and updated as climate conditions, better data, new technologies, regulations, or electric utility industry trends warrant. In addition, if a major wildfire incident occurs involving Hawaiian Electric's facilities, then an investigation should be conducted. The results of such an investigation may also warrant revisions to this Plan.

1. Objectives

The Hawaiian Electric core values of Safety, Aloha, Integrity, and Excellence shall form the foundation of this Plan. Thus, a primary objective of this Plan is to minimize the probability of Hawaiian Electric's facilities becoming the origin or contributing source of ignition for a wildfire. Regardless of whether Hawaiian Electric's facilities may have been the cause or not, another objective of this Plan is to mitigate Hawaiian Electric facilities from contributing to the severity and breadth of the wildfire. This Plan provides the framework for a comprehensive and coordinated wildfire mitigation strategy across Oahu, Maui County, and Hawaii Island, from which common technology, equipment, and procedures are developed and implemented to meet the objectives. It is recognized that Oahu, Maui County, and Hawaii Island have different system, geographic, environmental, and resource availability factors to contend with in managing the respective grids. Thus, this Plan allows flexibility to have differences in the use of technology and equipment and different procedures among the three service territories. Each department/division will develop their own specific implementation procedures, timelines, and budgets to support the Plan per the Company's priorities.

2. High Risk Areas

The service territory of Hawaiian Electric is approximately 5,700 square miles across the islands of Oahu, Maui, Molokai, Lanai, and Hawaii Island. For comparison, Pacific Gas & Electric's service territory is 70,000 square miles.[1]

[1] Pacific Gas and Electric Company's Wildfire Mitigation Plan, February 6, 2019, p. 18.

In Hawaii, the western (or leeward) sides of most of the main Hawaiian Islands appear to historically have experienced more wildfires as shown in the “Ignition Density Maps” (Pacific Fire Exchange, www.pacificfireexchange.org), Figures 1, 2 and 3.

Figure 1 -Oahu Ignition Density Map, www.pacificfireexchange.org.

Figure 2 – Maui, Molokai, and Lanai Ignition Density Map, www.pacificfireexchange.org.

Figure 3 – Hawaii Island Ignition Density Map, www.pacificfireexchange.org.

Table 1 below shows the approximate amount of distribution, sub-transmission, and transmission overhead circuit miles within the Hawaiian Electric service territory with potential wildfire risks. Pacific Gas & Electric is also shown for comparison.

Overhead Asset	Oahu	Maui County	Hawaii Island	Pacific Gas & Electric[2]
Distribution	120	250	1,520	43,000

[2] Pacific Gas and Electric Company's Wildfire Mitigation Plan, February 6, 2019, p. 22.

Overhead Asset	Oahu	Maui County	Hawaii Island	Pacific Gas & Electric[2]
Sub-transmission	20	Not applicable	~1	Not applicable
Transmission	30	110	100	9,000
Total	**170**	**360**	**1,620**	**52,000**

Table 1 – Approximate Overhead Circuit Miles in Wildfire Areas[3]

Ignitions Related to Electric Facilities

The Wildfire Mitigation Plans for Pacific Gas & Electric, Southern California Edison Company and San Diego Gas & Electric Company show that most ignitions related to electric facilities involve contact with vegetation. Either vegetation flies or falls into the electric overhead conductors or conductors contact vegetation. The next leading cause appears to be overhead conductors failing and falling to the ground.

In 2019 and 2020, Hawaiian Electric conducted both ground and Unmanned Aerial System ("UAS" aka "drone") inspections of facilities and surrounding vegetation in potential wildfire areas. Figures 4, 5 and 6 are 2019 photos of potential wildfire areas on Oahu.

[3] State and federal agencies in California use a Fire Index Area mapping system to designate areas that could have wildfire risk. For this Plan, the "Ignition Density Maps" from www.pacificfireexchange.org were used as a first step to determine where wildfire risks are in Hawaii.

Figure 4 – Makaha Valley 12kV circuit, Makaha Valley, Oahu 2019.

Figure 5 – Kalaeloa-Ewa Nui 138kV Circuit, CEIP-Ewa Nui 138kV Circuit, Kahe-Standard Oil 2 46kV Circuit, CEIP 46 46kV Circuit, and CEIP 3 12kV Circuit, Kapolei, Oahu 2019

Figure 6 – Koolau-Wailupe #2 46kV Circuit, Hahaione Valley, Oahu.

Figures 7 and 8 are 2019 and 2020 photos, respectively, of potential wildfire areas on Maui.

Figure 7 – Lahaina #1 and #2 69kV Circuits, Upper Maalaea, Maui 2019.

Figure 8 – Lahaina #2 Mauka 69kV Circuit and 1381 12kV Circuit, Kapalua, Maui 2020.

Figures 9, 10, and 11 are photos of potential wildfire areas on Hawaii Island.

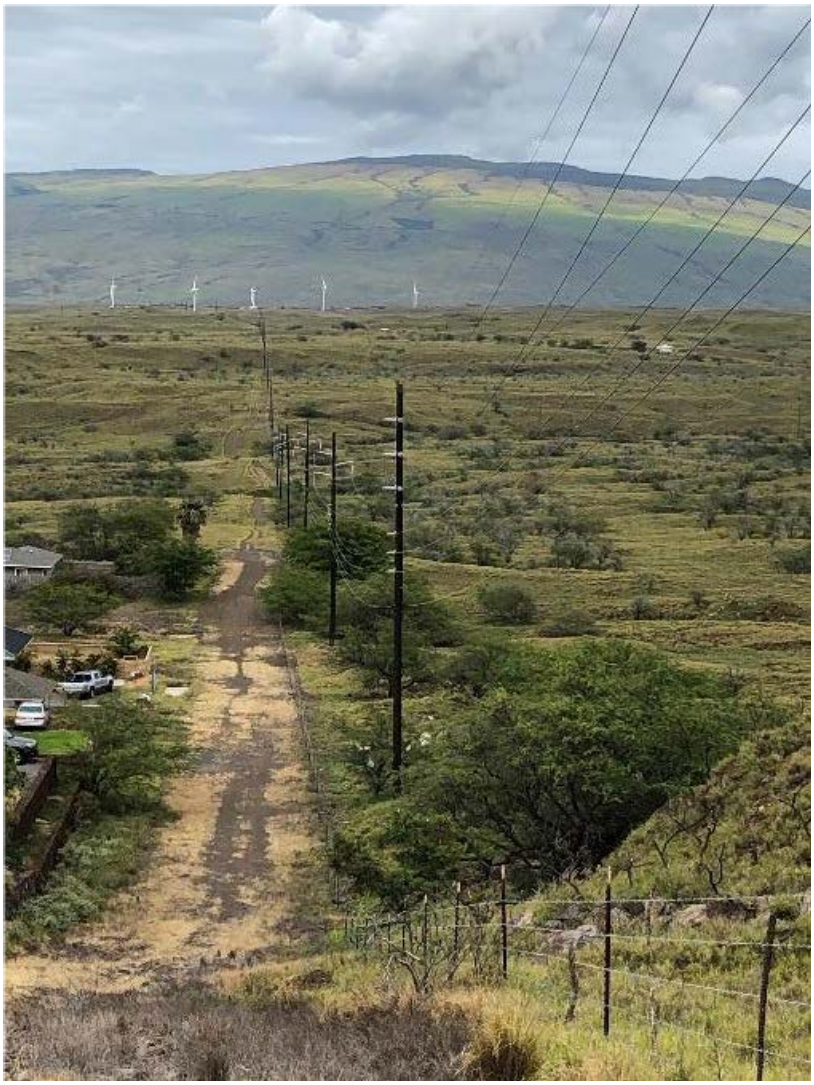

Figure 9 – 8200 69kV Circuit and Waikoloa 12 12kV Circuit, Waikoloa Village, Hawaii Island 2020.

Figure 10 – Punaluu 12kV Circuit, Mauka of Honuapo Bay, Hawaii Island 2020.

The inspections conducted in 2019 and 2020 revealed that the vegetation in these areas were generally grasses, brush, shrubs, and few trees. Trees that did exist were much shorter than the height of the conductors. Therefore, unlike California, Hawaiian Electric's main ignition risks from its facilities would be associated with

overhead conductors failing and falling to the ground or conductors hitting each other and causing sparks.

Figure 11 – Honokaa 12kV Circuit 14, Eucalyptus Trees along Waipio Road, Honokaa, Hawaii Island (Google Maps 2022).

Hawaii Drought Risks

According to the National Integrated Drought Information System ("NIDIS"), since 2000, Hawaii has experienced numerous periods of drought. The longest extended period of drought in Hawaii since 2000 occurred from 2008 to 2015. Figure 12 below is from the NIDIS website and shows the May 17, 2022, weekly update for drought conditions in Hawaii.

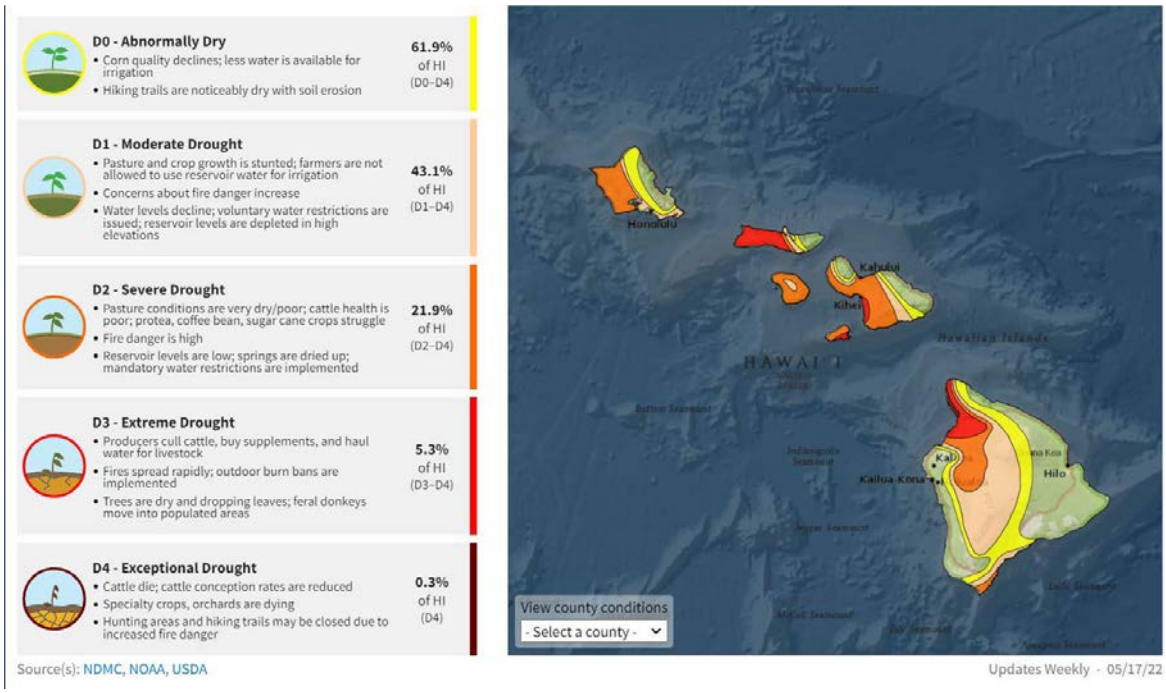

Figure 12 – Drought condition characterizations by the NIDIS for Hawaii, weekly update as of May 17, 2022. www.drought.gov/drought/states/hawaii

Figure 13 below shows the percentage of land area in Hawaii that experienced abnormally dry or drought conditions by years.

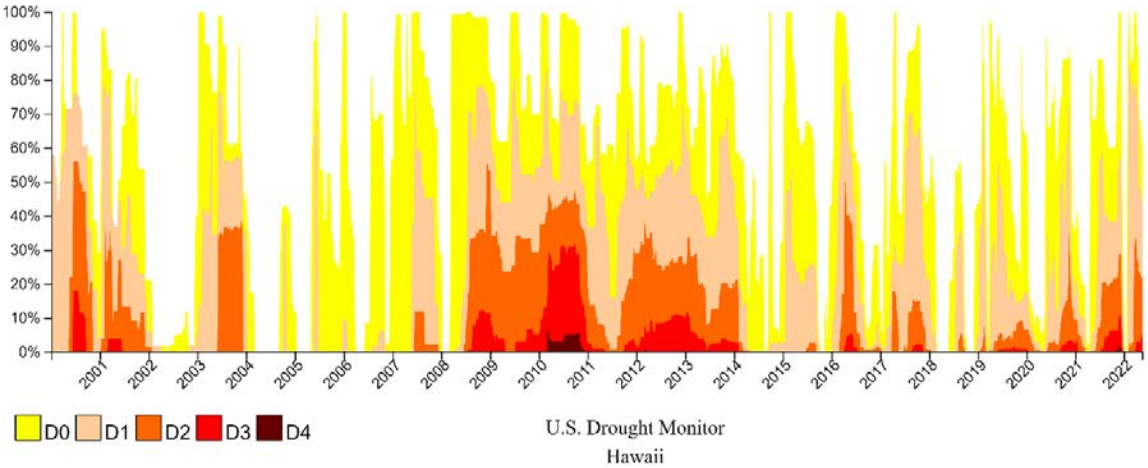

Figure 13 – Percent of land area in Hawaii that experienced drought conditions by years. www.drought.gov/drought/states/hawaii

The NIDIS issues seasonal and monthly drought forecasts for the United States. In the December 2021 “Quarterly Climate Impacts and Outlook” for the Hawaii and U.S. Affiliated Pacific Islands for the September to November 2021 time period, the NIDIS noted: “During the SON [September-October-November] period, below-normal rainfall led to expansion and intensification of drought across areas of the Hawaiian Islands with the most severe drought-related conditions (Exceptional Drought [D4]) observed in Maui and Molokai.”

The main takeaway from the NIDIS information is that dry or drought conditions in Hawaii will likely not dissipate soon. Thus, it is prudent for Hawaiian Electric to implement certain wildfire mitigation measures in potential high-risk areas.

Hawaiian Electric Geographic Priority Areas

While Hawaii’s wildfire risk is much less than California’s in terms of geographic area and potential destructive capability (due to less robust fuel sources), there are certain areas in Hawaiian Electric’s service territory that should be considered for mitigation. The following qualitative criteria was used to prioritize the areas that mitigative plans should be developed and implemented.

1. Identified potential wildfire area
    a. Pacific Fire Exchange
    b. Historical experience
2. Type of vegetation
3. Proximity of residents

4. Accessibility issues for fire response
5. Lessons learned from California experiences

With the above criteria and 2019, 2020, 2021, and 2022 inspections conducted, the circled, numbered areas in Figures 14, 15 and 16 were identified as priority areas. The areas are prioritized with “1” signifying the highest priority. This prioritization should not preclude lower Priority Area recommendations from being implemented at the same time or earlier than higher Priority Areas if circumstances warrant. For example, if there are pole replacements being planned in a lower Priority Area that involves a circuit recommended to be reconductored for wildfire mitigation, then the reconductoring project should occur with the pole replacements.

Figure 14 – Wildfire priority areas on Oahu.

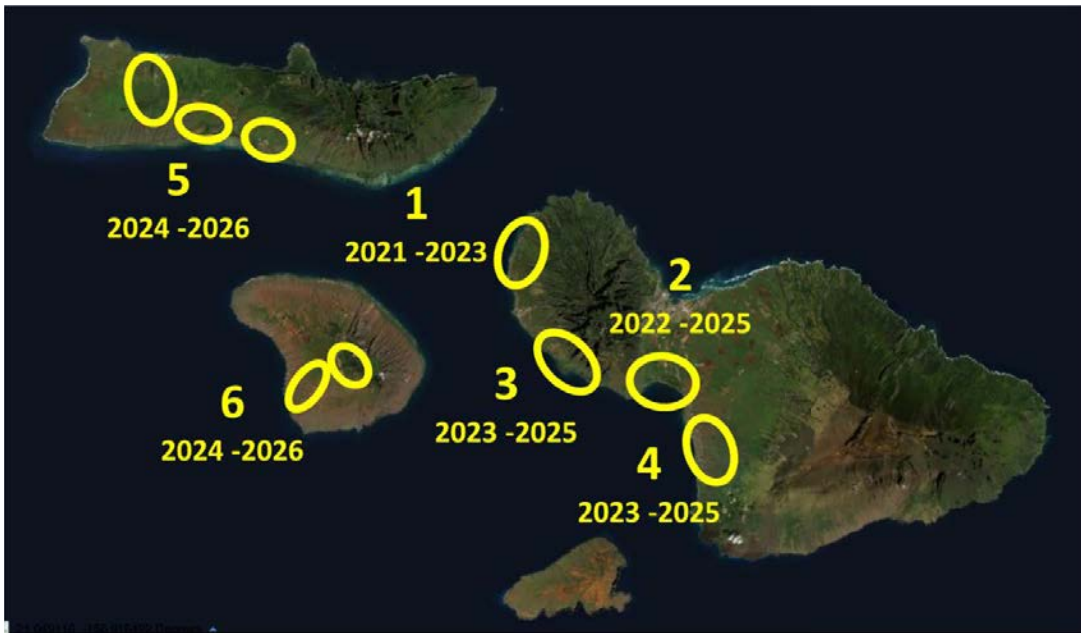

Figure 15 – Wildfire priority areas in Maui County.

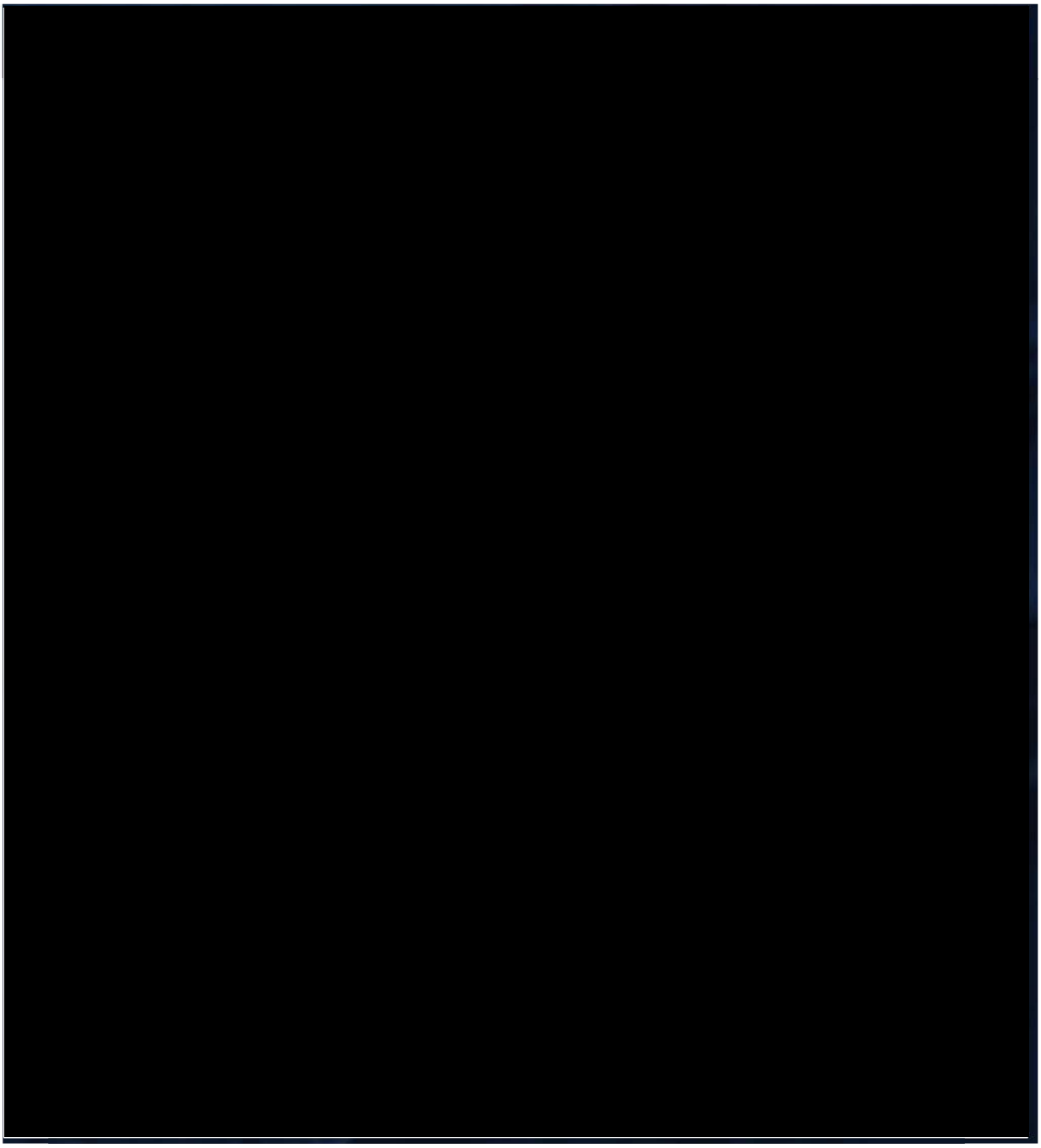

Figure 16 – Hawaii Island wildfire priority areas.

The above Figures should be considered as a starting point. Figures 14, 15 and 16 should not preclude Hawaiian Electric from implementing wildfire mitigation actions

in other areas of its service territory. When this Plan is periodically reviewed, other areas should be added as circumstances warrant.

3. Components of a Wildfire

Per the "Fire Triangle,"[4] a fire starts when there is the appropriate mix of fuel, oxygen, and heat present.

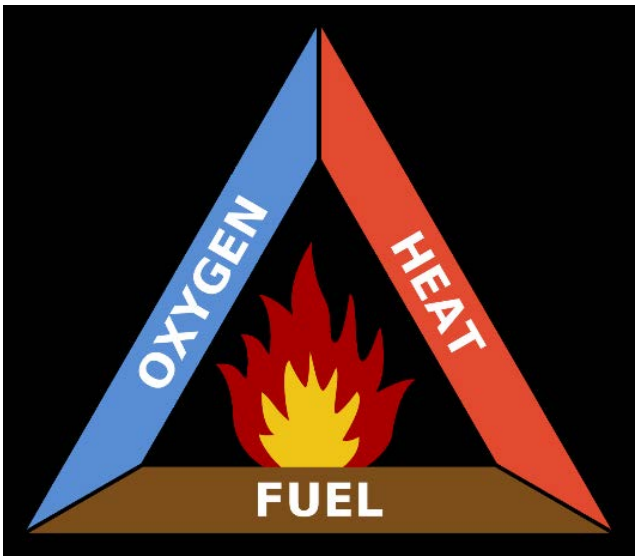

Figure 17 – "Fire Triangle" Wikipedia.

In the context of wildfires and electric utility facilities, the "fuel" would be dry vegetation in or adjacent to the facility rights-of-way. The "oxygen" would be the ambient air and wind. Finally, the "heat" would be the sparks created from a downed conductor or conductors coming into contact with each other.

In developing a wildfire mitigation strategy, the goal is to sufficiently lessen the amount of one or all the three elements needed to start a fire. Hawaiian Electric has vegetation management plans in place to maintain the amount of vegetation in the right-

[4] Wikipedia.

of-way. But as noted previously, the type of vegetation in the Hawaii wildfire areas are primarily grasses, shrubs, and few trees, which rarely grow into conductors. Thus, adjusting vegetation management plans in the wildfire areas will not likely produce any appreciable results. This will be discussed further in the Vegetation Management Plan section.

Obviously, the control of "oxygen" would be out of Hawaiian Electric's control. However, Hawaiian Electric could monitor wind conditions through government, 3rd party or Company-owned weather stations to provide improved situational awareness. This will be discussed further in the Situational Awareness Plan section.

Finally, the "heat" element is where Hawaiian Electric can have much influence. The best solution is to prevent sparks from being created by ensuring facilities do not fail or preventing conductors from contacting each other. The next tier in controlling the "heat" element is to lower the intensity of the sparks if there is a downed conductor or line contact. These mitigation concepts will be discussed in greater detail in the System Hardening Plan.

4. Inspection Plan

Typical maintenance inspections will identify potential issues with vegetation, hardware, equipment, and facilities that, if left unaddressed, could lead to outages and be a source for ignition. The transmission systems for the Hawaiian Electric Companies are inspected on a regular basis. The wood poles of the transmission[5], sub-transmission and distribution systems are inspected through the Test & Treat program,

[5] For Oahu, transmission wood poles are not included in the Test & Treat program.

which is focused on the condition of the wood pole itself. The hardware and conductor on sub-transmission and distribution systems are only inspected on an exception basis. For example, inspections would occur after an incident to determine the extent of damage or to determine the cause of the incident. Another example is if a project is about to start, inspections may be conducted to determine the scope of work or determine if pre-construction work needs to occur before construction can commence.

Inspections in high-risk wildfire areas are a necessary fundamental step in a Wildfire Mitigation Plan. With limited budget and resources, the challenges include what areas to inspect, when to conduct inspections (e.g., before the wildfire season starts), and how often should inspections be conducted. In Hawaii, detailed information on wildfire causes is very limited. The “Ignition Density Maps” discussed in a previous section only tracked if there was a wildfire in an area but does not provide information or details on what caused the wildfire. In addition, no public databases exist on the types of vegetation that exist in Hawaii that are more susceptible to ignite during drought conditions and where such vegetation are located. Furthermore, there are limited drought forecasting models for Hawaii. Thus, with the lack of key data, it is difficult to prioritize where to inspect in high-risk wildfire areas and to determine how often inspections should be conducted in these areas. Until more reliable data becomes available, Hawaiian Electric will inspect wildfire areas as describe below. However, as more data or information becomes available, then the Inspection Plans below will be revised accordingly.

Transmission Systems

The current maintenance inspection programs for the transmission systems should continue. This includes periodic flying inspections to identify any obvious issues and detailed climbing inspections when needed. In potential wildfire areas, as circumstances warrant, infrared and corona cameras, Light Imaging, Detection, and Ranging ("LiDAR") and/or UAS should be utilized to identify any potential issues with the transmission facilities that would not have been revealed in regular inspection methods. Any anomalies or potential anomalies should be addressed and given high priority to remediate.

Sub-transmission and Distribution Systems

The System Hardening Plan and Situational Awareness Plan as discussed in more detail later should provide sufficient mitigation for the sub-transmission and distribution systems in the wildfire risk areas. It is recommended that inspections on the sub-transmission and distribution systems be conducted every 3 to 5 years in the wildfire areas utilizing LiDAR and UAS technologies as appropriate. Because Hawaii's wildfire risk is significantly less than California, a 3 to 5-year inspection cycle is reasonable. However, if a wildfire were to occur and lines are in the vicinity, then it is imperative that a Root Cause Investigation be conducted as soon as practical. Such an investigation can provide valuable information to determine if the wildfire mitigation plan needs to be adjusted.

Substations

The current maintenance inspection programs for substations should continue, which are primarily focused on the equipment and structures within the substation

fencing. However, inspections of substations in potential wildfire areas should include the type and condition of the vegetation on the perimeter of the substation. Vegetation that is overgrown and dry should be addressed as soon as practical.

5. Vegetation Management Plan

Hawaiian Electric's vegetation management programs involve trimming, removing, and herbicide spraying of vegetation on prescribed cycles and is limited to the boundaries of the right-of-way and roadsides. Due to plant species and rainfall amounts, certain areas will have more frequent maintenance cycles than other areas. Vegetation management is critical to maintaining and improving system reliability performance for overhead systems by executing work plans to minimize the frequency and duration of vegetation-related outages. As noted previously, the type of vegetation in the Hawaii wildfire areas are primarily grasses, shrubs, and few trees, which rarely grow into conductors. Thus, it is not recommended that vegetation management plans be adjusted in the wildfire areas. Further trimming of the already low-lying vegetation will not likely produce any appreciable results in the potential wildfire areas. The exception would be creating fire breaks in the vegetation areas. Figure 9 shows an example of a fire break in the vegetation area.[6] However, creating a fire break would require agreement from landowners and stakeholders and would be very costly. If this strategy is pursued, then it should be done outside of the vegetation management programs.

[6] The access road shown in Figure 9 acts as a fire break between the vegetation in the 69/12kV easement and the Waikoloa Village subdivision, but Hawaiian Electric has not researched whether the road was built for that purpose.

Vegetation Management contractor, Asplundh, confirmed that the vegetation type that exists in the potential wildfire areas of Oahu and Maui do not require more trimming for wildfire mitigation purposes. This opinion was based on Asplundh's experiences with wildfires in Australia.[7]

6. System Hardening Plan

System Hardening can be categorized into three prioritized tiers with the 1st tier being of highest priority. The 1st tier involves addressing conductor sag, tension, and clearance issues with overhead conductors in potential wildfire areas to minimize conductor contact with vegetation or between conductors. Long-spans should be given higher priority as the chance of conductor contact is greater as compared to short-spans. These types of issues are difficult to identify or detect by traditional inspection methods. However, LiDAR, as discussed in the Inspection Plan, has proven to be an effective tool to find these types of overhead issues. Solutions to address these issues could include re-tensioning conductors, replacing cross-arms (to provide greater spacing between conductors), or changing horizontal conductor configurations to vertical or delta (to reduce probability of swing shorts).

The 2nd tier involves replacement of facilities, which may include replacement of poles, structures, hardware, conductors, shield wires and guy wires. Replacement is the best preventive measure to prevent failures or conductors contacting each other to start an ignition. These replacements could easily be integrated with existing T&D asset

[7] Photos of potential wildfire areas on Oahu and Maui were shown at a November 23, 2020, video conference between Hawaiian Electric and Asplundh (Australia) personnel.

sustainment strategies as the scope of work is similar and the objective is similar, which is to prevent failures before they occur.

A particular asset that the major California utilities are replacing in potential wildfire areas are single strand copper conductors. Single strand copper conductors tend to be “stiff” and break during vibrations from wind and break easier when in an aged condition as compared to multi-stranded aluminum conductors or multi-stranded copper conductors. In addition, the degraded properties of aged copper conductor are also a system reliability issue in Hawaii since the conductor is typically derated. It is recommended that Hawaiian Electric implement the practice of replacing single strand copper conductors as well, given Hawaii’s corrosive environment.

The 3rd tier of hardening involves mitigating or reducing the intensity of ignition from conductors failing or contacting each other. Based on lessons learned from the major California utilities, the utilization of smart reclosers or smart fuses on distribution circuits provides this level of mitigation and provides a way to isolate portions of long circuits that enter into wildfire areas from non-wildfire areas. Smart reclosers or smart fuses operate at such a high speed (i.e., fractions of a second) that the intensity of the sparks from a conductor contact is diminished significantly. In addition, smart reclosers or smart fuses are more sensitive than the substation relays when the faults are closer to the ends of the circuit, and thus will be able to detect and operate at lower fault currents during these situations. The fast pick-up, trip operation, and sensitivity of smart fuses may detect some downed lines on some earth surfaces and dry grass. The reclosers give the option to block reclosing if there is a “Red Flag” warning condition (i.e., dry and windy conditions). Under normal conditions, the reclosing capability can

be unblocked to take advantage of reliability benefits from momentary faults. The installation of smart reclosers and smart fuses should be coordinated with other reliability initiatives. There may be opportunities to address both the wildfire risk and reliability issues with the same smart recloser or smart fuse on the same circuit.

Some of the major California utilities are replacing existing overhead conductors with tree wire or spacer cable. These types of conductors are insulated or "covered" so they offer the significant advantage of not creating sparks when conductors are contacted by vegetation or come into contact with each other. These technologies are excellent if tall vegetation is in or adjacent to the line right-of-way. But as noted previously, the type of vegetation in the Hawaii wildfire areas are grasses, shrubs with few tall trees. Thus, tree wire or spacer cable would not be cost-effective in most of Hawaii wildfire areas. However, if there are wildfire areas with tall trees adjacent to the line rights-of-way, tree wire or spacer cable should be considered. Based on past projects in Hawaii, the estimated $/circuit feet for the different conductor types are as follows:

Conductor Type (3-phase)	**$ Per Circuit Feet (Total installed cost)**
#1/0 Aluminum 7-strand	$71
Tree Wire	$100
Spacer Cable	$126

Table 2 – Conductor cost comparison based on 5 poles, 4 spans, #1/0, spaced 200' apart or 800 circuit feet total.

Table 3 below compares the cost of installing Tree Wire and Spacer Cable versus installing a Smart Fuse for one mile of a primary distribution line to mitigate wildfire ignition.

Solution	Quantity	Estimated Total Installed Cost	Advantages	Disadvantages
Reconductor with Tree Wire	5,280 circuit feet	$528,000	No sparks	Higher cost
Reconductor with Spacer Cable	5,280 circuit feet	$665,000	No sparks	Higher cost
Install 3-phase Smart Fuse with telecommunications	1 each	$104,000	Minimize spark intensity Lower cost Can protect longer circuits at same cost	Sparks not totally eliminated

Table 3 – Comparison of estimated total installed costs for one mile of a primary distribution circuit.

A practice that could be characterized as “hardening” of poles regarding wildfire mitigation is applying a fire-retardant paint or fire-retardant mesh to wood poles in potential wildfire areas. In 2019, Hawaiian Electric in coordination with the Honolulu Fire Department conducted a live burn test of wood poles with a fire-retardant paint and mesh applied. The test demonstrated that these products did protect the wood pole from fire damage and maintained the integrity of the pole. This is important in potential wildfire areas by providing a level of resiliency to the wood poles. This ensures that the poles and associated equipment and conductors do not fail in a fire and contribute “fuel” to the fire.

Hawaiian Electric has adopted a practice that if existing wood poles in potential wildfire areas require maintenance, a fire-retardant paint should be applied to the pole. The fire-retardant mesh should only be used on new poles in potential wildfire areas. The reason for this is that the fire-retardant mesh should not be installed over the

termite barrier that Hawaiian Electric typically installs on the bottom of wood poles. New pole installations provide an opportunity to install the fire-retardant mesh on the pole first, then the termite barrier can be installed over the fire-mesh. This ensures that the effectiveness of the termite barrier is not compromised. Thus, for the Hardening Plan recommendations that involve wood poles (e.g., installing smart fuses on wood poles) that follow, the fire-retardant paint or mesh should be applied as discussed.

Finally, it is recommended that Hawaiian Electric re-evaluate protective relaying schemes of circuits in potential wildfire risks areas. Consideration should be given to increasing the tripping speed of circuit breakers and reclosers to quickly mitigate the intensity and duration of sparks created by line contact. However, caution is needed to not increase the likelihood of false trips that would create nuisances and unnecessary outages for customers. This consideration is even more critical as one of the performance benchmarks mandated by the Hawaii Public Utilities Commission ("PUC") is System Average Interruption Duration Index ("SAIDI") and System Average Interruption Frequency Index ("SAIFI") metrics.

Oahu System Hardening Plan

As shown in Figure 14, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the completed or proposed hardening mitigation measures. Detailed engineering and protective relay coordination are required to determine the optimal location to install equipment or facilities and to program appropriate settings on smart devices.

<u>Priority Area #1 – West Oahu (Makaha Valley to Kahe Valley)</u>

1. Installed smart fuses on the Makaha Valley 12kV circuit in Makaha Valley where circuit leaves developed area and heads mauka, traversing less developed, dry vegetation area.
2. Installed smart fuses on two sections of the Mauka 12kV circuit in Waianae Valley where circuit leaves developed area and traverses less developed, dry vegetation areas.
3. Installed smart fuses on Mikilua 4 12kV circuit in Waianae Valley where circuit leaves developed area and heads mauka, traversing less developed, dry vegetation area. Reconductored a portion of the Mikilua 4 12kV circuit in Waianae Valley that is copper with standard aluminum conductors in an area where significant dry vegetation exists.
4. Review LiDAR data for the Wahiawa-Mikilua 46kV line where it traverses the mountain ridges in Nanakuli to identify any conductor clearance issues and implement necessary line configuration improvements.

Priority Area #2 – East Honolulu (Aina Haina to Hawaii Kai)

1. Installed smart recloser on the Kahala 12kV circuit to cover a portion of the circuit that traverses up toward Halekoa Avenue.
2. Install smart recloser on the Kaalakei 12kV circuit near Ahi Substation.
3. Install smart fuse on the Wailupe 12kV circuit to cover portion of the circuit traverses through a less developed, dry vegetation area.
4. Install smart fuse on the Kokohead 12kV circuit in the back of Kamiloiki Valley.
5. Review LiDAR data for the Koolau-Wailupe 1 and Koolau-Wailupe 2 46kV lines that traverse down from the Koolau Mountains to the various distribution

substations in East Honolulu to identify any conductor clearance issues and implement necessary line configuration improvements.

6. Reconductor a portion of the Anuu 12kV circuit that traverses up from Kalanianaole Highway to Hanauma Bay Road.

Priority Area #3 – Kapolei (along Railroad track)

1. Reconductored a portion of the CEIP 1 12kV circuit along the railroad track that is copper with standard aluminum conductors.

Priority Area #4 – Aikahi/Mokapu

1. Installed smart fuse on the Bay 4kV circuit where circuit traverses up toward existing telecommunications site.

Priority Area #5 – Central Oahu (Kunia – Waikele area)

1. Install smart fuses on the Managers 12kV circuit where circuit traverses down from Waikele into Kipapa Gulch.
2. Reconductor portions of the Waipio 1 12kV circuit that is copper that traverses through Central Oahu Regional Park and over Kipapa Gulch.
3. SCADA enable Waiawa 4 12kV circuit breaker at Waiawa Substation to be able to remotely block reclosing under Red Flag conditions.

Priority Area #6 – Waialua

1. Reconductor Waialua 12kV circuit on Mt. Kaala Road.
2. Replace existing wood pole 12/59 of the Waialua 12kV circuit with guy less steel pole per NESC extreme wind criteria.

3. Conduct detailed inspections on certain sections of the Waialua 12kV circuit on Mt. Kaala Road and implement necessary improvements and upgrades of hardware.
4. Replace existing fuses and install smart fuses on the Waialua 12kV circuit at pole 17/12/59.
5. Reconductor Waialua 12kV circuit in area around Cane Haul Road and Kaupe Road off Farrington Highway.
6. Replace fuses with smart fuses on Waialua 12kV circuit at Pole 21/8.
7. Tightened up slack span between Poles 27/8 and 28/8 on the Waialua 12kV circuit on the Cane Haul Road mauka of Farrington Highway.
8. Replace the following structures on the Wahiawa-Waialua 1 46kV line with guy less steel structures using NESC extreme wind criteria: 6X, 533, 530, 526, 525, 524, 522, 521, and 520.
9. Replace existing fuses and install smart fuses on the Waialua 12kV circuit that is underbuilt on the following Wahiawa-Waialua 1 46kV line structures: 6X, 524, and 522.

Maui County System Hardening Plan

As shown in Figure 15, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the proposed hardening mitigation measures for each area. Detailed engineering and protective relay coordination are required to determine the optimal location to install equipment or facilities and to program appropriate settings on smart devices.

Priority Area #1 – West Maui (Lahaina to Kapalua)

1. Replace deteriorated structures and guy wires/anchors for the Lahaina-Puukolii (Lahaina #1) Makai 69kV line[8]. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles. The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.
2. Replace deteriorated structures and guy wires/anchors for the Puukolii-Napili (Lahaina #1) Makai 69kV line[9]. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles. The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.
3. Replace the shield wire with Optical Ground Wire ("OPGW") for the Lahaina-Puukolii (Lahaina #1) Makai 69kV line. While standard shield wire would be sufficient in this instance, the incremental additional cost of utilizing OPGW is worth the additional telecommunication benefits to support the Grid

[8] The Lahaina #1 Makai 69kV line starts from the Lahaina Substation and ends at the Napili Substation with taps to Puukolii Substation and Mahinahina Substation. Thus, the Lahaina #1 Makai 69kV line is electrically a single circuit. For this Hardening Plan, the Lahaina #1 Makai 69kV line is described in sections (e.g., Lahaina-Puukolii and Puukolii-Napili) for priority, budgeting, and implementation purposes.

[9] The Lahaina #1 Makai 69kV line starts from the Lahaina Substation and ends at the Napili Substation with taps to Puukolii Substation and Mahinahina Substation. Thus, the Lahaina #1 Makai 69kV line is electrically a single circuit. For this Hardening Plan, the Lahaina #1 Makai 69kV line is described in sections (e.g., Lahaina-Puukolii and Puukolii-Napili) for priority, budgeting, and implementation purposes.

Modernization initiative, utility-scale renewable energy interconnections and reliability improvements. The OPGW installation should be coordinated with other projects in the area that require telecommunications.

4. Replace the shield wire with OPGW for the Puukolii-Napili (Lahaina #1) Makai 69kV line. The OPGW installation should be coordinated with other projects in the area that require telecommunications.
5. Install smart fuses to replace existing fuses on sections of the Puukolii Ckt 1273 12kV circuit that traverse through existing and former agriculture lands.
6. Install smart fuse to replace existing fuse on the Mahinahina Ckt 1381 12kV circuit near the Mahinahina Substation.
7. Reconductor a portion of the Mahinahina Ckt 1381 12kV circuit that is copper with standard aluminum conductors.
8. Install smart fuses to replace existing fuses on sections of the Napili Ckt 1420 12kV circuit that traverse through existing and former agriculture lands.

<u>Priority Area #2 – Maalaea</u>

1. Replace deteriorated structures and guy wires/anchors for the Maalaea-Kaheawa 1 69kV line. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles. The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.
2. Replace deteriorated structures and guy wires/anchors for the Maalaea-Kaheawa 2 69kV line. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles.

The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.

3. Replace the shield wire with Optical Ground Wire ("OPGW") for the Maalaea-Kaheawa 1 69kV line. The OPGW installation should be coordinated with other projects in the area that require telecommunications.
4. Replace the shield wire with Optical Ground Wire ("OPGW") for the Maalaea-Kaheawa 2 69kV line. The OPGW installation should be coordinated with other projects in the area that require telecommunications.
5. Reconductor a portion of the Maalaea Ckt 1286 12kV circuit that is copper with standard aluminum conductors along Honoapiilani Highway heading to Lahaina.

Priority Area #3 – Olowalu

1. Replace deteriorated structures and guy wires/anchors for the Kaheawa 1-Lahaina 69kV line. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles. The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.
2. Replace deteriorated structures and guy wires/anchors for the Kaheawa 2-Lahaina 69kV line. Consideration should be given to install self-supporting steel poles for certain dead-end structures instead of utilizing wood poles. The structure replacements should be coordinated and possibly folded into the existing wood pole asset management strategy for Maui County.

3. Replace the shield wire with Optical Ground Wire ("OPGW") for the Kaheawa 1-Lahaina 69kV line. The OPGW installation should be coordinated with other projects in the area that require telecommunications.
4. Replace the shield wire with Optical Ground Wire ("OPGW") for the Kaheawa 2-Lahaina 69kV line. The OPGW installation should be coordinated with other projects in the area that require telecommunications.
5. Leverage Recloser 505 at Pole E-44 on Lahaina Ckt 1398 12kV circuit for fire mitigation of the Olowalu area[10].
6. Relocate a portion of the Lahaina Ckt 1398 12kV circuit that is on concrete poles and inaccessible to a route that is accessible by vehicle. The new installation shall be standard wood poles and aluminum conductors.
7. Reconductor portions of the Lahaina Ckt 1398 12kV circuit that is copper with standard aluminum conductors in the mountainous, dry vegetation areas in Olowalu.

Priority Area #4 – Kihei-Wailea

1. Install smart fuse to replace existing fuse on the Kihei 1384 12kV circuit at Pole 31.
2. Install smart fuse on the Wailea 1517 C-phase at Makamae Place.

Priority Area #5 – Molokai

[10] Initially, this Plan recommended replacing the existing fuses with a smart recloser at Pole E-81 at Olowalu. However, input from Maui County System Operations and Distribution Planning indicated that the existing Recloser 505 at Pole E-44 could protect the Olowalu area for fire mitigation similarly as replacing the existing fuses at Pole E-81. In addition, Pole E-81 is along the Honoapiilani Highway and not in an area of wildfire concern. Thus, sparks from the fuses operating are not a concern.

1. Replace existing wood poles 38 and T-37 of Ckt 1467 with guy less steel poles.
2. Based on detailed inspections, proactively replace poles and hardware on Ckt 1467 and upgrade/remove the abandoned 34kV Ckt. If the 34kV Ckt is upgraded, then install a neutral conductor and energize the circuit at 12kV to provide a second distribution circuit to address reliability issues in the area.
3. At Puunana Substation, program reclosers for Ckt 1466, 1467, and 1468 for two settings. One setting for normal conditions with reclosing capability enabled and second setting for “red flag” weather conditions with reclosing blocked.
4. Replace existing wood pole W-210A for Ckt 1466 with guy less steel pole using NESC Extreme Wind Loadings.
5. Replace Pole 13 and replace existing fuses with smart fuses for Ckt 105A in Kaunakakai.
6. Replace existing fuses on Pole 2 of Ckt 111A with smart fuses for Kawela 1 subdivision.
7. Replace existing fuses on Pole 2 of Ckt 111A with smart fuses for Kawela 2 subdivision.
8. Replace existing fuses on Pole 1 of Ckt 111A with smart fuses for Kawela 2 subdivision.
9. Replace existing fuses on Pole E-77 of Ckt 111A with smart fuses in Kawela 3 subdivision.

Priority Area #6 – Lanai

1. Replace Pole 24 of Ckt 1208 with guy less steel pole using NESC Extreme Wind Loading.
2. Reconductor portions of Ckt 1208 (Well 3) that is copper with standard aluminum conductors.
3. Replace Pole 36 of Ckt 1208 with guy less steel pole using NESC Extreme Wind Loading.
4. Replace Pole 42 of Ckt 1208 with standard wood pole with Fire Mesh.
5. Reconductor portions of Ckt 1208 (in the vicinity of Pole 36) that is copper with standard aluminum conductors.
6. Reconductor portions of Ckt 1208 (Well 4) that is copper with standard aluminum conductors.
7. Replace Pole E6-60 of Ckt 1208 with guy less steel pole using NESC Extreme Wind Loading.
8. Reconductor portions of Ckt 1208 (Well 15) that is copper with standard aluminum conductors.
9. Replace Pole 7-129 of Ckt 1212 with guy less steel pole using NESC Extreme Wind Loading.
10. Reconductor portions of Ckt 1212 (Kaumalapau Harbor) that is copper with standard aluminum conductors.

Hawaii Island System Hardening Plan

As shown in Figure 16, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the proposed hardening mitigation measures. Detailed engineering and protective relay coordination are required to determine the optimal location to install equipment or facilities and to program appropriate settings on smart devices.

Priority Area #1 – Waikoloa Village

1. Installed smart fuse on the Waikoloa 11 12kV circuit where circuit traverses past makai side of Waikoloa Village.
2. SCADA enable Waikoloa 12 circuit breaker at Waikoloa Substation to be able to remotely block reclosing under Red Flag conditions.

Priority Area #2 – Naalehu

1. Install smart fuse to replace existing fuse on the Punaluu 12kV circuit where circuit branches off and heads up the mountain just south of Whittington Beach Park and mauka of the Mamalahoa Highway.

Priority Area #3 – Honokaa

1. Install smart fuse on Pole 60 (double dead-end pole) of the Honokaa 14 distribution circuit along Waipio Road, Highway 240. The distribution line from Pole 60 to the Waipio Lookout is about eight (8) miles long and exposed to about three (3) miles of adjacent eucalyptus trees. Kamehameha Schools agreed to cut back their eucalyptus trees along the Mamalahoa highway (Belt Highway) but not their trees along Waipio Road.

Priority Area #4 – Kawaihae-Waimea

1. Replaced 69kV disconnect switch that was possibly arcing on the 7300 69kV line.

Priority Area #5 – Kohala

To be determined.

Priority Area #6 – Pohakuloa, Saddle Road

To be determined.

7. Situational Awareness Plan

Given the large service territories of the major California utilities, it is not feasible to have troublemen situated in every potential wildfire area ready to respond to circuit faults or failures at a moment's notice or to provide surveillance if conditions are ripe for a potential wildfire. Two significant tools that the major California utilities are utilizing for situational awareness are weather stations and live-feed cameras.

Weather Stations

The two primary weather parameters that contribute to wildfire conditions are wind speed and moisture in the air or relative humidity (ratio of water vapor and water pressure). In California, given the long-term drought conditions, the major California utilities are primarily concerned with wind speed regarding wildfire risks. The major California utilities have installed their own weather stations instead of solely relying on publicly accessible weather stations such as stations operated by the National Weather Service. By installing their own weather stations, the California utilities can more strategically and precisely monitor their respective service territories. Due to the large customer bases and service territories, the major California utilities have dedicated meteorological staff to monitor and alert their operations and external stakeholders of potential wildfire conditions.

For Hawaii's tropical climate, both wind speed and relative humidity should be considered for potential wildfire conditions. In Hawaii, the relative humidity typically ranges between 60 and 70%[11]. In discussions with University of Hawaii Professor Clay Trauernicht of the College of Tropical Agriculture & Human Resources and Principal Investigator of the Pacific Fire Exchange, he strongly believes that when the relative humidity is at 45% or less, conditions are favorable for a potential wildfire in Hawaii. As discussed previously, Hawaiian Electric's service territory and potential wildfire risks are significantly less than the major California utilities. Thus, it would be difficult for Hawaiian Electric to justify a dedicated meteorological staff. Instead, it is recommended that Hawaiian Electric strategically place a limited amount of weather stations in or near

[11] https://www.currentresults.com/Weather/Hawaii/humidity-by-month.php

potential wildfire areas. These weather stations could be set with simple threshold criteria for relative humidity and wind speed to alert System Operations Dispatch Centers of conditions ripe for a potential wildfire. However, it is recognized that across the three Hawaiian Electric service territories there are different environmental conditions (e.g., Pohakuloa on Hawaii Island has low relative humidity on a daily basis). Thus, threshold criteria for relative humidity and wind speed may have to be specific to certain areas. This will be discussed in further detail in the Operations Plan section.

Video Cameras

Video cameras provide one of the best means to have physical surveillance on what is happening in the service territory. Visual situation awareness will determine if there are any physically compromised electrical facilities or whether a fire is occurring near the electrical facilities. The major California utilities have deployed many video cameras in wildfire prone areas. In the case of the San Diego Gas & Electric, nearly all their fixed based cameras can be accessed by the public through their website. For the cameras that can be rotated and controlled, only San Diego Gas & Electric and Cal Fire personnel have access to those cameras. As mentioned previously, Hawaii's significantly smaller service territory and lower wildfire risk than California does not justify the need for a dedicated staff monitoring weather and video cameras. To leverage the benefits of video cameras but not increase staff to manage the camera surveillance, it is recommended that Hawaiian Electric use the cameras on an "exception" basis. In other words, cameras should be viewed or monitored only when there is an outage in a potential wildfire area and weather conditions are ripe for a potential wildfire. This will be discussed in further detail in the Operations Plan section.

Secondary Line Monitoring

Hawaiian Electric have extensively deployed Grid 20/20's OptaNode line monitoring devices on Oahu and Maui. The main driver for these deployments is to get secondary voltage and current data to validate or build models for residential photovoltaic installations. The OptaNode device can also be set up to provide notifications on loss of power. More recently, the OptaNode device can be manufactured to detect heat, smoke, humidity, and temperature. In 2021, Hawaiian Electric partnered with the Honolulu Fire Department ("HFD") to conduct a live-burn test of the heat and smoke detection capabilities of the OptaNode device. HFD was able to gather dry vegetation for the fuel from an actual potential wildfire area on Oahu. The OptaNode device was hung at height of approximately 30 feet above the ground, which would be a similar height on a distribution pole. The test was successful as the OptaNode device was able to detect heat and smoke from the live burn. Furthermore, Hawaiian Electric is working with Grid 20/20 to also allow the OptaNode devices to provide notifications when there are significant voltage imbalances, which could be an indication of a downed conductor.

In Hawaii, many of the distribution circuits in potential wildfire areas are in less populated areas. Thus, Hawaiian Electric wants to leverage the outage notification, heat and smoke sensor features, and voltage imbalance monitoring of the OptaNode devices for circuits in remote potential wildfire areas so dispatchers can respond to outages or notify the fire department of potential fires. In addition, by placing the OptaNode devices in remote areas, it would significantly decrease the chance of picking

non-emergency smoke and heat from activities such as grilling or creating a fire for an "imu" (Hawaiian underground cooking).

Fault Current Indicators with Communications

The major California utilities are deploying Fault Current Indicators ("FCIs") with communications in potential wildfire areas. This allows dispatchers to have better knowledge of where faults have occurred and can more accurately dispatch troublemen to the probable location of a fault. It is recommended that Hawaiian Electric also deploy this type of FCIs for portions of 46kV and 34.5kV lines in potential wildfire areas. Also, real-time information from FCIs can provide valuable data to justify reconfiguration of conductors or address issues that were not picked up by maintenance inspections.

Oahu Situational Awareness Plan

As shown in Figure 14, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the proposed situation awareness measures. Detailed engineering is required to determine the optimal location to install equipment or facilities and to coordinate with System Operations on how to leverage the information from the situational awareness devices. Proposed protocols for System Operations are described in more detail in the Operations Plan section.

<u>Priority Area #1 – West Oahu (Makaha Valley to Kahe Valley)</u>

1. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, at the end of the Makaha Valley 12kV circuit in Makaha Valley downstream of the smart fuse installed as part of the Hardening Plan.

2. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, at the end of the Mauka 12kV circuit spurs in Waianae Valley downstream of the smart fuses installed as part of the Hardening Plan.
3. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection feature enabled, on the Mikilua 4 12kV circuit in Waianae Valley downstream of the smart fuse installed as part of the Hardening.
4. Install weather station at Makaha Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party provider.
5. Install weather station at Mikilua Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
6. Install weather station at the Kahe Point Communication Site and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
7. Install camera at the Kahe Point Communication Site to monitor transmission, sub-transmission and distribution lines and telemeter video to System

Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

Priority Area #2 – East Honolulu (Aina Haina to Hawaii Kai)

1. Install weather station at Queens Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
2. Install FCIs with cellular communications on 46kV lines traversing down Koolau Mountains to distribution substations in East Honolulu.
3. Install camera on existing pole to monitor and Koolau-Wailupe 2 46kV line Queens 2 12kV circuit in mountainous, unpopulated area between Kalama Valley and Makapuu and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

Priority Area #3 – Kapolei (along Railroad track)

No Situational Awareness tools recommended for this area.

Priority Area #4 – Aikahi/Mokapu

No Situational Awareness tools recommended for this area.

Priority Area #5 – Central Oahu (Kunia – Waikele area)

1. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, at the end of the Managers 12kV circuit in the gulch downstream of the smart fuse installed as part of the Hardening Plan.

2. Install weather station at Waiawa Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

Priority Area #6 – Waialua

1. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled on either Pole 23/59 or Pole 24/59 of the Waialua 12kV circuit.
2. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled on Pole 22/8 of the Waialua 12kV circuit on Cane Haul Road.

Maui County Situational Awareness Plan

As shown in Figure 15, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the proposed situation awareness measures. Detailed engineering is required to determine the optimal location to install equipment or facilities and to coordinate with System Operations on how to leverage the information from the situational awareness devices. Proposed protocols for System Operations are described in more detail in the Operations Plan section.

Priority Area #1 – West Maui (Lahaina to Kapalua)

1. Install weather station at Puukolii Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
2. Install cameras at Puukolii Substation to monitor transmission and distribution lines and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
3. Install weather station at Lahainaluna Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
4. Install cameras at Lahainaluna Substation to monitor transmission and distribution lines and telemeter video to System Operations directly through

existing telecommunication networks or through 3rd party telecommunication provider.

5. Install weather station at Mahinahina Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
6. Install cameras at Mahinahina Substation to monitor transmission and distribution lines and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
7. Install weather station at Napili Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
8. Install cameras at Napili Substation to monitor transmission and distribution lines and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

9. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, at the end of the Puukolii Ckt 1273 12kV circuit spurs downstream of the smart fuses installed as part of the Hardening Plan.
10. Install Grid 20/20's OptaNode line monitoring devices with outage notification. heat, and smoke detection features enabled, at the end of the Napili Ckt 1420 12kV circuit spurs downstream of the smart fuses installed as part of the Hardening Plan.

Priority Area #2 – Maalaea

1. Install weather station at Maalaea Power Plant and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
2. Install cameras at Maalaea Power Plant to monitor transmission lines coming in from Kahului direction and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
3. Install cameras on existing poles near Honoapiilani Highway to monitor transmission lines in the mountainous area headed to Kaheawa wind farm and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
4. Install cameras on existing pole87X of the Maalaea-Kaheawa 1 and 2 69kV lines to monitor transmission lines in the mountainous areas and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
5. Install cameras at the Kaheawa Wind Farm substation to monitor transmission lines in the mountainous areas and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

6. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, at the end of the Maalaea Ckt 1286 12kV circuit along Honoapiilani Highway heading toward Olowalu.

Priority Area #3 – Olowalu

1. Install weather station on existing pole or structure in the Olowalu area and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

2. Install camera on Pole E-24 of the Lahaina Ckt 1398 in the Ukumehame area to monitor transmission lines in the mountainous area**s** and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider

Priority Area #4 – Kihei/Wailea

1. Install weather station at Wailea Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.
2. Install camera at Auwahi Substation to monitor transmission lines in the "makai" direction toward Wailea Substation and subdivision "mauka" of Piilani Highway and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

3. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on Pole 38 and Pole E62 at the end of the Kihei Ckt 1384 12kV circuit downstream of the smart fuses installed as part of the Hardening Plan.

Priority Area #5 – Molokai

1. Install weather station at Puunana Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

2. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on Pole 42 (end of circuit) and Pole 4 of Ckt 111A for Kawela 1.
3. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer feeding the water tank of Ckt 111A for Kawela 2.

4. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on Pole 10, Pole 3-26, Pole W-58, and Pole W-4 of Ckt 1467.

Priority Area #6 – Lanai

1. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on H-frame structure of Ckt 1208 at Well 3.

2. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer E-31 by Well Shaft 3 of Ckt 1208 for Well 4.
3. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on Pole E-4 of Ckt 1208 near lateral to Well 15.
4. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on Pole 109 of Ckt 1210.
5. Install Grid 20/20's OptaNode line monitoring devices with outage notification, heat, and smoke detection features enabled, on transformer on H-frame structure Poles 2/2A of Ckt 1212.

Hawaii Island Situational Awareness Plan

As shown in Figure 16, there are six primary potential wildfire areas where Hawaiian Electric facilities exist. The following describes the proposed situation awareness measures. Detailed engineering is required to determine the optimal location to install equipment or facilities and to coordinate with System Operations on how to leverage the information from the situational awareness devices. Proposed protocols for System Operations are described in more detail in the Operations Plan section.

Priority Area #1 – Waikoloa Village

1. Install weather station at Waikoloa Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

2. Install cameras on existing poles of 8200 69kV and Waikoloa 12kV lines along the eastern side of Waikoloa Village to monitor this right-of-way and telemeter video to System Operations directly through existing telecommunication networks or through 3rd party telecommunication provider.

Priority Area #2 – Naalehu

1. Install weather station at Punaluu Substation and telemeter wind and relative humidity data and/or exception notification (Red Flag condition) to System Operations directly through existing telecommunication.

Priority Area #3 – Honokaa

To be determined.

Priority Area #4 – Kawaihae-Waimea

To be determined.

Priority Area #5 – Kohala

To be determined.

Priority Area #6 – Pohakuloa

To be determined.

8. Operations Plan

The severity of damage and fatalities associated with the California wildfires forced the major California utilities to make significant changes to their operations plans. For example, one of the controversial changes that Pacific Gas & Electric implemented was to preemptively turn off circuits in certain areas if conditions were ripe for a wildfire.

Based on news reports, this practice was not well-received by certain customers affected by the preemptive outages.

For Hawaii, it is not recommended that Hawaiian Electric adopt the practice of preemptively turning off circuits. As noted previously, the type of vegetation in the potential wildfire areas in Hawaii would not likely cause the same catastrophic level of wildfires that California has experienced. In addition, a lot of the Hawaiian Electric distribution circuits meander through non-wildfire areas and then through potential wildfire areas. Thus, preemptively turning off circuits would impact customers that may not be in potential wildfire areas. However, it is recommended that certain other operational practices and protocols be adopted by Hawaiian Electric.

Given the proposed System Hardening Plans and Situational Awareness Plans described previously, System Operations personnel will have additional tools for better situational awareness without overburdening personnel with information/alarm overload. The weather stations and video cameras will monitor potential wildfire areas and will notify System Operations personnel of impending risks on an exception basis.

There are two primary scenarios that are of concern for potential wildfire areas. As discussed in the Situational Awareness Plan section, when the Relative Humidity is less than 50%, conditions are ripe for a wildfire if an ignition were to occur. Scenario 1 deals with the situation of Relative Humidity **less than** 50% **and** the average wind speed is 25 miles per hour or higher. Scenario 2 deals with situation where the Relative Humidity is **greater than** 50%, winds are extremely gusty where the average wind speed is 35 miles per hour or higher, **and** there is little to no precipitation. In Scenario

2, a Red Flag condition would typically not exist because the Relative Humidity is high, but the winds could be strong enough to exacerbate an ignition.

The following describes each scenario and the recommended actions. It is recognized that across the three Hawaiian Electric service territories there are different environmental conditions (e.g., Pohakuloa on Hawaii Island has low relative humidity on a daily basis). Thus, threshold criteria for relative humidity and wind speed may have to be specific to certain areas. System Operations should modify the recommended actions as needed to address the unique circumstances of each service territory.

Scenario 1

Weather stations (in potential wildfire areas) or weather services indicate Red Flag conditions (Relative Humidity less than 50% **and** average wind speed is 25 miles per hour or higher.

1. Temporarily disable reclosing capabilities for circuit breakers and reclosers for circuits.
2. No circuit breakers, reclosers or switches should be manually closed until there is confirmation that fault conditions do not exist.
3. A troubleman should be dispatched to investigate any outage.

Scenario 2

Weather stations (in potential wildfire areas) or weather services indicate Relative Humidity 50% or more, average wind speed is 35 miles per hour or more, **and** there is little to no precipitation.

1. No circuit breakers, reclosers or switches should be manually closed until there is confirmation that fault conditions do not exist.

2. A troubleman should be dispatched to investigate any outage.

9. New Technologies

Predictive Maintenance

There are research and pilot projects in progress for advance predictive maintenance and artificial intelligence technologies that could detect issues with transmission and distribution facilities before failure. Such technology when reliable and cost-effective could provide much significant benefits to utilities beyond wildfire mitigation. Hawaiian Electric should continue to monitor activities in this realm through EEI and Electric Power Research Institute (EPRI) and pursue opportunities that are low-risk and economical.

Protective Relaying

New protective relaying schemes are under development or being implemented at certain utilities to better detect downed conductors, even on poorly conducting surfaces. This involves being able to better detect high-impedance faults (e.g., circuits with insufficient short-circuit current to trip circuit breakers). It has been reported anecdotally that the reliability rate of these relaying schemes is between 50% and 75%. In other words, 50% to 25% time you could have false trips, which would cause nuisance outages to customers. For Hawaiian Electric, this level of performance would be unacceptable as one of performance benchmarks mandated by the Hawaii PUC is SAIDI and SAIFI. It is recommended that Hawaiian Electric continue to monitor the progress of this relay technologies and consider doing a pilot project when the performance reliability would not significantly impact SAIDI and SAIFI.

“Sparkless” Fuses

“Sparkless” fuses are available that contain or eliminate the sparks when the fuse operates. This would be a more economical solution than a recloser or smart fuse for certain overhead situations. The tradeoff is that a troubleman will be required to go out and refuse to restore service.

If there are service lines that transition from overhead to underground in potential wildfire risk areas, then sparkless fuses should be considered. Because underground circuit faults tend to be “solid” and not intermittent, fuses are the appropriate protection device in lieu of a recloser in most cases.

Situational Awareness

There are existing monitoring technologies like FCIs that could be modified to detect heat, smoke, or relative humidity. These technologies could be installed in remote or less-populated areas to provide system operators an additional situational awareness tool. While the technologies themselves are not new, their application to detect heat, smoke, or relative humidity as part of an overall wildfire mitigation strategy would be innovative. Hawaiian Electric is considering a pilot project to detect heat and smoke.

10. Stakeholder Communication Plan

In terms of wildfire, there are generally four key external stakeholder groups that would have an interest in this Plan. Each group would have different interests and agendas regarding wildfire as it relates to Hawaiian Electric’s facilities. The following is just a high-level assessment of each group’s interest. Hawaiian Electric’s Government

and Community Relations areas will be relied upon to develop the appropriate strategies to engage these groups.

Government Agencies

Government agencies could include the county Fire Departments, Federal Fire Department, and the State Forestry and Wildlife Division. These groups have the responsibility to protect life, property, and natural resources from wildfires. These groups would likely support this Plan and provide valuable insights for consideration. For example, in 2019, Hawaiian Electric's Government Relations on Oahu was able to establish a working relationship between the Honolulu Fire Department ("HFD") and Hawaiian Electric specifically on wildfire. Working groups from HFD and Hawaiian Electric met regularly and thus far resulted in the following:

- Areas on Oahu that this Plan should focus on.
- Provided set up and protection of live fire test of fire-retardant products for wood poles.
- Considerations on how to mark or identify poles with fire-retardant products applied.
- Guidance on weather stations and the value they could provide for responding to wildfires.
- Provided set up and protection of live fire test to confirm the capabilities of the Grid 20/20 OptaNode devices to detect heat and smoke.

Communities in Potential Wildfire Areas

Communities in or adjacent to potential wildfire areas are generally concerned about their personal safety, potential damage to their homes and properties and the

ability to safely escape if evacuation is necessary. These groups would likely support this Plan but may have concerns about preemptively turning off circuits, which was publicized in Pacific Gas & Electric's response to wildfires in California. As noted in the Operations Plan section, Hawaiian Electric is not recommending adoption of this practice for Hawaii. In engaging the community on wildfire mitigation, other tangential issues could arise such as aesthetics and relocation of overhead facilities, which this plan does not address.

Large Landowners and Land Managers in Potential Wildfire Areas

Large landowners and land managers play a significant role in wildfires as the vegetation (or "fuel") reside on their properties. Managed vegetation, in particular fire breaks, significantly reduces the risk of a wildfire getting out of control. However, vegetation management involves significant costs and must be done thoughtfully to avoid harming endangered or protected flora and fauna and creating potential erosion issues.

Large landowners and managers would likely welcome and expect Hawaiian Electric to take steps to prevent transmission and distribution facilities from causing a wildfire. However, some landowners may argue to have the transmission and distribution facilities relocated off their land at Hawaiian Electric's cost.

Wildfire Special Interest Groups

Wildfire special interest groups could include the Hawaii Wildfire Management Organization and the Pacific Fire Exchange. These groups would be very interested in this Plan. Hawaiian Electric should engage these groups further and build working

relationships. These groups could become strong advocates for the implementation of this Plan.

11. Response Plan

Hawaiian Electric continues to maintain established lines of communications with County Fire Departments when there is a fire involving Hawaiian Electric's facilities. In the worst-case scenario, where a wildfire is raging out of control and containment is uncertain, Hawaiian Electric could activate and leverage its Incident Management Team ("IMT"). Hawaiian Electric has adopted the National Incident Management System ("NIMS") as the framework for its IMT. One of the main advantages of adopting the NIMS framework is that it can be applied to any disaster, including wildfire response. Another advantage of NIMs is that it facilitates more effective inter-agency coordination in responding to disasters.