BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAIʻI

In The Matter of the Requests of PUBLIC UTILITIES COMMISSION Directing Public Utilities to Develop Reports Related to their Ongoing Efforts and Future Mitigation Plans to Address Natural Hazards.	CASE NO. 2023-04661

Hawaiian Electric Companies' Wildfire Safety Strategy

Book 1 of 3

January 10, 2025

January 10, 2025

The Honorable Chair and Members
of the Hawaiʻi Public Utilities Commission
Kekuanaoʻa Building, First Floor
465 South King Street
Honolulu, Hawaiʻi 96813

Dear Commissioners:

Subject: Case No. 2023-04661 (Non-Docketed)
Hawaiian Electric Companies' 2025-2027 Wildfire Safety Strategy

In accordance with Order No. 41033, issued on September 13, 2024 and Order No. 41076, issued on October 1, 2024, the Hawaiian Electric Companies[1] respectfully submit their 2025-2027 Wildfire Safety Strategy.

Portions of the 2025-2027 Wildfire Safety Strategy contain confidential information, which is being submitted pursuant to the terms of Protective Order No. 40414 issued on November 30, 2023 in the above-referenced case. Exhibit 1 to this letter provides the detailed justification for the confidential and/or restricted treatment of the information.

Very truly yours,

/s/ Kevin M. Katsura

Kevin M. Katsura
Director
Regulatory Non-Rate Proceedings

[1] Hawaiian Electric Company, Inc. ("Hawaiian Electric"), Hawaiʻi Electric Light Company, Inc. ("Hawaiʻi Electric Light"), and Maui Electric Company, Limited ("Maui Electric").

EXHIBIT 1: CONFIDENTIALITY JUSTIFICATION TABLE

Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawaiʻi Electric Light Company, Inc. (collectively referred to as "Hawaiian Electric" or the "Company") hereby identifies redacted confidential and/or proprietary information in accordance with Protective Order No. 40414 in this docket. The following (1) identifies, in reasonable detail, the confidential information's source, character, and location; (2) states clearly the basis for the claim of confidentiality; and (3) describes, with particularity, the cognizable harm to the producing party or participant from any misuse or unpermitted disclosure of the information. For designations of restricted information, additional descriptions of the cognizable harm are provided.

Reference	Identification of Item	Basis of Confidentiality	Harm
Hawaiian Electric 2025-2027 Wildfire Safety Strategy-Appendix D	Wildfire Risk Maps	Confidential critical infrastructure and system security information falling under the frustration of legitimate government function exception of the Uniform Information Practices Act ("UIPA").[1]	Public disclosure of the confidential information could increase risk to and/or compromise the physical or electronic security of the Company's critical energy infrastructure; increase critical infrastructure vulnerability; expose the critical infrastructure to hazards such as vandalism, equipment theft, or other criminal activity; expose the critical infrastructure to physical or electronic disruption; jeopardize the Company's emergency and disaster preparedness plans; and/or adversely impact its ability to respond to potential terrorist threats, all of which could damage public security. The Company maintains that the subject information falls under the frustration of legitimate government function exception of the UIPA, as disclosure of the subject information would impair the Commission's ability to obtain necessary information to properly perform its review of this regulatory proceeding (as the Company would not have submitted the confidential information in this docket but for: (1) the governmental function of reviewing the Company's request for

[1] Haw. Rev. Stat. § 92F-13(3). *See also* OIP Op. Ltr. No. 07-05 at 1-4; OIP Op. Ltr. No. F17-02 at 13-14.

Reference	Identification of Item	Basis of Confidentiality	Harm
			approval of the Application; and (2) the Company's belief and reliance that the information would not be publicly disclosed) and would frustrate its function of ensuring public security of critical energy infrastructure. The confidential information: (1) has not been previously disclosed or otherwise publicly disseminated; (2) is not of the kind of information that the Company would customarily disclose to the public; and (3) is of a nature that its disclosure could (a) impair the Commission's ability to obtain necessary information from similarly situated parties in the future, and (b) cause substantial harm to the Company and/or its customers as previously described above.

Wildfire Safety Strategy

2025-2027

Hawaiian Electric

January 2025

This page intentionally left blank.

CONTENTS

Executive Summary ... ii

Growing Threat of Wildfires ... ii

Immediate Actions and Investments ... iii

Objectives of the Enhanced Wildfire Safety Strategy ... vii

Four Pillars of the Wildfire Safety Strategy ... ii

2025-2027 Three-Year Action Plan ... iii

1 Introduction ... 1-1

1.1 Four Pillars of Wildfire Safety ... 1-4

1.1.1 Harden the Grid to Reduce the Probability of Ignition ... 1-5

1.1.2 Expand and Improve Situational Awareness ... 1-6

1.1.3 Improving Operational Practices ... 1-7

1.1.4 Strengthen Stakeholder and Community Partnerships ... 1-8

1.2 Overview of Service Territory ... 1-10

1.2.1 O'ahu ... 1-10

1.2.2 Hawai'i Island ... 1-11

1.2.3 Maui County ... 1-12

1.3 Hawai'i Wildfire Risk Considerations ... 1-13

1.4 Immediate Measures After August 2023 Wildfires ... 1-14

1.4.1 Development of Interim Wildfire Risk Maps and Overview of IAP Measures ... 1-15

1.4.2 Milestones and Achievements ... 1-20

1.4.3 Evolving Process ... 1-20

2 Wildfire Risk Map ... 2-1

2.1 Background and Purpose ... 2-1

2.2 Baseline Data ... 2-2

2.2.1 Ignition Points and Fire Perimeter Data ... 2-3

2.2.2 Vegetation Classification Data ... 2-4

2.2.3 DLNR Community Risk Maps ... 2-5

2.3 Overview of High Wildfire Risk Areas ... 2-7

2.4 Overview of Fire Risk Tiers ... 2-9

2.5 Operationalized Wildfire Risk Map ... 2-10

3 Risk Modeling and Mitigation Assessment ... 3-1

3.1 Summary of Risks ... 3-2
3.2 Quantitative Risk Framework ... 3-4
3.2.1 Model Inputs ... 3-5
3.2.2 Risk Attributes ... 3-7
3.3 Estimated Total Wildfire Risk ... 3-8
3.3.1 Method ... 3-9
3.3.2 Probabilistic Modeling ... 3-11
3.3.3 Resulting Estimated Total Wildfire Risk ... 3-12
3.4 Risk Spend Efficiency ... 3-12
3.4.1 Enhanced Fast Trip ... 3-13
3.4.2 Public Safety Power Shutoff ... 3-14
3.4.3 Covered Conductor ... 3-14
3.4.4 Undergrounding ... 3-14
3.5 Feeder Model ... 3-15
3.5.1 Scope of Analyses ... 3-15
3.5.2 Methodology ... 3-16
3.5.3 Model Results ... 3-16
3.5.4 Sensitivities ... 3-19
3.6 Qualitative Risk Framework ... 3-20
3.6.1 Qualitative Risk Framework Methodology ... 3-20
3.6.2 Qualitative Risk Framework Attributes ... 3-21
3.7 Building an Executable Workplan ... 3-25
3.7.1 Process ... 3-26
3.8 Future Model Updates ... 3-28
3.8.1 Data Collection Programs ... 3-29
3.8.2 Future Analytics ... 3-31
4 Enhanced Wildfire Safety Strategy ... 4-1
4.1 Situational Awareness ... 4-1
4.1.1 Environmental monitoring and data collection systems ... 4-2
4.1.2 Enhanced Meteorology Capabilities ... 4-3
4.1.3 Weather Station and Camera Deployment Strategy ... 4-5
4.1.4 Watch Office ... 4-10
4.1.5 Spotters ... 4-11
4.1.6 Summary of Situational Awareness Scope and Cost ... 4-11
4.2 Vegetation Management Program ... 4-12
4.2.1 Wildfire Vegetation Management Program Components ... 4-13

4.2.2 Vegetation Management Wildfire Quality Assurance/Quality Control ... 4-18
4.2.3 Summary of Vegetation Management Scope and Cost ... 4-19
4.3 Asset Inspection Programs ... 4-19
4.3.1 Distribution Asset Inspection and Remediation Programs ... 4-20
4.3.2 Transmission Asset Inspection and Repair/Replacement Programs ... 4-23
4.3.3 Distribution and Transmission Asset QA/QC Inspections ... 4-25
4.3.4 Summary of Asset Inspection Scope Cost ... 4-25
4.4 Grid Hardening ... 4-26
4.4.1 Covered Conductor ... 4-26
4.4.2 Targeted Undergrounding ... 4-28
4.4.3 Transmission/Sub-Transmission Line Hardening ... 4-30
4.4.4 Expulsion Fuse Replacement ... 4-32
4.4.5 Lightning Arrester Replacement ... 4-32
4.4.6 Pole and Structure Replacement ... 4-33
4.4.7 Ingress/Egress Risk Mitigation ... 4-34
4.4.8 Areas of Continuous Improvement ... 4-35
4.4.9 Summary of System Hardening Scope and Cost ... 4-39
4.5 Operational Practices ... 4-39
4.5.1 Enhanced Fast Trip ... 4-39
4.5.2 Restoration of Customers Following Blocked Reclose and After a Fast Trip ... 4-42
4.5.3 Summary of EFT Expansion Scope and Cost ... 4-43
4.5.4 Public Safety Power Shutoff Program ... 4-44
4.5.5 PSPS Incident Management Team ... 4-47
4.5.6 Customer and Stakeholder Communication ... 4-54
4.5.7 Activation and Deactivation of PSPS ... 4-55
4.5.8 Advancing the Public Safety Power Shutoff Program ... 4-57
4.6 Grid Modernization ... 4-58
4.6.1 Summary of Grid Modernization Scope and Cost ... 4-59
4.7 New Technology Pilots ... 4-60
4.7.1 Distribution System Enhanced Fault Detection Pilot ... 4-60
4.7.2 Distribution System Downed Conductor Detection Pilot ... 4-60
4.7.3 Transmission Traveling Wave Downed Conductor Detection Pilot ... 4-61
4.7.4 Summary of New Technology Pilots Scope and Cost ... 4-61
4.8 Stakeholder and Community Partnerships ... 4-62
4.8.1 Overview of the Community Outreach and Engagement Approach ... 4-62
4.8.2 Island-Specific Outreach ... 4-63

4.8.3 Wildfire Safety Symposium ... 4-83
4.8.4 Wildfire Safety Working Group Meetings ... 4-85
4.8.5 Engagement and support for access and functional needs customers, and strategic community partners ... 4-86
4.8.6 Customer Programs that Support Community Safety for Wildfire and PSPS Safety ... 4-87
4.8.7 Summary of Stakeholder and Community Outreach Scope and Cost ... 4-88
5 WSS Management, Organization and Governance ... 5-1
5.1 Key Performance Indicators ... 5-1
5.1.1 Performance Metrics ... 5-1
5.1.2 Progress Metrics ... 5-3
5.1.3 Summary of Additional WSS actions ... 5-5
5.2 Data Collection of Metrics ... 5-6
5.3 Management and Governance ... 5-6
5.3.1 Responsibilities ... 5-7
5.3.2 Monitor and Audit ... 5-7
5.3.3 Summary of WSS Management and Governance Scope and Cost ... 5-8
5.4 Continuous Improvement ... 5-9
5.5 Future Revisions to WSS ... 5-9
6 Projected Costs ... 6-1
6.1 Total Projected Costs of the WSS ... 6-1
6.1.1 Capital ... 6-1
6.1.2 Operations and Maintenance (O&M) ... 6-2
6.1.3 Deferred ... 6-2
6.2 Incremental WSS Costs ... 6-2
6.2.1 Capital ... 6-3
6.2.2 O&M ... 6-3
6.3 Commission Approval or Acceptance and Cost Recovery Plan ... 6-4
6.3.1 Federal Funding Efforts ... 6-4

Tables

Table ES-0-1. Summary of Hawaiian Electric wildfire safety initiatives ... v
Table 1-1. Hardening work planned for 2025–2027 ... 1-5
Table 1-2. Situational Awareness Work Planned for 2025–2027 ... 1-6
Table 1-3. EFT work planned for 2025-2027 ... 1-7
Table 1-4. Scope of IAP Measures ... 1-19
Table 1-5. Hawaiian Electric Key Initiatives Implemented ... 1-20

Table 2-1. Transmission and Distribution circuit miles by tier 2-10
Table 3-1. Hawaiian Electric Wildfire Risk Reduction Estimates of Measures Applied System-wide 3-3
Table 3-2. Quantitative Risk Framework (Multi-attribute function) 3-7
Table 3-3. Mitigation Analysis Parameters 3-13
Table 3-4. Total Portfolio of Mitigations, Circuit Count (overhead circuit miles in MWRA and HWRA) 3-17
Table 3-5. Pre-Mitigation Risk Levels with Applied Risk Reduction Mitigations 3-18
Table 3-6. Critical facilities type across Hawaiian Electric Territory 3-22
Table 4-1. Situational Awareness Scope with Estimated Costs 4-11
Table 4-2. Wildfire vegetation management Program Components 4-14
Table 4-3. Vegetation Management Scope with Estimated Costs 4-19
Table 4-4. Distribution Maintenance Action Priority Matrix 4-22
Table 4-5. Asset Inspection Scope with Estimated Costs 4-25
Table 4-6. Grid Hardening Mitigation Scope with Estimated Costs 4-39
Table 4-7. Enhanced Fast Trip Expansion Targets 4-44
Table 4-8. Grid Modernization Scope with Estimated Costs 4-59
Table 4-9. New Technology Pilot Scope with Estimated Costs 4-61
Table 4-10. Stakeholder and Community Outreach Scope with Estimated Costs 4-88
Table 5-1. Performance Metrics Attributes 5-2
Table 5-2. Major WSS Activities 2025-2027 5-3
Table 5-3. Additional WSS actions as described in this WSS 5-5
Table 5-4. Responsible person(s) for executing the WSS 5-7
Table 5-5. Management and Governance Scope with Estimated Costs 5-8
Table 6-1. Summary of Hawaiian Electric Wildfire and Resilience Initiative Grant Pursuits 6-5

Figures

Figure ES-0-1. Illustration of Immediate and Future Wildlife Safety Measures iv
Figure ES-0-2. Public awareness of PSPS, May, July and October 2024 vi
Figure 0-3. Four Pillars of the Wildfire Safety Strategy ii
Figure 1-1. Illustration of the collective effort to reduce wildfire risk 1-3
Figure 1-2. WSS development process 1-4
Figure 1-3. Four Pillars of the Wildfire Safety Strategy 1-4
Figure 1-4. Public awareness of PSPS, May, July and October 2024 1-9
Figure 1-5. Declination of Hawaiian agricultural and pastoral land-use 1-14
Figure 1-6. O'ahu high wildfire risk areas based on DLNR risk maps 1-16
Figure 1-7. Maui County high wildfire risk areas based on DLNR risk maps 1-17

Figure 1-8. Hawaiʻi Island High Wildfire Risk Areas based on DLNR risk maps ... 1-18
Figure 2-1. Historic ignitions point source data ... 2-3
Figure 2-2. Historic Hawaiʻi wildfire perimeter data ... 2-4
Figure 2-3. Hawaiʻi vegetation classification data ... 2-5
Figure 2-4. DLNR community wildfire risk data ... 2-6
Figure 2-5. Relative vegetation wildfire risk data ... 2-8
Figure 3-1. Multiple Processes were undertaken to develop the model(s). ... 3-2
Figure 3-2. Distribution feeders and transmission system wildfire risks. ... 3-2
Figure 3-3. Currently Estimated Wildfire Risk Reduction due to the IAP and 2025-2027 WSS ... 3-3
Figure 3-4. Quantitative Risk Framework Schematic ... 3-4
Figure 3-5. 2019-2023 Overhead Distribution Outages by Cause in HWRA ... 3-7
Figure 3-6. Overview of combined top-down and bottom-up approach ... 3-9
Figure 3-7. Distribution of wildfire risk (prior to August 2023) ... 3-11
Figure 3-8. Feeder Modeling Process ... 3-15
Figure 3-9. Portfolio of mitigations with RSE greater than 0.9 ... 3-17
Figure 3-10. Wildfire risk reduction vs total portfolio cost for different scenarios. ... 3-20
Figure 3-11. Distribution of critical facilities type across Hawaiian Electric territory ... 3-22
Figure 3-12. Model update process ... 3-29
Figure 4-1. Sample Hawaiian Electric weather station on Oʻahu ... 4-6
Figure 4-2. Publicly available Hawaiian Electric weather station data on MesoWest ... 4-7
Figure 4-3. Illustrative view of Hawaiian Electric localized weather dashboard sample ... 4-8
Figure 4-4. Sample Hawaiian Electric deployed AI-assisted video camera on Maui ... 4-8
Figure 4-5. Sample alert first responders and Hawaiian Electric received from one of the AI-assisted camera stations ... 4-9
Figure 4-6. Publicly available ALERTWest dashboard ... 4-10
Figure 4-7. Sample live stream viewshed from the Lahainaluna camera station ... 4-10
Figure 4-8. Distribution right-of-way clearance specifications ... 4-15
Figure 4-9. Transmission right-of-way clearance specifications ... 4-16
Figure 4-10. Facility Clearance – transmission and distribution assets ... 4-17
Figure 4-11. Facility Clearance - Substations ... 4-18
Figure 4-12. Overall Asset Maintenance Program Workflow ... 4-20
Figure 4-13. Distribution inspection and repair workflow ... 4-21
Figure 4-14. Transmission inspection and repair workflow ... 4-23
Figure 4-15. Cross sectional view of covered conductor ... 4-27
Figure 4-16. Protection settings under non-wildfire risk conditions ... 4-41
Figure 4-17. Protection settings under wildfire risk conditions ... 4-42
Figure 4-18. Steps of progression – PSPS event ... 4-45

Figure 4-19. PSPS timeline for restoration upon a forced outage 4-45
Figure 4-20. Planning in advance of PSPS activation 4-46
Figure 4-21. PSPS Incident Management Team – Organizational Structure 4-51
Figure 4-22. PSPS Communication and Outreach Process 4-55
Figure 4-23. Execution prior to and during PSPS activation 4-56
Figure 4-24. Hawaiian Electric staff and partners at community events in Maui County 4-64
Figure 4-25. Public awareness of PSPS per island, May, July and October 2024 4-67
Figure 4-26. Hawaiian Electric staff and partners at community events on Oʻahu 4-69
Figure 4-27. Hawaiian Electric staff and partners at community events on Hawaiʻi Island 4-73
Figure 4-28. Examples of materials that Hawaiian Electric shared online and in person to help communities understand and prepare for PSPS 4-74
Figure 4-29. Example of a handout provided at community events 4-82
Figure 4-30. ʻImiloa Executive Director Kaʻiu Kimura gives opening remarks at the Wildfire Safety Symposium 4-83
Figure 4-31. A breakout group discusses collective actions for wildfire safety during day 2 of the symposium 4-84

Appendices

Appendix A – Stakeholder and Community Engagement
- Appendix A-1: Community outreach events per island
- Appendix A-2: Community outreach materials
- Appendix A-3: Wildfire Safety Symposium Summary
- Appendix A-4: Materials from Wildfire Safety Working Group Meetings

Appendix B – Order 41033 Compliance Table
Appendix C – Risk Model
Appendix D – Wildfire Risk Maps

ABBREVIATIONS

Abbreviation	Definition
ADMS	Advanced Distribution Management System
AI	Artificial Intelligence
AMI	Advanced Metering Infrastructure
ANSI	American National Standards Institute
BRIC	Building Resilient Infrastructure and Communities
CAL FIRE	California Department of Forestry and Fire Protection
CBA	Community Benefits Agreements
CBO	Community-Based Organizations
CDC	Centers for Disease Control
Company	Hawaiian Electric Company
CRC	Community Resource Center
CSO	Customer Service Officer
CWPP	Community Wildfire Protection Plans
DER	Distributed Energy resource
DIC	Deputy Incident Commander
DLNR	Department of Land and Natural Resources
DOE	U.S. Department of Energy
DOFAW	Division of Forestry and Wildlife
EFD	Enhanced Fault detection
EFT	Enhanced Fast trip
EIC	Executive Incident Commander
EPP	Emergency Planning and Preparedness
EPRM	Extraordinary Project Recovery Mechanism
ETWR	Estimated Total Wildfire Risk
EV	Electric Vehicle
EVT	Existing Vegetation Type
FCI	Fault Current Indicators
FEMA	Federal Emergency Management Agency
FPI	Fire Potential Index
GIS	Geographic Information System
GRIP	Grid Resilience and Innovation Partnerships
HECO	Hawaiian Electric Company
HMGP	Hazard Mitigation Grant Program
HWMO	Hawai'i Wildfire Management Organization
HWRA	High Wildfire Risk Areas
IAP	Immediate Action Plan
IIJA	Infrastructure Investment and Jobs Act
IMP	Ignition Management Program
IMT	Incident Management Team
ISA	International Society of Arboriculture
IVM	Integrated Vegetation Management
JFSP	Joint Fire Science Program
KIUC	Kaua'i Island Utility Cooperative

Abbreviation	Definition
kV	Kilovolt
LGO	Legal Officer
LiDAR	Light Detection and Ranging
LNO	Liaison Officer
LSC	Logistics Section Chief
LWRA	Low Wildfire Risk Area
mph	Miles Per Hour
MRI	Mean Recurrence Interval
MW	Megawatt
MWRA	Medium Wildfire Risk Area
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration
NOSC	Network Operations and Security Center
NWS	National Weather Service
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
OT	Operational Technology
PGCG	Public Information, Government, & Community Group
PG&E	Pacific Gas and Electric
PIO	Public Information Officer
PLTE	Private Long Term Evolution
PSC	Planning Section Chief
PSPS	Public Safety Power Shutoff
PUC	Public Utilities Commission
QA/QC	Quality Assurance/Quality Control
RAN	Radio Access Network
RSE	Risk Spend Efficiency
SAIDI	System Average Interruption Duration Index
SCADA	Supervisory Control and Data Acquisition
SCE	Southern California Edison
SDG&E	San Diego Gas and Electric
SME	Subject Matter Expert
SOFR	Safety Officer
SVI	Social Vulnerability Index
TRAQ	Tree Risk Assessment Qualification
USFWS	U.S. Fish & Wildlife Service
VPP	Virtual Power Plant
WFSWG	Wildfire Safety Working Group
WSS	Wildfire Safety Strategy

Message from Shelee Kimura

Aloha Esteemed Stakeholders and Partners,

Wildfires pose a significant and growing threat to Hawaiʻi's communities, ecosystems, and economy. Factors such as human-caused ignitions, the spread of non-native fire-prone vegetation, severe drought, and extreme weather have made wildfires increasingly frequent and damaging. Hawaiʻi is now among the many places worldwide that face similar threats.

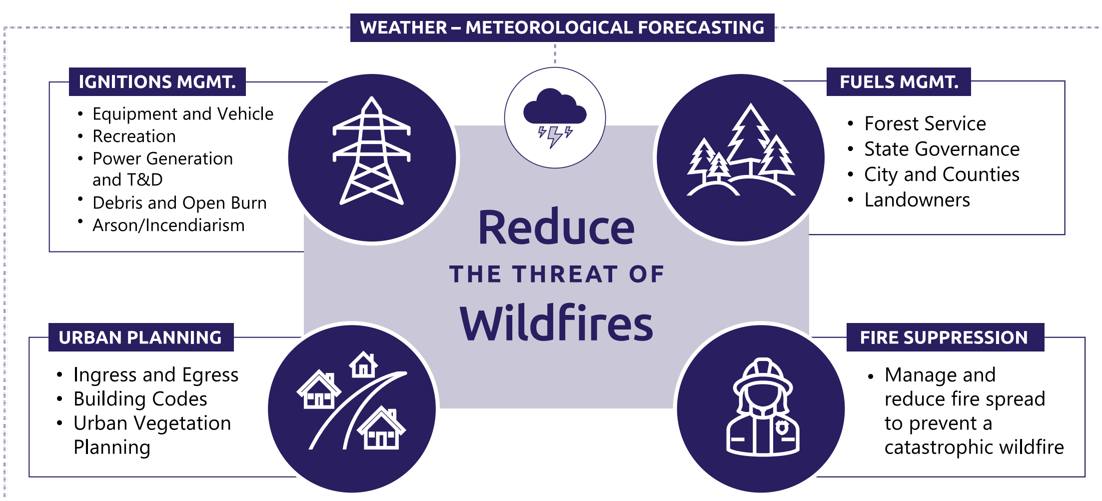
In the wake of the devastating wildfires that have impacted our own communities, Hawaiʻi deeply knows the urgent need for proactive, collaborative, and comprehensive solutions to protect our islands and people. We are thankful for the hundreds of stakeholders and partners ––local, state, and federal agencies, elected officials, landowners, businesses, community organizations, customers, peer utilities, and expert advisors—who have contributed to wildfire mitigation efforts across our state, including the development and implementation of Hawaiian Electric's wildfire safety plans.

The objective of Hawaiian Electric's 2025-2027 Wildfire Safety Strategy is to minimize ignition risks from our infrastructure. It builds upon our past plans and efforts and is not just a technical roadmap – it is our shared and steadfast commitment to a safer, more resilient Hawaiʻi.

As we implement the 2025-2027 Wildfire Safety Strategy, we remain committed to transparency, accountability, ongoing collaboration, and continuous improvement. Our modeling estimates that the comprehensive work within this strategy will reduce the risk of wildfires associated with utility infrastructure by approximately 70% by 2027, while balancing affordability and reliability for customers. While these measures may occasionally require trade-offs, such as outages during high-risk conditions, we believe they are essential for protecting lives and communities.

In parallel, the ongoing efforts of many stakeholders are needed to holistically address all critical components of wildfire prevention -- ignitions and fuels management, fire suppression, and urban planning. To be successful, wildfire risk must be everyone's kuleana, the responsibility of our entire community. Through collective action and thoughtful approaches, Hawaiʻi can create a fire-safe environment for generations to come.

On behalf of Hawaiian Electric, mahalo to our stakeholders and partners who are united in our shared mission to ensure the safety of our communities. *Mahalo for your trust, collaboration, and commitment.*



Shelee Kimura, *Hawaiian Electric CEO*

EXECUTIVE SUMMARY

Hawaiʻi is experiencing fiercer and more frequent wildfires driven by climate change, human activity, shifts in land use and invasive vegetation. The August 2023 Maui windstorm and wildfires represented a turning point for the State and underscored the devastating human and environmental toll of extreme weather events. Addressing wildfire risk through collective action at every level of society is both urgent and essential to protect Hawaiʻi's people, ecosystems and infrastructure. Hawaiian Electric will do its part to prevent catastrophic wildfire and continue collaborating with diverse partners to implement a holistic, "whole-of-society" approach to wildfire safety.

Hawaiian Electric first began developing its Wildfire Safety Strategy (WSS) in 2019 and updated it in 2023. In this report, Hawaiian Electric proposes its "enhanced WSS" for 2025–2027, which builds on the actions taken to date and outlines short-, mid-, and long-term initiatives to reduce the risk of wildfires igniting from Hawaiian Electric's equipment. This executive summary offers a high-level overview of the enhanced WSS.

Growing Threat of Wildfires

The first global *State of Wildfires*[1] report, which analyzes wildfires and their causes between March 2023 and February 2024, finds that a warming climate, with increased droughts and hot, dry, fire-prone weather is "driving reductions in vegetation moisture and priming landscapes to burn more regularly, severely and intensely" (Matthew W. Jones et al., 2024).[2]

Hawaiʻi is not immune to these conditions. According to a study published by the National Oceanic and Atmospheric Administration (NOAA), Hawaiʻi is currently in the midst of one of its most severe droughts on record.[3] Concurrently, shifts in land use—from irrigated agricultural fields to dry, invasive grasslands—have heightened wildfire risks. Swaths of dry, non-native grasses and shrubs transform landscapes into kindling that fuels wildfire. According to the Hawaiʻi Wildfire Management Organization, over 99% of wildfires in

[1] Available at https://doi.org/10.5194/essd-16-3601-2024

[2] Matthew W. Jones, et al: State of Wildfires 2023–2024, *Earth System Science Data*, 16, 3601–3685, https://doi.org/10.5194/essd-16-3601-2024, 2024.

[3] National Oceanic and Atmospheric Administration, "Diagnosing Hawaii's Recent Drought," 2022, *Journal of Climate* (https://repository.library.noaa.gov/view/noaa/48984)

Hawai'i are human caused, and "about 0.5% of Hawai'i's total land area burns each year, which is equal or greater than the proportion burned of any other U.S. state."[4]

The built environment also contributes to wildfire risk. Construction materials, building codes and the density of homes all play a role in a community's susceptibility to burning. As reporter Thomas Heaton puts it in a Honolulu Civil Beat series[5] on catastrophic wildfires in Hawai'i, "Wildfire's most devastating impacts are not only stoked by high winds and invasive grasses, as was documented in Lahaina last year, but by the houses and structures that themselves can feed the flames."

Immediate Actions and Investments

In the aftermath of the Maui windstorm and wildfires, Hawaiian Electric took immediate action to reduce wildfire risk through its **Wildfire Immediate Action Plan (IAP)**.

Hawaiian Electric invested approximately $120 million to make wildfire safety improvements in 2024, including:

- Rolling out a Public Safety Power Shutoff (PSPS) program
- Implementing enhanced fast trip[6] (EFT)
- Replacing and testing over a thousand utility poles
- Upgrading miles of overhead power lines
- Clearing intrusive vegetation near certain electrical equipment

See Table ES-0-1 for a list of actions taken to date. Figure ES-0-1 on the following page is an illustration depicting wildfire safety measures Hawaiian Electric has implemented and is continuing to advance.

---

[4] Hawai'i Wildfire Management Organization. n.d. *Resiliency for land-use and community planners*. Retrieved November 27, 2024, from https://www.hwmo.org/resource-library/resiliency-for-land-use-and-community-planners

[5] Heaton, T. (2024, August 20). An overlooked factor in Hawai'i wildfires: They're fed by the houses in their paths. *Honolulu Civil Beat*. https://www.civilbeat.org/2024/08/an-overlooked-factor-in-hawaii-wildfires-theyre-fed-by-the-houses-in-their-paths/

[6] Enhanced Fast Trip (EFT) is a setting that automatically shuts off power when the system detects a disturbance, such as a tree limb coming in contact with a power line. Lines remain de-energized until a visual inspection of the affected area is performed and deemed safe to energize.

Figure ES-0-1. Illustration of Immediate and Future Wildlife Safety Measures

These immediate safety upgrades and programs have made Hawai'i safer, reducing the risk of wildfire from the utility's equipment by an estimated 60%.[7] This risk reduction has largely been driven by operational changes, such as EFT and PSPS. These changes represent noteworthy strides toward risk reduction, and more are being planned to achieve greater wildfire safety across Hawaiian Electric's service territory.

Upgrades made to date have also strengthened cross-sector partnerships and the timely, transparent sharing of safety information. For example, Hawaiian Electric's installation of 53 weather stations in the last year has bolstered the National Weather Service's fire weather monitoring capabilities. Likewise, Hawaiian Electric shares all data from its 44 AI-assisted cameras with emergency responders, who have noted that it

[7] Filsinger Energy Partners, a nationally recognized independent energy advisory firm that specializes in wildfire mitigation strategies and risk modeling, estimates that the various wildfire risk mitigation actions and programs implemented by Hawaiian Electric have reduced the risk of wildfire from the utility's equipment by approximately 60%.

provides them faster situational awareness, and, in some instances, the cameras are able to alert them to fire hazards faster than 911 calls.

Table ES-0-1. Summary of Hawaiian Electric wildfire safety initiatives

Initiative	Description
Wildfire risk mapping	Developed utility-specific, multi-tiered wildfire risk maps to assist with prioritizing mitigations.
Wildfire risk modeling	Developed a wildfire risk model to quantitatively analyze wildfire risk and inform mitigation planning.
Situational awareness enhancements	Deployed 53 additional weather monitoring stations in areas identified for higher wildfire risk. Deployed 44 AI-enhanced cameras to monitor for fire and notify Hawaiian Electric and first responders. Established procedures to deploy company personnel during periods of elevated risk to monitor for wildfires (spotters).
Operational mitigations	Developed a PSPS program and associated risk maps for the 2024 wildfire season. Deployed EFT settings to limit potential for utility sources of ignition during times of elevated wildfire risk on 213 circuits. Replaced 10 electro-mechanical relays with micro-processor relays. Established special restoration procedures for circuits in wildfire risk areas.
System hardening	Inspected 226 Transmission and Distribution circuits Replaced or upgraded 2,124 wood poles Installed 11 reclosers to reduce customers impacted by a PSPS Replaced over 20 miles of overhead copper conductor with stronger aluminum conductor Replaced 21 "KPF" air break switches Replaced 3,558 expulsion fuses with firesafe fuses Replaced 680 lightning arresters with firesafe lightning arresters
Vegetation management program	Initiated hazard tree inspection and abatement program in high wildfire risk areas. Removed 367 hazard trees and performed trimming on 20 medium risk area circuits.
WSS website	Deployed a special purpose website to publicly disseminate wildfire mitigation program information: hawaiianelectric.com/safety-and-outages/wildfire-safety
Community outreach and engagement	Implemented a wide range of outreach strategies tailored to individual islands to connect with community members, listen to concerns, gather input, collect emergency contact information and share wildfire safety information and resources. Hosted or participated in more than 100 in-person and virtual public outreach events on Maui, Molokaʻi, Oʻahu and Hawaiʻi Island in 2024—from visiting residents door to door and attending neighborhood fairs, to hosting public open houses and community meetings. Partnered with local, county and state entities to amplify resources and reach.
Wildfire Safety Symposium and Wildfire Safety Working Group	Hosted a Wildfire Safety Symposium to bring together wildfire safety experts and stakeholders from utilities, government agencies, research institutes, landowners, non-profits and local communities to share best practices, inform the WSS and chart collective actions to reduce wildfire risk. Subsequent Working Group meetings were held to discuss wildfire risk maps, mitigation strategies and priorities, operational strategies, PSPS enhancements and key performance indicators.

One of Hawaiian Electric's early initiatives in 2024 was the development of wildfire risk maps for its facilities. These maps identify areas of high, moderate and low wildfire risk, and offer a guide to prioritizing investments where they are most impactful. See Section 2 Wildfire Risk Maps for discussion and copies of the current fire risk maps for each island in Hawaiian Electric's service territory. Hawaiian Electric began by working to upgrade those circuits, moving from the areas of greatest risk toward those with lower risk. As of December 2024, Hawaiian Electric has implemented upgrades, as described in Table ES-0-1, to the majority of circuits within high-risk areas and is continuing to implement upgrades within medium-risk areas.

Wildfire safety is not only a matter of infrastructure upgrades—it is also rooted in an informed and prepared public and strong partnerships at the community, local and state levels. Guided by a commitment to "meet people where they are," Hawaiian Electric implements a wide range of outreach and engagement strategies tailored to each island to connect with community members, listen to concerns, gather input, collect emergency contact information and share wildfire safety information and resources. Hawaiian Electric partners with local organizations, first responders, government agencies and fellow utilities to host community events and amplify resources and reach.

Since the PSPS program was announced in May 2024, a focus of this community outreach effort has been to expand public awareness of PSPS, help communities prepare, listen to individuals' concerns and questions and demystify the process of initiating a preemptive shutoff and subsequently restoring power. As Figure ES-0-2 illustrates, surveys tracking public awareness of PSPS before and during Hawaiian Electric's outreach efforts show increased awareness over time. From May to October 2024, public awareness of PSPS rose from 25% to 54% on O'ahu, from 14% to 73% in Maui County and 11% to 64% on Hawai'i Island.

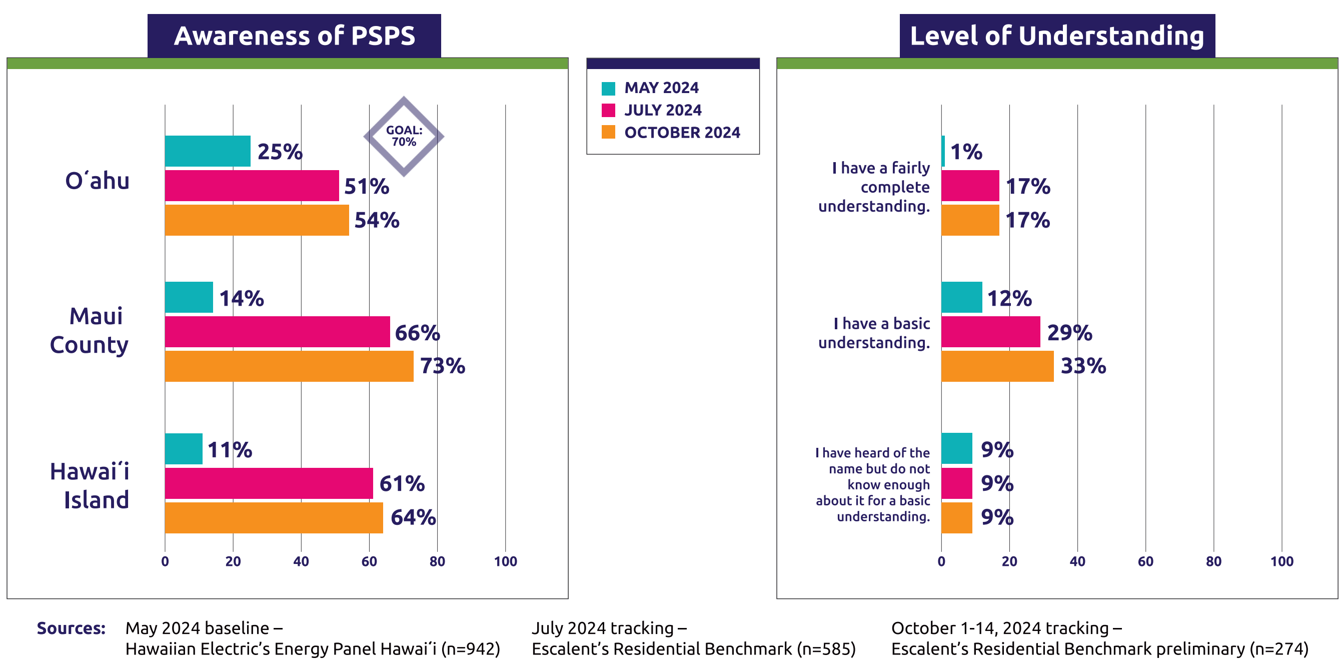


Figure ES-0-2. Public awareness of PSPS, May, July and October 2024

Community and stakeholder partnerships remain a foundational element of the enhanced WSS, as discussed below. For a detailed discussion of engagement strategies and outcomes, see Section 4.8 Strengthen Stakeholder and Community Partnerships.

Objectives of the Enhanced Wildfire Safety Strategy

Hawaiian Electric's highest priority is the safety of our communities, customers and employees. To advance this commitment, Hawaiian Electric has developed the enhanced WSS that builds upon our immediate actions in response to the August 2023 windstorm and wildfires and establishes a 3-year action plan for 2025-2027. The ultimate objective of the WSS is to identify and implement measures that can accomplish the greatest risk reduction while balancing affordability and reliability for our communities, consistent with the Public Utilities Commission's Order 41033.[8] To accomplish this, Hawaiian Electric's approach is to:

- ✔ **Identify areas of high risk and drivers of risk**
  (see Section 2 Wildfire Risk Maps and Section 3 Risk Modeling and Mitigation Assessment)
- ✔ **Address drivers of risk through a four-pillar approach to wildfire safety**
  (see Section 4 Enhanced Wildfire Safety Strategy)
- ✔ **Engage with community members and partners to inform our strategies, learn from and coordinate with each other**
  (see Section 4.8 Strengthen Stakeholder and Community Partnerships)
- ✔ **Continuously improve our strategies and implementation by identifying and tracking key metrics and data**
  (see Section 5 WSS Management, Organization and Governance)
- ✔ **Estimate costs and schedules based on the information we have today in order to inform our plans**
  (see Section 6 Projected Costs)

The WSS is an evolving process with annual updates to the Public Utilities Commission and ongoing assessments of wildfire risk and high fire-risk zones, mitigation measures and environmental conditions. The four-pillar approach to wildfire safety, methods of balancing safety, resilience and reliability and ongoing refinement of data collection and risk models are discussed below.

---

[8] Order No. 41033, *Providing Guidelines Regarding Hawaiian Electric's Wildfire Safety Strategy*, issued on September 13, 2024 in (Non-Docketed) Case No. 2023-04661.

Figure ES-0-3. Four Pillars of the Wildfire Safety Strategy

Four Pillars of the Wildfire Safety Strategy

Hawaiian Electric's enhanced WSS is founded on a four-pillar approach, illustrated above in Figure ES-0-3, to long-term reduction in wildfire risk. Each pillar reinforces the others and creates a comprehensive web of actions that enhance resilience and mitigate the risk of wildfire from the electrical grid. See Section 4 Enhanced WSS for detailed discussion of each pillar. The pillars are:

- **Harden and redesign the grid:** Upgrading infrastructure, such as installation of covered conductors, targeted undergrounding and equipment replacements to enhance fire safety. These efforts also aim to improve reliability impacts resulting from the safer operational practices put into place in 2024.
- **Expand and improve situational awareness:** Deploying weather stations, AI-assisted cameras and spotters to improve real-time fire weather monitoring and early identification of potential ignitions, as well as implement a Watch Office and operational wildfire risk model to inform real-time operational decision-making.
- **Improve operational practices:** Using EFT settings and PSPS with advanced weather monitoring to reduce ignition risks. Enacting restoration procedures in areas with elevated wildfire risk. Expanding vegetation management programs and annual inspection of electrical assets in the highest-risk areas.
- **Strengthen stakeholder and community partnerships:** Engaging the partners and the public through tailored outreach and collaborative events like the Wildfire Safety Symposium and Working Group meetings.

This report breaks down the maps and modeling that informed the four-pillar approach to wildfire safety before describing each pillar in detail. It also covers data and benchmarks that will be used to monitor progress, as well as associated costs of the proposed programs and initiatives.

2025-2027 Three-Year Action Plan

Hawaiian Electric currently estimates the WSS will reduce risk by 68-72% with a target of 70% by the end of 2027. Reducing risk well beyond 70% would come with a steep escalation in costs largely due to the need for significant additional undergrounding and the installation of additional miles of covered conductors. For more details, see Section 4.44.2.1, which discusses the complexities of these projects. Separately, efforts by others—for example, to reduce wildland fuels, create firebreaks and increase the fire resistance of communities—will reduce wildfire risk from all ignition sources, including ignitions from utility infrastructure. These parallel efforts will factor into Hawaiian Electric's risk reduction efforts in the long-term.

The actions Hawaiian Electric will take to reach the current target of 68-72% risk reduction over the next 3 years include:

- **Ongoing grid hardening, asset inspections and vegetation management**, focusing on areas with medium to high risk of ignition. Upgrades include:
  - Upgrading of poles and replacement of pole equipment that enhances fire safety
  - Enhanced inspections of electrical assets
  - Deployment of covered conductor and initial undergrounding in targeted areas
  - Expanded vegetation management programs for hazard tree removal, wider rights-of-way, rights of access for clearing, more frequent inspections
- **Installing more weather stations and hazard-detection cameras** with the goal of adding more weather stations to support PSPS program evolution and more video cameras to achieve desired viewshed of high and medium wildfire risk areas. Additional weather and hazard monitoring provides more real-time information to support rapid emergency response and a more refined approach to PSPS to improve safety measures while reducing the negative reliability impacts supported by an operational risk model that can provide fire weather forecasting capabilities.
- **Measures to lessen the impact of reliability disruptions caused by wildfire mitigation,** including further sectionalization and communications through the grid modernization program, enhanced meteorological capabilities, establishment of community resource centers where appropriate for expected multi-day outages and pursuit of battery programs through a virtual power plant program.
- **Ongoing engagement with stakeholders and communities**. This includes continuing to host Wildfire Safety Working Group meetings to bring experts and stakeholders together and share best practices. It also includes continued partnerships with local organizations to host community events, reach individual residents and share information and resources on each island. Throughout the year, Hawaiian Electric will continue to emphasize the importance of emergency preparedness and help raise public awareness and understanding of PSPS.
- **Continuous improvement of the enhanced WSS**. This includes technical studies to further develop covered conductor standards, a detailed undergrounding analysis to evaluate construction and scope alternatives for future undergrounding projects and locations, review resilience of different overhead structure types including pole materials, design standards for new overhead lines in elevated risk areas and further evaluation on ingress and egress risks. Continuous improvement initiatives also include new

data collection streams such as ignition management and tracking, planning risk model improvements and a monitoring and audit program.

- **Fostering collective action.** As Hawaiian Electric heard from participants at its Wildfire Safety Symposium, protecting Hawaiʻi from wildfires is a shared responsibility that requires unified efforts from utilities, governments, organizations and communities. The way we manage land and vegetation, build our homes and neighborhoods and communicate between organizations and individuals has a real impact on our collective wildfire safety. Events that bring diverse partners together on a regular basis can help foster continued dialogue and innovation. Collaboration is essential to reduce the risk of wildfire.

See Section 5.1 for a detailed list of actions.

Prioritizing community safety is essential as Hawaiʻi continues to face the escalating threats of climate change, invasive vegetation and human-caused ignition. Protecting Hawaiʻi from wildfires will take continued technical and operational improvements, as well as active participation from diverse partners across all sectors and islands. By working together, we can create safer, more resilient communities.

This page intentionally left blank.

1 INTRODUCTION

In the past two decades, Hawaiian Electric has made substantial investments totaling over $4 billion to strengthen the safety and reliability of the electricity grid that powers over 471,000 customers. These strategic investments have been pivotal in maintaining grid reliability and resilience, generating 33% of electricity from renewable energy sources and deploying advanced technologies to fortify and modernize our electric power infrastructure for the 21st century.

Hawaiian Electric serves five of eight Hawaiian Islands including Hawai'i (Hawai'i County), O'ahu (Honolulu County), Maui (Maui County), Moloka'i (Maui County) and Lāna'i (Maui County). Hawaiian Electric's proactive stance on climate change has been unwavering, with Hawaiian Electric at the forefront of addressing the climate crisis. However, the escalating severity of climate and weather extremes has introduced unprecedented challenges. Globally, these extremes are exerting new pressures on safety, reliability and resilience. Specifically, Hawai'i has witnessed a marked intensification of drought conditions; according to a study published by National Oceanic and Atmospheric Administration, Hawai'i is currently in the midst of one of its most severe droughts on record. Rainfall during the November to April wet season ranked second lowest from 2010 to 2019, among consecutive 10-year periods since 1900.[9] Concurrently, shifts in land use by large landowners—from irrigated agricultural fields to dry, invasive grasslands—have heightened wildfire risks.

Hawaiian Electric's initiatives in this domain are not only **essential for immediate adaptation** but also **serve as a catalyst for broader sectoral changes**, offering valuable insights and learnings to a diverse array of stakeholders throughout Hawai'i.

Following the August 2023 Maui windstorm and wildfires, Hawaiian Electric enacted a comprehensive suite of interim measures to mitigate fire risks for the year 2024. These measures, initially informed by fire risk maps from the State of Hawai'i Department of Land and Natural Resources (DLNR), were implemented to minimize potential impacts in advance of the 2024 wildfire season.

Hawaiian Electric has engaged in a dynamic risk assessment process, incorporating additional data and expert analyses so that its risk mitigation strategies are responsive to the evolving environmental conditions. Through these concerted efforts, Hawaiian Electric is not only safeguarding the present but also shaping a

[9] National Oceanic and Atmospheric Administration, "Diagnosing Hawaii's Recent Drought," 2022, *Journal of Climate* (https://repository.library.noaa.gov/view/noaa/48984)

more resilient and sustainable future for Hawaiʻi. The enhanced WSS serves as a foundational framework to mitigate fire risks, drawing upon a comprehensive benchmarking process that incorporates insights from utilities worldwide affected by major wildfires. This strategy was enriched by the diverse perspectives presented at the April 2024 Hawaiʻi Wildfire Safety Symposium, with contributions from utility and company representatives spanning from California to Puerto Rico, and as far as Australia. The symposium facilitated a valuable exchange of experiences and best practices, while also garnering essential feedback from stakeholders throughout the state to refine the WSS. After the symposium, a Wildfire Safety Working Group was established to delve into the core aspects of Hawaiian Electric's wildfire mitigation strategies, ensuring that community concerns were represented and woven into the fabric of the strategic planning.

The enhanced WSS outlines methods to enhance both safety and reliability, while emphasizing emergency preparedness and resilience during unavoidable outages. Wildfire safety measures can come with tradeoffs for reliability—for example, PSPS involves proactively shutting off power to help prevent ignitions in extreme weather conditions. To mitigate these impacts, it is crucial to bolster community resources, support residents in preparing for emergencies and facilitate rapid restoration of power.

At the same time, wildfire safety measures can also *improve* reliability. For example, the enhanced WSS includes plans to implement covered conductor in the highest-risk areas over the next three years, reducing both the probability of ignition from electric facilities and reliability impacts. See Section 4.4 Grid Hardening for discussion of methods to improve reliability and resilience. With its WSS, Hawaiian Electric strives to optimize the allocation of resources to achieve a reasonable balancing of mitigation costs, enhancing reliability and reducing risk.

Looking ahead, the implementation of future mitigation measures will necessitate substantial investment, particularly in the initial stages, to expedite risk reduction in the most effective manner. These investments are projected to be substantially lower than the potential costs associated with the catastrophic consequences of wildfires, including threats to public safety.

Hawaiian Electric's initial risk modeling shows that, by the conclusion of 2027, the baseline risk of electrical facilities igniting a significant wildfire will be diminished by an estimated 68–72% as a result of steps taken to date and diligent implementation of the 2025-2027 WSS. While this represents a noteworthy stride towards risk reduction, the responsibility does not rest with the utility alone.

The prevention of devastating wildfires is a collective endeavor that necessitates a unified approach across the state to address risks that go beyond utility infrastructure. It is imperative that all stakeholders collaborate to fortify public safety and sustain the economic resilience of our communities for the future. Figure 1-1 illustrates the collective, "whole-of-society" effort needed to effectively reduce the threat of wildfire and keep our communities safe.

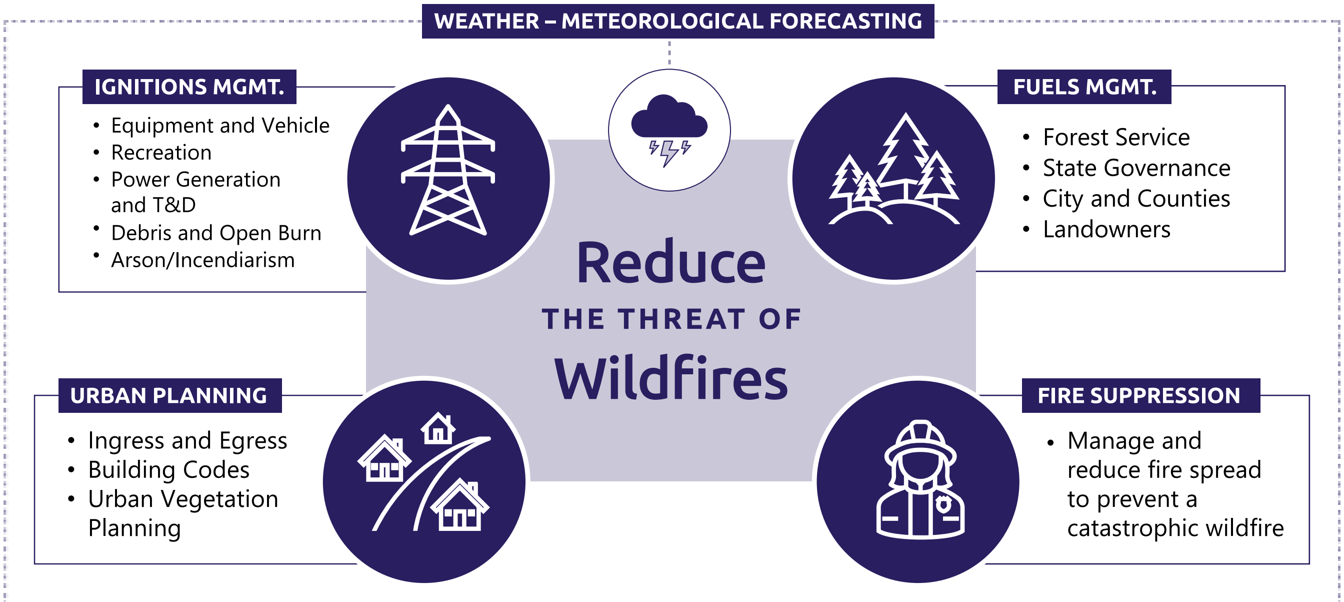


Figure 1-1. Illustration of the collective effort to reduce wildfire risk

The enhanced WSS represents a dynamic and evolving process with annual updates to the Public Utilities Commission (PUC) and an enduring commitment to regularly assess wildfire risk and high fire-risk areas, evaluate the efficacy of mitigation measures and adapt to the ever-shifting environmental conditions. This iterative, continuous improvement process allows for ongoing refinement of strategies as Hawaiian Electric's risk models mature. Figure 1-2 illustrates the development of the WSS and the integrated process of ongoing review, refinement and community/stakeholder engagement.

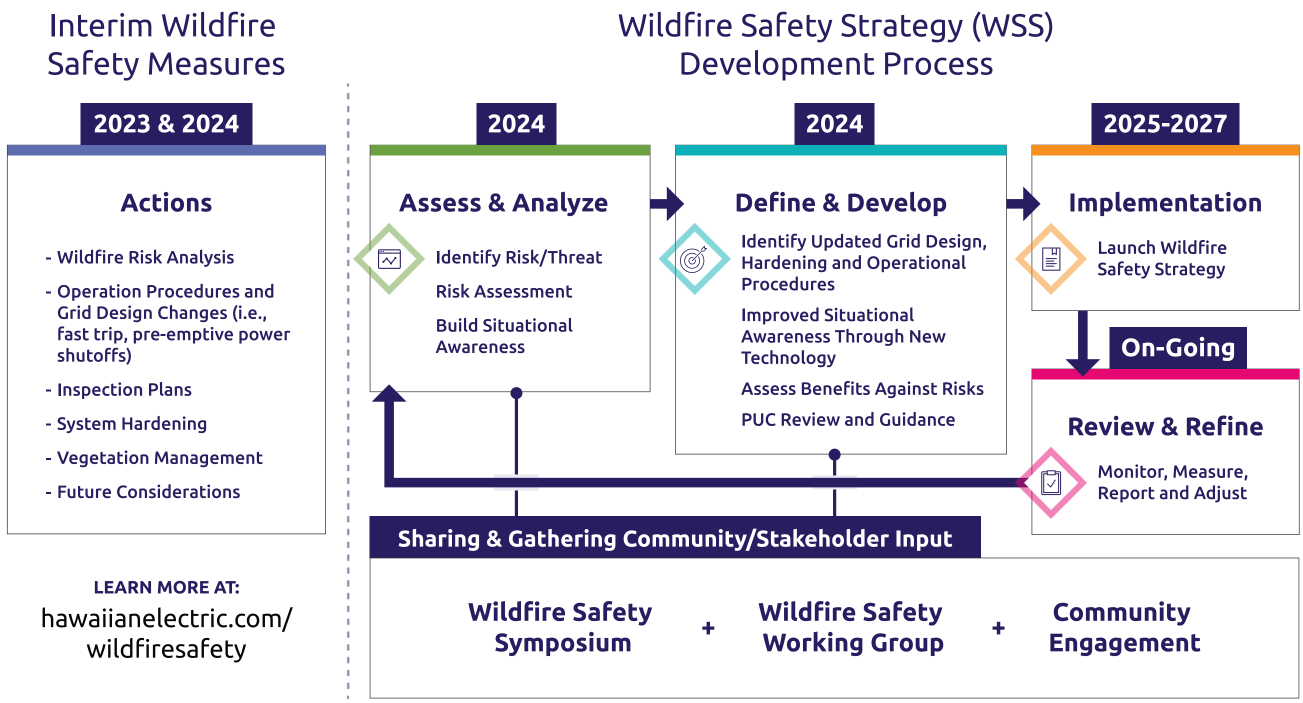


Figure 1-2. WSS development process

1.1 Four Pillars of Wildfire Safety

Hawaiian Electric's enhanced WSS is founded on a four-pillar approach to long-term reduction in wildfire risk. Each pillar reinforces the others and creates a comprehensive framework of actions that enhance resilience and fortify the electrical grid and communities against ignition. As shown below, the four pillars are: harden and redesign the grid, expand and improve situational awareness, improve operational practices and strengthen stakeholder and community partnerships. See Section 4 Enhanced WSS for detailed discussion of each pillar.

Figure 1-3. Four Pillars of the Wildfire Safety Strategy

Hawaiian Electric will collect data on the efficacy of the 2025 WSS programs (and every year thereafter) and will make adjustments for the 2026 and 2027 plans accordingly. The plans and budgets may change to maximize risk reduction based on available resources and actual data collected. This may include modifications to targets discussed below for the four pillars.

1.1.1 Harden the Grid to Reduce the Probability of Ignition

Hawaiian Electric's grid hardening programs, also referred to as system hardening programs, reduce the risk of wildfires caused by utility equipment and can help to minimize impacts to customers from other wildfire risk mitigations, such as PSPS. For example, the covered conductor program, transmission/sub-transmission line hardening program and pole and structure replacement program are intended to reduce the frequency of risk events across several risk drivers, such as energized wire down or foreign object contact with intact wire.

Other initiatives, such as the expulsion fuse replacement program and the lightning arrester replacement program, do not prevent risk events from occurring, but instead reduce the probability that a risk event will cause an ignition by utilizing equipment that addresses a specific failure mode or other mechanism that could cause an ignition. Undergrounding eliminates most of the wildfire risk associated with overhead infrastructure and can also potentially reduce the need for operational mitigations such as PSPS, EFT settings and vegetation management.

However, these projects are inherently complex and costly and are highly dependent on the location of the project. Hawaiian Electric is committed to identifying sections of its distribution system where undergrounding is the most efficient hardening mitigation. Upon identification of those sections, engineering and feasibility studies will be undertaken to determine the approximate number of miles that will be added to the Targeted Undergrounding Program. Updates to the Targeted Undergrounding Program will be provided in Hawaiian Electric's annual WSS Update. Additionally, Hawaiian Electric will underground approximately 2 miles of distribution lines in Lahaina in concert with the community. This work will help inform future undergrounding mitigation projects. Table 1-1 shows the grid hardening work Hawaiian Electric is targeting completing across its service area over the 2025–2027 period.

Table 1-1. Hardening work planned for 2025–2027

Hardening Mitigation	Current 2025–2027 Targets
Covered conductor	Approximately 15-70 miles on high risk distribution circuits
Initial targeted undergrounding	To-be-determined number of circuit miles, pending feasibility studies. Additionally, approximately 2 miles in Lahaina
Expulsion fuse replacements	100% of fuses replaced in HWRA and MWRA (approximately 13,600 fuses)
Arrester replacements	100% of arresters replaced in HWRA and MWRA (approximately 2,600 arresters)
Cellon-treated and poly-filled pole replacements	On pace to complete replacement of cellon poles in 11 years (approximately 648 poles)
Transmission/sub-transmission line hardening	Harden 19 circuit miles on high risk transmission circuits

The current targets listed in Table 1-1 are based on initial assessments and are subject to refinement as detailed engineering and project scoping is completed and based on available resources. Refer to Section 4.4 Grid Hardening for more details. Although circumstances differ across utilities, similar strategies have been adopted by utilities with extensive wildfire mitigation experience such as Southern California Edison (SCE), Pacific Gas and Electric (PG&E) and San Diego Gas & Electric (SDG&E). Taken together, these utilities have successfully installed thousands of miles of covered conductor and underground lines and replaced at-risk equipment in wildfire areas.

1.1.2 Expand and Improve Situational Awareness

Advancements in situational awareness provide better real-time understanding of wildfire risks and insights in forecasting elevated risk periods. Deployment of situational awareness technologies not only benefits Hawaiian Electric but enables the public, emergency responders and other stakeholders to have early wildfire detection and monitoring capabilities and provides more information to facilitate decisions that support public safety.

Hawaiian Electric is deploying more weather stations to provide data on wind speed, gust and relative humidity critical to improving decision making around PSPS decisions and EFT settings. These weather stations will significantly increase the state's weather forecasting capabilities, particularly in the various microclimates in elevated fire risk areas.

Hawaiian Electric is also deploying a network of 360-degree, high-resolution, AI-assisted video cameras to detect potential wildfires in high- and medium-risk areas on Oʻahu, Maui, Molokaʻi, Lānaʻi and Hawaiʻi Island. The camera platform allows emergency responders to receive early notification of wildfires, visually track progression in real-time and triangulate fire location by multiple cameras.

Additionally, Hawaiian Electric plans to establish a wildfire-focused Watch Office that will monitor local, state and national media, as well as internal and external weather products, to provide situational awareness. The Watch Office will be crucial for early fire detection, monitoring weather stations and video cameras to enhance wildfire ignition detection accuracy, alerting response teams and supporting the Incident Management Team (IMT) during PSPS events.

Hawaiian Electric also plans on adopting an operational wildfire risk model and fuel sampling program to inform real-time operational decision-making, including PSPS and EFT and reclose block enablement/disablement. A more sophisticated operational framework will also contribute to enhanced service reliability for customers.

The current targets listed in Table 1-2 are based on initial assessments and are subject to refinement as detailed engineering and project scoping is completed and based on available resources. See Section 4.1 Expand and Improve Situational Awareness for more details.

Table 1-2. Situational Awareness Work Planned for 2025–2027

Situational Awareness Scope	Current 2025–2027 Targets
Weather stations	Deploy additional weather stations as necessary (locations to be informed by wildfire risk modeling) to support PSPS program evolution
Video Cameras	Install additional standard camera stations and mini cameras to achieve desired viewshed of high and medium risk areas
Watch Office	Build Watch Office staff and meteorological capability, training and office space
Wildfire risk model for operations and forecasting	Acquire forecasting tools to inform operational decisions on EFT, reclose block and PSPS
Fuel sampling program	Inform and update risk models with state of vegetation and fuels

1.1.3 Improving Operational Practices

Infrastructure hardening programs can be effective at increasing grid resilience and reducing wildfire ignition risks, but they are expensive and take time to implement. As grid hardening work progresses, Hawaiian Electric is implementing enhanced and expanded operational practices to reduce fire risk in the near term. Operational practices include PSPS, EFT settings (which enhance the protection on utility circuits to quickly clear hazards), blocking of circuit autoreclose schemes, and expanded and advanced asset inspections and vegetation management.

Hawaiian Electric is implementing EFT settings in elevated risk areas of the grid to more quickly detect problems and de-energize power lines, reducing the potential for an ignition to occur. The EFT program builds on work completed in 2024 by adding protection devices to sectionalize distribution circuits, isolate faults more quickly and reduce the adverse reliability impacts of the program to customers outside fire risk areas. To further enhance and reduce adverse customer impacts of the EFT program, Hawaiian Electric plans to acquire real-time operational risk model tools to work in conjunction with weather monitoring and forecasting to inform operational decisions on EFT and PSPS activation.

Hawaiian Electric is targeting completing the following work across its service area to implement the EFT program, including measures to reduce customer reliability impacts over the 2025–2027 period, as shown in Table 1-3:

Table 1-3. EFT work planned for 2025-2027

Operational Mitigation	Current 2025–2027 Targets
EFT: Enable circuits with settings only	Complete implementation of EFT on medium risk circuits consistent with risk model. (40 circuits)
EFT: Upgrade circuit breaker relays to microprocessor	Install relay upgrades, as needed, to support EFT enablement (approximately 10 upgrades)
EFT: Install remote-control line reclosers	Deploy up to 117 reclosers as needed on the distribution system to implement enhanced fast trip or reduce reliability impacts to customers
EFT: Add SCADA* to substations to remotely enable EFT	Enable SCADA at up to 12 distribution substations to enhance EFT schemes
Sectionalizing switch installations (transmission and sub-transmission)	Deploy up to 43 switches as needed on the sub-transmission system to reduce reliability impacts and increase operational flexibility

* SCADA = Supervisory Control and Data Acquisition

Refer to Section 4.5 for more details regarding improved operational practice plans.

In addition, Hawaiian Electric will enhance its asset inspection and vegetation management programs. This includes annual inspections of assets in the high-risk areas and a 3-year inspection cycle for assets in medium risk areas. See Section 4.3 for more details on the asset inspection program. Vegetation management programs include 12- to 18-month vegetation clearing, with mid-cycle inspections to identify hazards to electrical assets. See Section 4.2 for more details on the vegetation management program.

1.1.4 Strengthen Stakeholder and Community Partnerships

Wildfire safety is not only a matter of infrastructure upgrades—it is also rooted in an informed and prepared public and strong partnerships at the community, local and state levels. The following is a high-level overview of Hawaiian Electric's approach to engaging communities and stakeholders. See Section 4.8 for a detailed discussion of outreach and engagement strategies on individual islands, the Wildfire Safety Symposium and Working Group meetings.

1.1.4.1 Community Outreach and Engagement

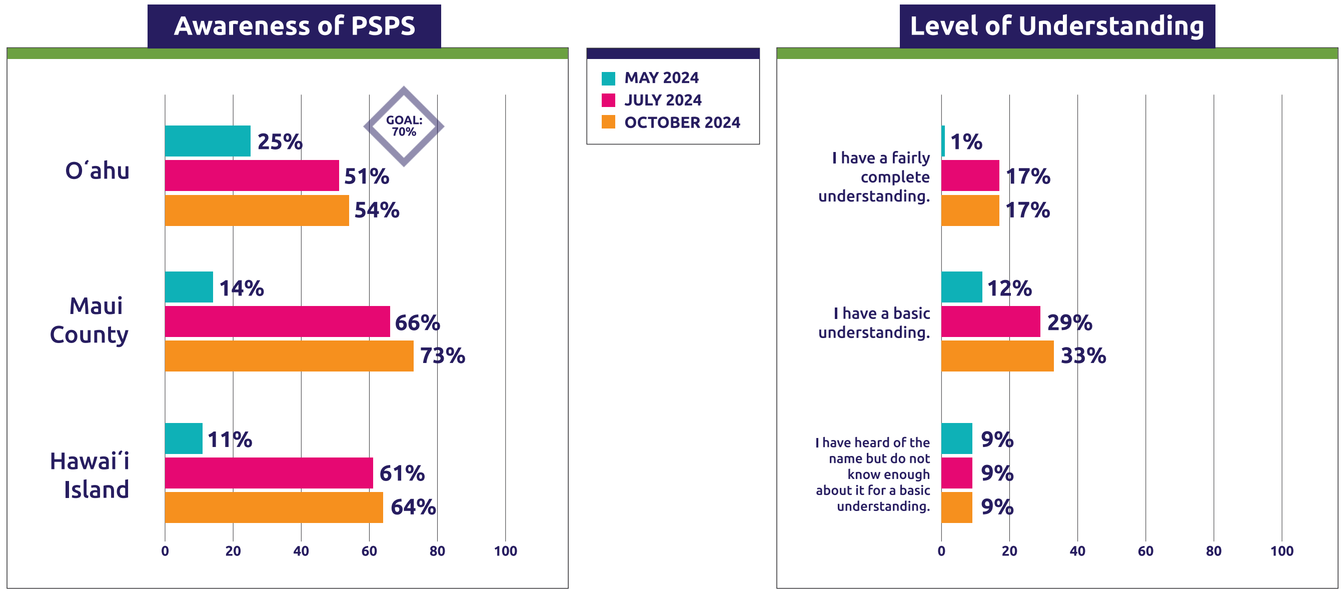
Guided by a commitment to "meet people where they are," Hawaiian Electric implements a wide range of outreach strategies tailored to individual islands to connect with community members, listen to concerns, gather input, collect emergency contact information and share wildfire safety information and resources.

From January through October 2024, Hawaiian Electric participated in more than 100 in-person and virtual public outreach events on Maui, Molokaʻi, Oʻahu and Hawaiʻi Island—from visiting residents door to door and attending neighborhood fairs, to hosting public open houses and community meetings. Hawaiian Electric partnered with many local organizations, first responders, government agencies and fellow utilities to host community events and amplify resources and reach. (See Appendix A-1 for a list of all wildfire safety community events Hawaiian Electric participated in or hosted, as well as partners involved.)

Hawaiian Electric also shared information through emails and printed mail, on social media and online. In all its outreach efforts, Hawaiian Electric worked to broaden the accessibility of its events and materials, providing information in multiple formats and languages.

Since the PSPS program was announced in late May 2024 and implemented on July 1, 2024, Hawaiian Electric's aim has been to expand public awareness of PSPS, help identified PSPS communities prepare, listen to individuals' concerns and questions, communicate the need for PSPS as a last line of defense and demystify the process of initiating a shutoff and restoring power.

As Figure 1-4 illustrates, surveys tracking public awareness of PSPS before and during Hawaiian Electric's outreach efforts show increased awareness over time. From May to October 2024, public awareness of PSPS rose from 25% to 54% on Oʻahu, from 14% to 73% in Maui County and 11% to 64% on Hawaiʻi Island.



Sources: May 2024 baseline – Hawaiian Electric's Energy Panel Hawaiʻi (n=942); July 2024 tracking – Escalent's Residential Benchmark (n=585); October 1-14, 2024 tracking – Escalent's Residential Benchmark preliminary (n=274)

Figure 1-4. Public awareness of PSPS, May, July and October 2024

Another form of local partnership is through Hawaiian Electric's community-driven resilience program. Through a federal grant from the U.S. Department of Energy, Hawaiian Electric is working with community partners in areas of high wildfire risk that are also impacted by infrastructure upgrades to implement resilience projects and enter Community Benefits Agreements (CBAs). The CBAs will be centered around actions that will benefit the most people in the region, serve to protect human life and safety, address a specific community resilience concern (e.g., community-planned firebreaks, hazard tree removal, native plant reforestation) or past incident, and must be realistic and feasible. For example, Hawaiian Electric recently funded a 1,000-foot firebreak to clear vegetation along Leihoku Elementary's fenceline.

1.1.4.2 Cross-Sector Collaboration

Consistent communication and collaboration with diverse partners are key to building enduring partnerships. In addition to partnering with a wide spectrum of organizations to conduct community outreach, Hawaiian Electric hosted a series of events to foster dialogue and collaboration between stakeholders and technical experts. Hawaiian Electric's April 2024 Wildfire Safety Symposium and subsequent series of seven Wildfire Safety Group meetings helped bring together experts from utilities, agencies, research institutes and the state to share best practices, inform the WSS and chart collective actions to reduce wildfire risk.

Hawaiian Electric's wildfire safety upgrades to date have also strengthened cross-sector partnerships and the timely, transparent sharing of safety information. As mentioned earlier, Hawaiian Electric's installation of weather stations has bolstered the National Weather Service's (NWS) fire weather monitoring capabilities, particularly in the leeward, highest risk areas for each island. By November 2024, the NWS began referencing Hawaiian Electric-deployed weather stations in its Red Flag Warnings. The NWS was supportive of the specific 2024 weather station locations, and Hawaiian Electric plans to continue collaborating with the NWS on potential 2025–2027 locations. Likewise, prior to deployment, Hawaiian Electric socialized the 2024 video camera station locations and viewsheds with emergency responders to obtain their input. After deployments began, Hawaiian Electric, in partnership with its camera solution provider, onboarded emergency responders onto the camera system, held feedback meetings and continues to collaborate with emergency responders on future camera station locations and system enhancements.

1.1.4.3 Ongoing Engagement Efforts and Next Steps

Moving forward, Hawaiian Electric will continue to refine and implement outreach and engagement strategies to build enduring partnerships with communities and stakeholders. These ongoing efforts include:

- Developing innovative ways to reach those who are unable to attend community events or meetings
- Continuing to strengthen relationships with key partners and join them at events and meetings
- Expanding its network of partners who can advise and collaborate with Hawaiian Electric to keep communities safe
- Continuing to emphasize the importance of emergency preparedness throughout the year
- Utilizing the U.S. Department of Energy's (DOE) Grid Resilience Innovation Partnerships funds to empower organizations to continue their wildfire mitigation work and/or identify projects within the community to advance wildfire safety efforts

1.2 Overview of Service Territory

Hawaiian Electric provides electricity for 95% of residents of the state of Hawaiʻi on Oʻahu, Maui, Molokaʻi, Lānaʻi and Hawaiʻi Island. Hawaiian Electric is responsible for reliably, safely and cost-effectively delivering electricity between traditional Company-owned and operated generating facilities, independent power producers' facilities, an industry-leading number of distributed or customer-sited renewable energy facilities, and Hawaiian Electric's more than 471,000 customers. Hawaiian Electric owns more than 9,800 miles of transmission and distribution lines across the five islands it serves. Of that total, about 43% of the lines are underground.

1.2.1 Oʻahu

On Oʻahu, Hawaiian Electric serves approximately 309,000 customers. This is accomplished through operating 218 circuit miles of overhead 138,000-volt (138-kilovolt [kV]) transmission lines and 8 miles of underground transmission lines, over 500 circuit miles of overhead sub-transmission lines and almost 60 circuit miles of underground 46-kV sub-transmission lines, 1,200 circuit miles of overhead distribution lines and over 2,400 circuit miles of underground distribution lines, 24 transmission substations, 124 distribution substations and more than 64,000 transmission and distribution structures and poles.

Electric power generated at power plants is stepped up in voltage, to either 138 kV or 46 kV and sent through transmission lines to transmission substations at a nominal 138 kV. At the transmission substations, the power is transformed from 138 kV to a nominal 46 kV and sent through sub-transmission lines to distribution substations. At the distribution substations, the power is transformed, or stepped down, to Hawaiian Electric's nominal distribution voltages of 4,160 volts (4 kV), 11,500 volts, 12,470 volts (12 kV used to represent 11,500 volts and 12,470 volts), or 25 kV for distribution to Hawaiian Electric's customers.

There are 24 transmission substations located on O'ahu. These substations house equipment to transform power to different voltages (transformers), provide switching and protection (switches, circuit breakers, and relays) and collect data from meters. The 24 transmission substations provide power to a system of distribution substations. The 124 distribution substations are served through a system of overhead and underground lines, called sub-transmission lines, which are energized at 46 kV. At the distribution substations, the voltage is transformed from 46 kV to lower voltages of 4 kV or 12 kV. From there, distribution lines deliver power to Hawaiian Electric's customers directly or to distribution transformers that further lower the voltage. The distribution transformers reduce the voltage to 120, 240, 208 or 480 volts for delivery into the customer premises through service lines.

There are 40 transmission substation transformers, 262 distribution substation transformers, and over 32,000 distribution transformers mounted on poles or surface mounted pads on the Hawaiian Electric's system. Other pieces of equipment that allow the two-way flow of power to or from the customer include protective relays, circuit breakers, fuses, a variety of switches, capacitors, mobile radio systems, microwave and fiber optic communication systems, remote terminal units, switch vaults, concrete, fiberglass, steel, and wood poles, aluminum, steel, and wood, transmission structures, and line reclosers.

1.2.2 Hawai'i Island

On Hawai'i Island, Hawaiian Electric serves approximately 89,000 customers. The transmission and distribution service area encompasses the entire island of Hawai'i, which comprises approximately 4,028 square miles. The terrain ranges from lush tropical growth on the east side where there can be as much as 300 inches of rain per year to the dry, desert-like conditions of the west that get less than 5 inches of rain per year, and from sea level to the top of Mauna Kea at a height of 13,796 feet where temperatures can fall well below freezing.

Hawai'i Island's transmission system is a network of 69-kV, and 34.5 kV transmission lines and transmission switching stations used to transport power from various power plants to customer load centers. The power generated at power plants enters the transmission network through generator step-up transformers that are located at transmission switching stations. The power is delivered through the transmission lines to distribution substations. At the distribution substations, the power is transformed, or stepped down, to nominal distribution voltages of 13.8 kV, 12.47 kV, 4.16 kV or 2.4 kV. The majority of the distribution facilities are at Hawai'i Island's standard distribution voltage of 12.47 kV and nearly all new distribution facilities are constructed at 12.47 kV. From the distribution substations, overhead and underground distribution power lines deliver electric service directly to customers or to distribution transformers that further lower the voltage. The distribution transformers reduce the voltage to 120, 208, 240 or 480 volts for delivery into customer premises through service lines.

Most of Hawai'i Island's transmission network is constructed and energized at 69 kV, although there are 34.5 kV transmission lines used to transmit power to distribution substations along the Hamakua coast, North Kohala and in the Puna district. Most of Hawai'i Island's transmission lines are supported by wood poles, with steel poles being used in the more recent transmission line additions and when one pole supports two transmission lines. There are approximately 630 miles of overhead transmission lines on the island and a total of 21 transmission substations. There are over 9,400 transmission structures and poles.

There are approximately 2,075 miles of overhead distribution lines and 825 miles of underground distribution lines in the Hawai‘i Island system. There are also more than 58,000 distribution poles on the system and 63 distribution substations across the island.

1.2.3 Maui County

In Maui County, Hawaiian Electric serves approximately 72,000 customers on the islands of Maui, Moloka‘i and Lāna‘i, encompassing a service area of 1,128 square miles. The terrain ranges from lush tropical growth on the east side of Maui where there can be as much as 404 inches of rain per year to the drier conditions of west Maui, much of Moloka‘i and Lāna‘i, which get less than 20 inches of rain per year, and from sea level to the top of Haleakalā at a height of 10,023 feet where temperatures can fall well below freezing.

Maui Island's transmission system is a network of 69-KV and 23 kV transmission lines and transmission switching stations used to transport power from two main power plants to customer load centers. Molokai and Lanai do not have a transmission system. The power generated at the Kahului Power Plant and Maalaea Power Plant enters the transmission network through generator step-up transformers located at transmission switching stations. The power is delivered through the transmission lines to distribution substations. On Molokai and Lanai, power is generated at the distribution substations, the power is transformed, or stepped down to nominal distribution voltage of 13.8 kV, 12.47 kV, 4.16 kV or 2.4 kV. The majority of the distribution facilities are at the standard distribution voltage of 12.47 kV. From the distribution substations, overhead and underground distribution power lines deliver electric service directly to customers or to distribution transformers that further lower the voltage. The distribution transformers reduce the voltage to 120, 208, 240 or 480 volts for delivery into customer premises through service lines.

The Maui County transmission system comprises approximately 240 miles of overhead transmission lines, about 3 miles of underground transmission lines, about 4,500 transmission structures and poles and 22 transmission substations.

There are approximately 770 circuit miles of overhead distribution lines, over 910 circuit miles of underground distribution lines, over 27,000 distribution poles and 25 distribution substations.

1.3 Hawai'i Wildfire Risk Considerations

The State's first State Hazard Mitigation Plan, issued in November 2023, assessed wildfire as a high-risk hazard. According to the Hawai'i Wildfire Management Organization, the main causes of wildfire are human-caused ignitions, with heavy rain followed by drought and combustible buildings and vegetation. Although storms may bring rainfall to the state, they can worsen fire risk in the dry season by creating an accumulation of vegetation, which may then dry out and exacerbate fuel conditions.

Wildfire risk can be decreased by reducing ignitions through land management, fuel reduction and making homes and communities better able to withstand fires. Approximately 26% or 1 million acres of land in Hawai'i is covered by non-native, fire-prone grasses and shrubs.[11] This leads to increased fuel loads that provide an ignition source, which lead to wildfires that result in loss to native resources and communities. As seen in Figure 1-5, fire activity in Hawai'i is directly related to declines in agricultural and pastoral grazing land use and the expansion of non-native grasses. When sugarcane and pineapple plantations were in operation, there were often prescribed burns as part of the harvesting and cultivation processes to prepare for future agricultural cycles. With plantations ceasing operations, many of these properties are not actively managed, leading to an influx of non-native grasses and fire-prone weeds.

[11] 2023 State Hazard Mitigation Plan, Hawai'i Emergency Management Agency at 20. Available at, https://dod.hawaii.gov/hiema/final-2023-hazard-mitigation-plan/ ("2023 SHMP").

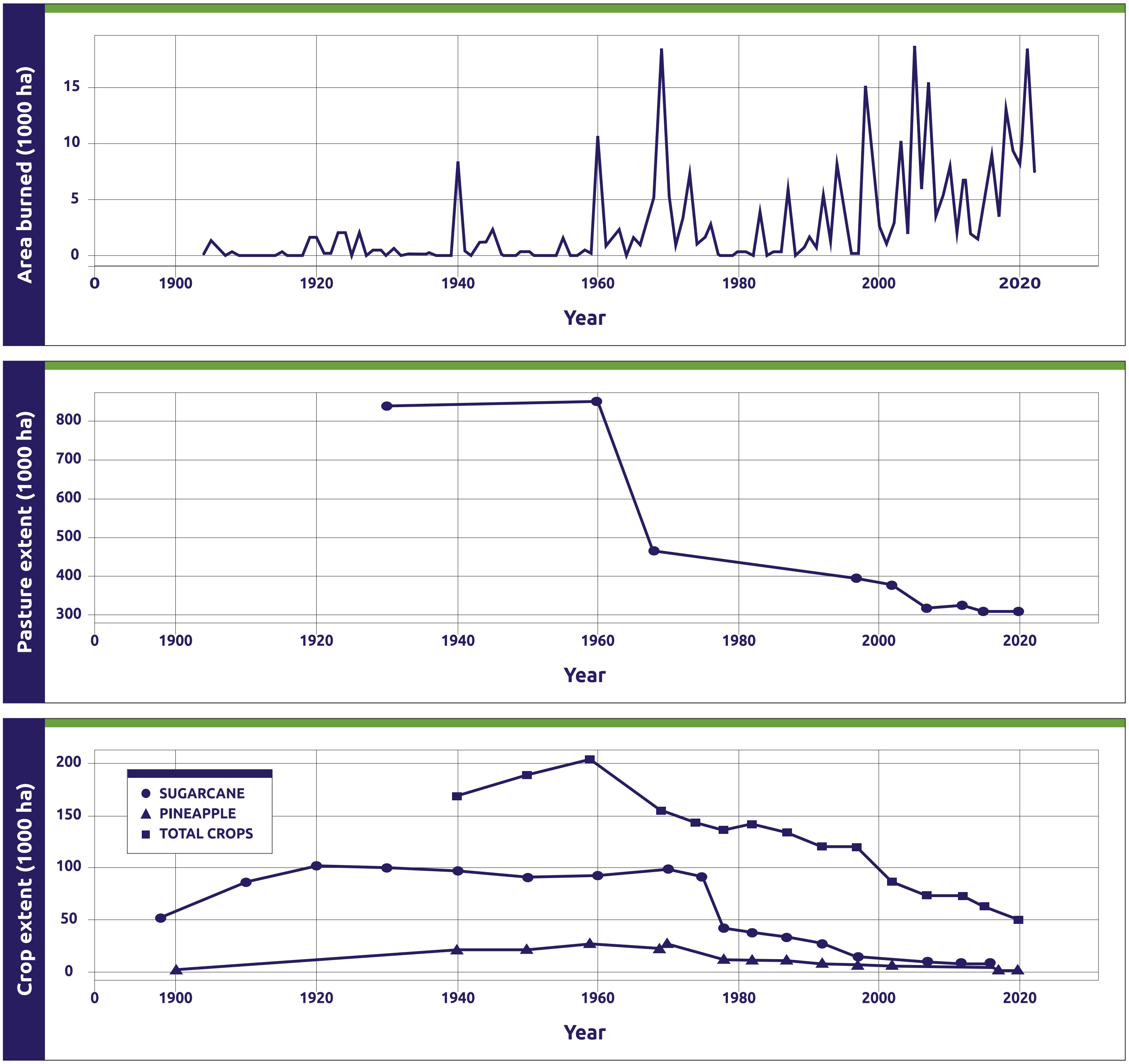


Figure 1-5. Declination of Hawaiian agricultural and pastoral land-use

1.4 Immediate Measures After August 2023 Wildfires

Following the August 2023 Maui windstorm and wildfires, Hawaiian Electric developed and implemented its Wildfire Immediate Action Plan[12] (IAP) to reduce the risk of wildfires associated with utility infrastructure in service territory areas that Hawaiian Electric identified as posing a higher wildfire risk. The 2025-2027 WSS builds on these measures along with mitigation measures based on risk-informed analysis as described in this WSS.

1.4.1 Development of Interim Wildfire Risk Maps and Overview of IAP Measures

Section 2 will discuss wildfire risk maps that were created for this WSS to identify risks of wildfire from electric infrastructure and to inform wildfire mitigation actions. To provide context for the actions Hawaiian Electric took in response to the August 2023 windstorm and wildfires, this section discusses the wildfire risk maps used to inform the development of the IAP.

In the development of the IAP in late 2023, Hawaiian Electric leveraged and augmented maps produced by the State of Hawaiʻi DLNR Division of Forestry and Wildlife (DOFAW) to identify high wildfire risk areas in the Hawaiian Electric service territory. DOFAW's maps identify at-risk wildland-urban interface communities on the major Hawaiian Islands. DOFAW originally developed maps in 2007 and updated them in 2021 based on guidelines from the National Association of State Foresters, and included evaluation of data such as the following to categorize communities into high, medium or low risk:

- Historical fire occurrence
- Fuel conditions on the landscape and surrounding community
- Human and economic values associated with the community (e.g., homes, business, community infrastructure, areas of high historical, cultural, or spiritual significance)

Wildland fire protection capabilities, such as the capacity and resources of all agencies and organizations with jurisdiction to undertake fire protection measures.

To support implementation of the IAP, Hawaiian Electric augmented DOFAW's maps with reference to its overhead lines. DOFAW centered its analysis on community wildfire risk, so the polygons in its wildfire risk maps are defined by the boundaries of communities. DOFAW's wildfire risk maps are not intended to, and do not, capture the locations of electrical infrastructure running just outside community boundaries that could potentially pose an ignition risk.

In many cases, Hawaiian Electric-owned electrical lines are located just outside of DOFAW's community boundary lines, traversing undeveloped areas that contain dry brush and grasses, and hazardous trees. Hawaiian Electric augmented DOFAW's maps by extending the boundaries by 1 mile in each direction to account for risk associated with overhead electrical facilities that run in these areas. through illustrate Hawaiian Electric's expansion of the polygons defining DOFAW's "high" at-risk wildland-urban interface communities by 1 mile. The resulting expanded boundaries defined Hawaiian Electric's IAP high wildfire risk areas (i.e., all areas within the boundaries of the bold red polygons in Figure 1-6 through Figure 1-8 are considered high wildfire risk areas).

---

[12] Hawaiian Electric initially called these measures its Interim Wildfire Safety Measures, but more recently has referred to them as its Wildfire Immediate Action Plan.

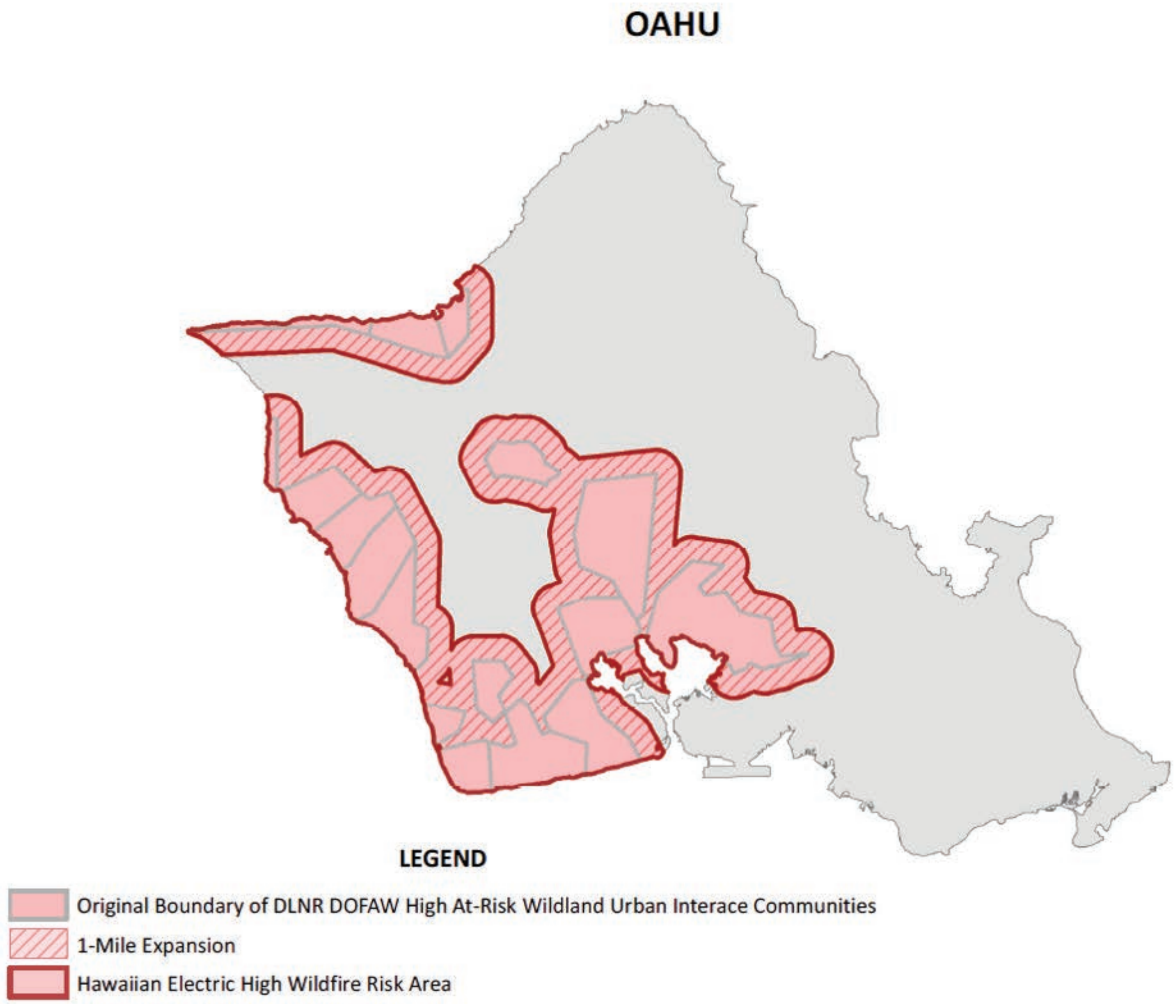


Figure 1-6. O'ahu high wildfire risk areas based on DLNR risk maps

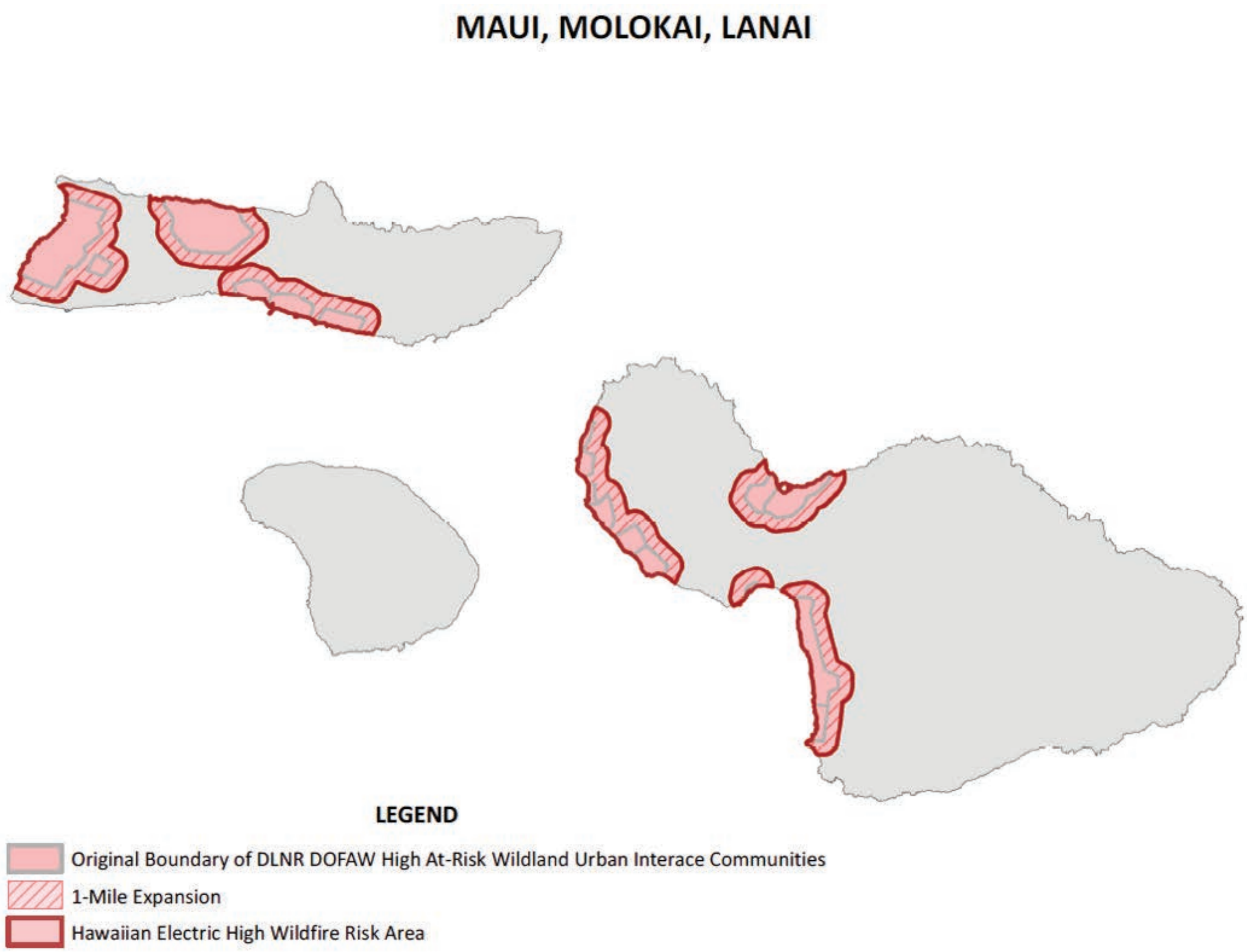


Figure 1-7. Maui County high wildfire risk areas based on DLNR risk maps

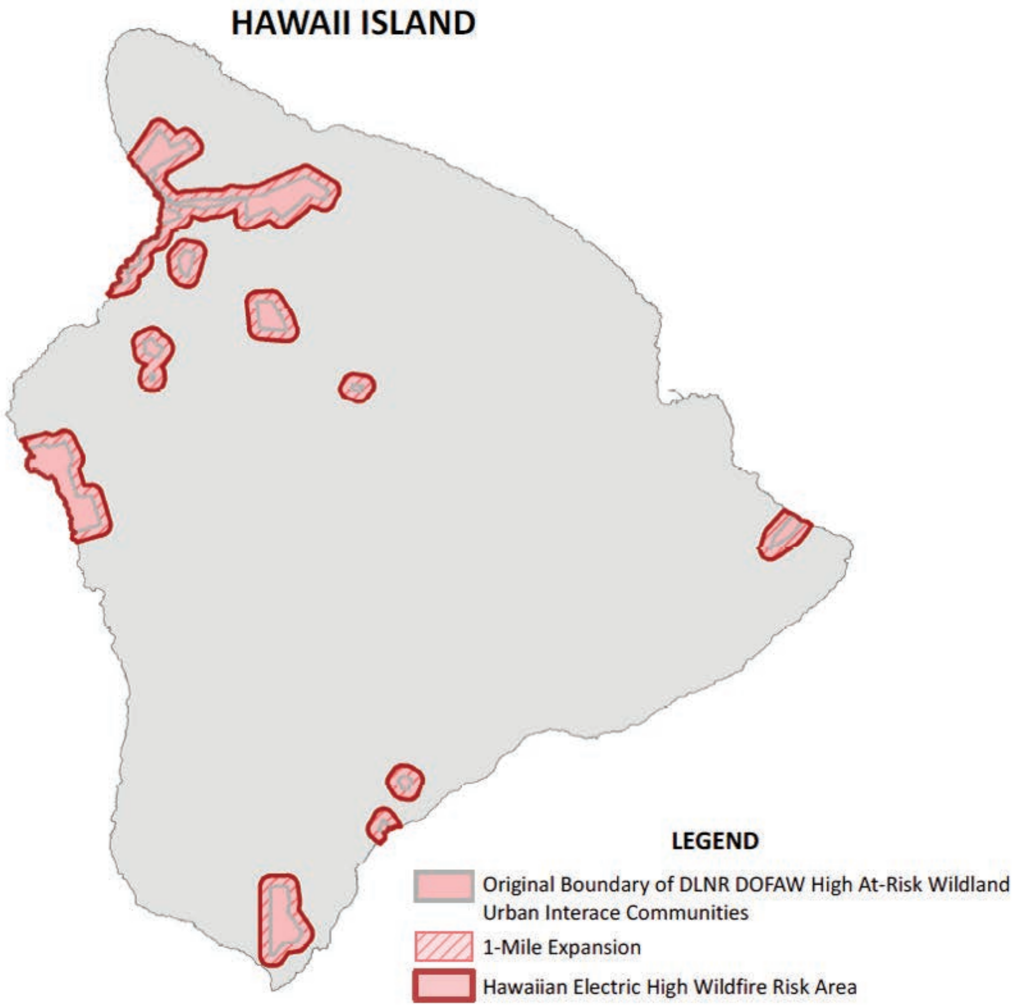


Figure 1-8. Hawai'i Island High Wildfire Risk Areas based on DLNR risk maps

Hawaiian Electric's IAP mitigation measures were prioritized to high wildfire risk areas, as identified in Figure 1-6 through Figure 1-8 until the risk maps discussed in Section 2 of this WSS were finalized.

Table 1-4 describes the IAP measures undertaken in 2024.

Table 1-4. Scope of IAP Measures

Mitigation Measure	Description
Wildfire risk modeling	Develop advanced methods to quantitatively analyze wildfire risk to inform mitigation planning and operational decision-making
Video cameras	Deploy high-definition, 360-degree cameras that use AI to identify ignitions and notify the Company and first responders
Watch Office	Enable 24/7 wildfire-focused watch office capabilities to monitor video cameras, enhance wildfire ignition detection accuracy, and alert response teams
Weather stations	Deploy additional weather stations to capture local weather data to enhance key operational decision-making during hazardous weather conditions
Spotters	Utilize human spotters during red-flag conditions to alert system operators and emergency responders of hazardous observations
EFT settings and reclose blocking	Implement fast-trip settings at substation feeder circuit breakers/reclosers and block reclosing to reduce the potential for ignitions caused by faults during certain weather conditions
Fault Current Indicators (FCIs)	Deploy new FCIs on high wildfire risk circuits that are capable of coordinating with EFT settings in order to better locate faults and improve trouble-shooting when EFT settings are enabled
Public Safety Power Shutoff (PSPS) Plans	Develop an early stage PSPS plan for the Company's service territories to be ready to proactively shut off power as a last resort option
Equipment inspections	Implement detailed ground and aerial inspections of transmission and distribution overhead assets in high wildfire risk areas
Pole replacement and upgrades	Replace poles and pole hardware to reduce the probability of asset failures that could cause fires
Conductor replacement	Replace smaller single-strand copper conductor, limit splices, and remove temporary in-line disconnects to reduce the probability of conductor failure
Shield wire replacement	Replace old/deteriorated shield wire to reduce the probability of failure
Expulsion fuse replacement	Replace expulsion fuses in high wildfire risk areas with fuse models designed to reduce the potential for the release of sparks or high temperature material during operation
Lightning/surge arrester replacement	Replace arresters in high wildfire risk areas with new models equipped with arc or spark prevention mechanisms
KPF Air Switch replacement	Replace existing KPF Air Switches in high wildfire risk areas
Targeted redesign of spans	Reduce the potential for swing shorts in high wildfire risk areas through targeted redesign of spans
Fire retardant mesh	Install fire retardant mesh on new poles in high wildfire risk areas
Enhanced vegetation management	Enhance vegetation management practices in high wildfire risk areas to further reduce the potential for vegetation contact with lines

1.4.2 Milestones and Achievements

Table 1-5 shows key initiatives implemented over the past year and Hawaiian Electric's progress to date. These efforts have contributed to an estimated risk reduction of 60% compared to 2023, largely driven by operational changes including implementation of the PSPS and EFT programs.

Table 1-5. Hawaiian Electric Key Initiatives Implemented

Category	Initiative	Planned 2024	Actual 2024
Foundational Work	Detailed inspections of distribution & transmission circuits	210	226
	Hazard tree	300	367
	Trimming on PSPS circuits	0	20
	Level 1 inspections on PSPS circuits	0	41
	Expulsion fuse replacements	3,534	3,558
	New lightning arresters	1,071	680
Operational Changes	Substation relay settings changes (EFT)	210	213
	Distribution relay upgrades for EFT	10	10
Situational Awareness	Single-phase FCIs	3,433	3,177
	360º High-definition video cameras with AI	44	44
	Weather stations	52	53
Hardening	Wood pole replacements & upgrades	1,865	2,124
	Aluminum reconductor circuit miles	9.9	23.01
	Smart reclosers for PSPS circuits	11	11
	Pole testing	2,746	5,805

1.4.3 Evolving Process

Hawaiian Electric's WSS has been developed in a manner that incorporates the best available electric utility industry information and approaches to assess and address wildfire risk tailored to its specific risk profile as it is understood today. Hawaiian Electric recognizes that the state of the art in utility wildfire risk management is evolving rapidly, so the WSS is also intended to evolve accordingly during the 2025–2027 period and beyond.

The WSS leverages lessons learned and practices applied by the utility industry. For example, the California utilities have focused intensively on wildfire risk management over the past 10 years and have advanced industry understanding and practice considerably over this period. Hawaiian Electric also recognizes that its situation is different than these utilities and has modified the practices accordingly, particularly given the relative size of Hawaiian Electric's service territory and wildfire risk areas, customer base, environmental risk drivers and resources. Recognizing the continued evolution of wildfire risk management and the need to tailor practices to its service area, Hawaiian Electric is participating in an array of industry associations, industry events and working groups to share and benefit from lessons learned that will evolve its practices. Further details of Hawaiian Electric's outreach efforts can be found in Section 4.8.3 and 4.8.4.

2 WILDFIRE RISK MAP

A wildfire risk map is a tool used to evaluate and prioritize the level of risk within a utility's service territory. The map indicates where risk is the highest, and therefore where risk mitigations may be the most effective. The map is used to inform the prioritization of activities and guide operational activities like vegetation management and asset inspection programs.

Hawaiian Electric first introduced the concept of a wildfire risk map in its initial Wildfire Mitigation Plan, where an "Ignition Density Map" obtained from the Pacific Fire Exchange[13] was used to inform ground and unmanned aircraft system inspections of Hawaiian Electric facilities and surrounding vegetation performed for wildfire mitigation planning. The IAP transitioned to maps produced by DLNR-DOFAW. These maps identify at-risk wildland-urban interface communities on the major Hawaiian Islands and were originally developed in 2007 and updated in 2021. As described in the IAP, Hawaiian Electric augmented the DLNR maps to account for Hawaiian Electric's overhead lines. The augmented maps were used to focus wildfire mitigation efforts while utility specific maps were being developed.

Hawaiian Electric has developed new wildfire risk maps, as shown in Appendix D, for its service territory that now reflect three geographic tiers of wildfire risk: low, medium, and high risk. The following provides an overview of the wildfire risk map(s) development.

2.1 Background and Purpose

Understanding wildfire risk on the landscape helps to inform wildfire mitigation efforts. Wildfire risk varies across the utility's geographic operating territory and is specific to the fuels, terrain, fire behavior patterns, prevalent weather patterns, proximity of developed areas (e.g., wildland-urban interface), and other key criteria. As such, Hawaiian Electric has developed a geospatial wildfire risk map specific to its service territory to better understand fire risk on the landscape and prioritize and operationalize wildfire mitigation efforts.

The purpose of the wildfire map and associated risk tiers is to delineate areas within the operating territory that are susceptible to high intensity, severe wildfire behavior, and are based on potential damages should a wildfire originate or burn in the vicinity. The higher the rating, the greater the potential damage. The wildfire risk tiers are foundational references that support multiple activities and functional areas and can provide

[13] Maps and related information available from https://pacificfireexchange.org/map_tool_topic/wildfire-ignition-density-maps-for-hawaii.

guidance and insight when developing measures for mitigating utility-related ignitions and improving system resilience to outside wildfire threat.

2.2 Baseline Data

The raw data sets utilized to develop the wildfire risk maps were obtained from the Pacific Fire Exchange, LANDFIRE (multi-agency federal wildfire vegetation resource), and the State of Hawaiʻi DLNR. The following information, sourced from public domain resources, provides a brief overview of these organizations and data sources:

- The Pacific Fire Exchange is part of the Joint Fire Science Program (JFSP) – Fire Science Exchange Network.[15] The JFSP provides scientific study funding associated with managing wildland fuels, fires, and fire-impacted ecosystems. The Pacific Fire Exchange is one of fifteen Fire Science Exchanges and is comprised of a partnership between the Hawaiʻi Wildfire Management Organization (HWMO) and the University of Hawaiʻi at Mānoa. Hawaiian Electric sourced historic ignition points and fire perimeter data from the work performed by the Pacific Fire Exchange. Additionally, the HWMO has many academic and historical discussions regarding fire risk that were used in building knowledge of risk for the Hawaiian Islands.
- LANDFIRE is an interagency vegetation, fire and fuel characteristics mapping program sponsored by the Wildland Fire Leadership Council.[16] Principal partners are U.S. Department of the Interior (U.S. Geological Survey and the Office of Wildland Fire), the U.S. Department of Agriculture Forest Service and The Nature Conservancy. Hawaiian Electric sourced vegetation and vegetation classification data from LANDFIRE resources. The LANDFIRE fuel data describes the composition and characteristics of both surface fuel and canopy fuel, and includes fire behavior fuel models, canopy bulk density, canopy base height, canopy cover, canopy height, and fuel loading models.
- The State of Hawaiʻi DLNR is statutorily mandated to take measures for the prevention of wildland fires within the DOFAW managed lands and to cooperate with county and federal fire agencies in developing plans and programs for prevention assistance of wildfires on lands not managed by DOFAW. DLNR supports the creation of Community Wildfire Protection Plans[17] by identifying and developing maps of communities at risk from wildfires. The DLNR Maps are complementary maps to Hawaiian Electric's wildfire risk maps and provide a community-centric assessment of wildfire risk. Hawaiian Electric utilized the DNLR maps for interim and confirmatory wildfire risk assessment information.

---

[15] Additional information on the Fire Science Exchange Network may be obtained at https://www.firescience.gov/ords/prd/jf_jfsp/jf_jfsp/r/jfspublic/jfsp-exchanges.

[16] Reference Landfire FactSheet - https://www.landfire.gov/sites/default/files/documents/fs20233044.pdf.

[17] Current Community Wildfire Protection Plans are available at https://dlnr.hawaii.gov/forestry/fire/community-risk-reduction/community-wildfire-protection-plans/.

The raw data sets described above were utilized to define the wildfire risk areas and the associated wildfire risk tiers. The following data layers were leveraged in the development of the wildfire map tiers.

2.2.1 Ignition Points and Fire Perimeter Data

Data sets obtained through the Pacific Fire Exchange included historic ignition points and fire perimeter data. As described on its website, the ignition point data provides locations of wildfires recorded for the main Hawaiian Islands for 2005 through 2020. The data set combines fire record data from Hawai'i's four county fire departments (Hawai'i County, Maui County, Kaua'i County, and Honolulu City and County), the DOFAW, and the National Park Service. Figure 2-1 provides an overview of Pacific Fire Exchange ignition point source data.

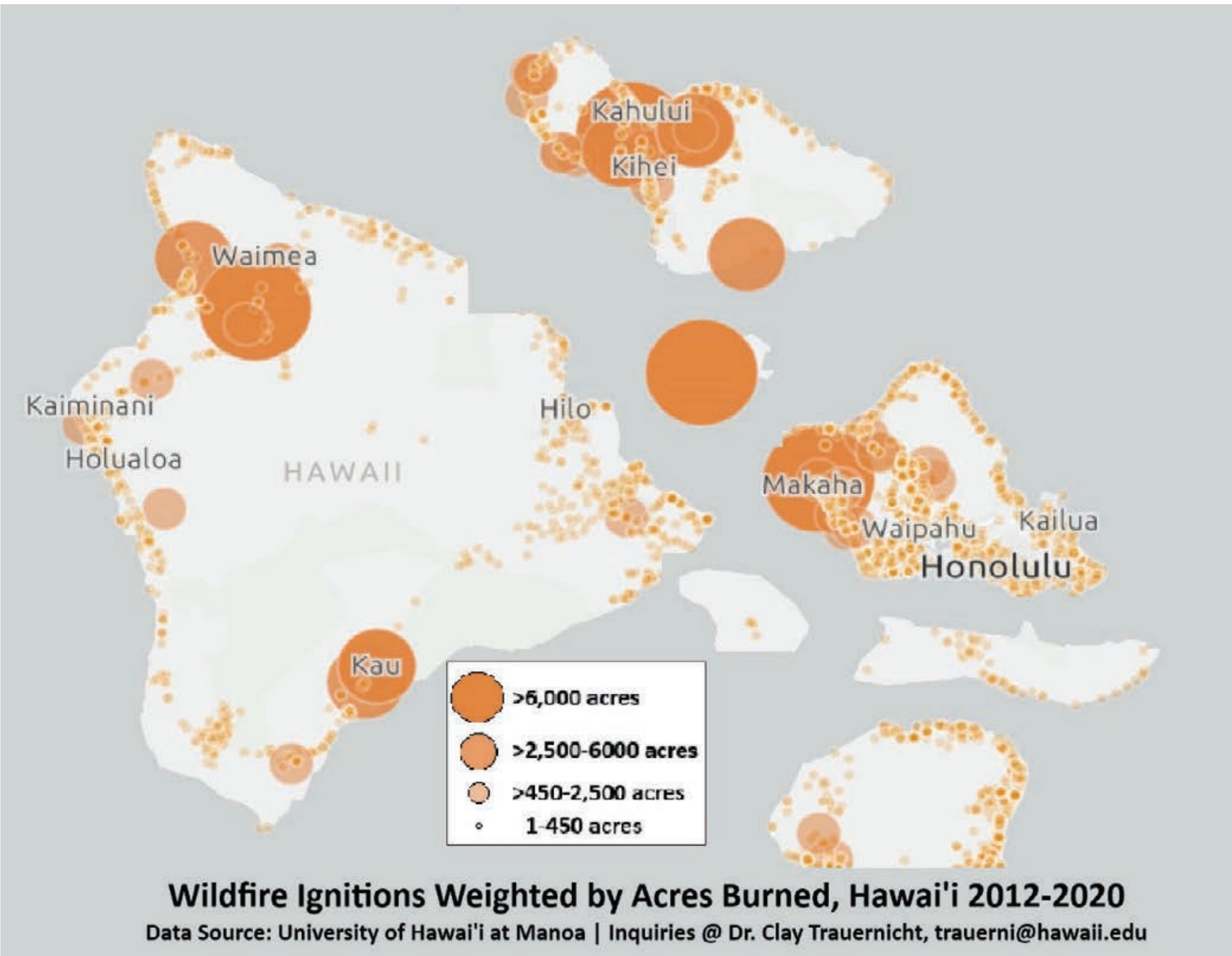


Figure 2-1. Historic ignitions point source data

Pacific Fire Exchange provides information related to the size of historic wildfires. The data set is comprised of polygons of wildland fire perimeters for the main Hawaiian Islands from 1999 to 2022. It compiles prior mapping efforts by different organizations with fires mapped from 2012 onwards and was led by Dr. Clay

Trauernicht in the Department of Natural Resources and Environmental Management at the University of Hawaiʻi at Mānoa. Figure 2-2 provides an overview of Pacific Fire Exchange wildfire perimeter data.

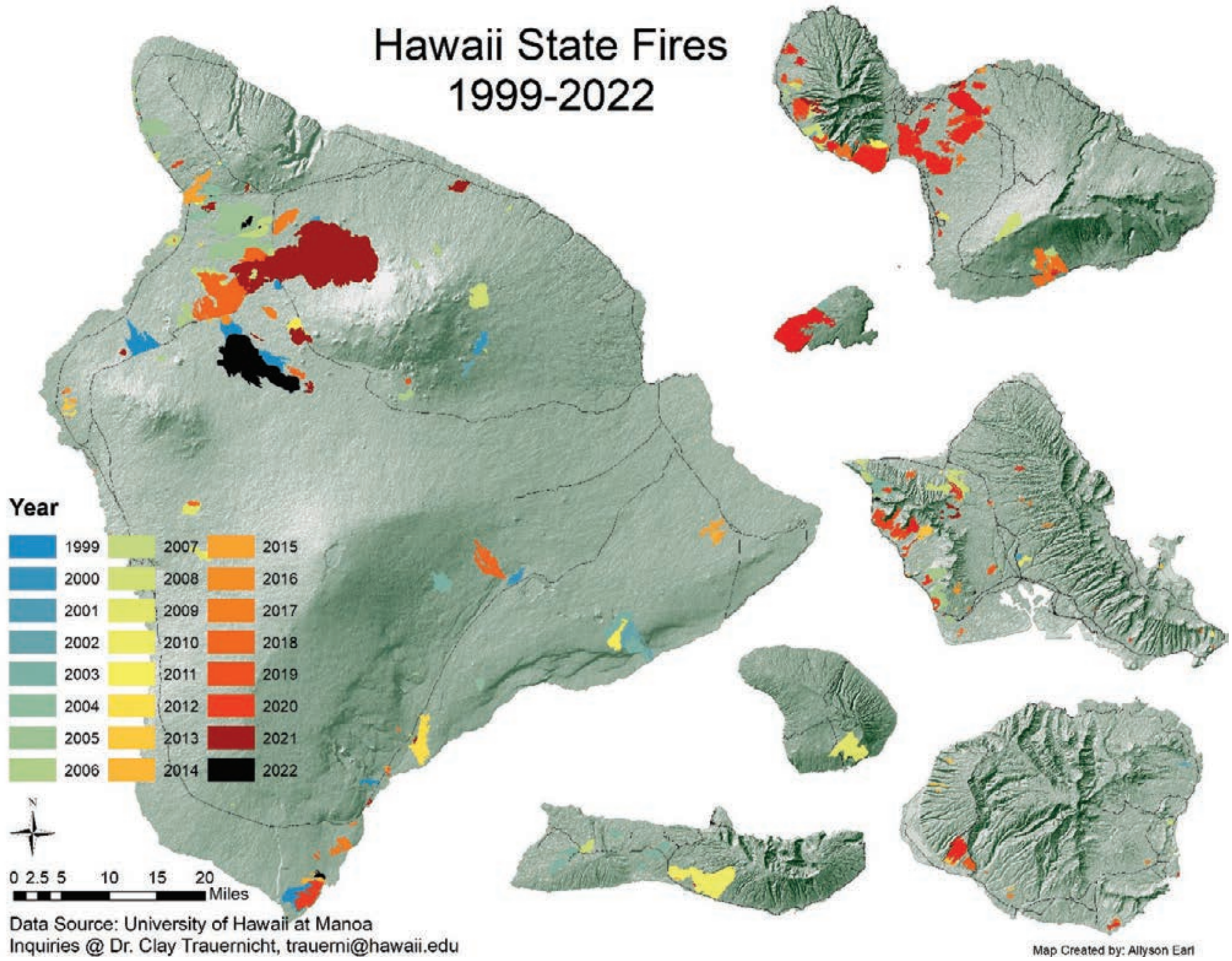


Figure 2-2. Historic Hawaiʻi wildfire perimeter data

2.2.2 Vegetation Classification Data

Although other data sets were considered in the process, that provided by LANDFIRE was selected. This data set is known as Existing Vegetation Type (EVT), described as follows: "LANDFIRE's Existing Vegetation Type represents the current distribution of the terrestrial ecological systems classification, developed by NatureServe for the western hemisphere."[18] The Hawaiʻi vegetation classification data is included in Figure 2-3.

[18] See, https://landfire.gov/vegetation/evt.

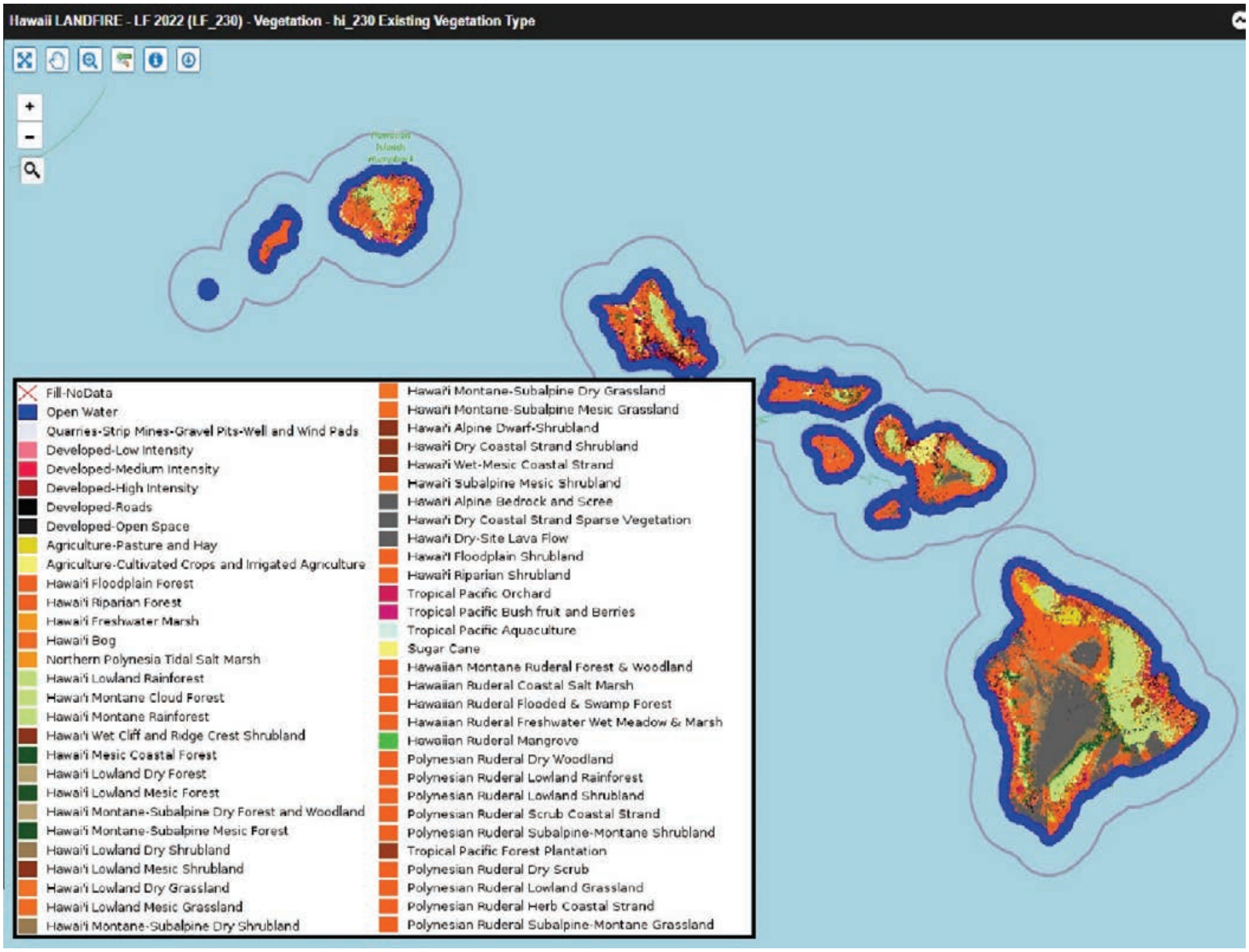


Figure 2-3. Hawai'i vegetation classification data
https://www.landfire.gov/viewer/

2.2.3 DLNR Community Risk Maps

The HWMO develops Community Wildfire Protection Plans (CWPPs) for various communities. The CWPPs are developed and updated with guidance and support from government agencies and representatives, community members, local organizations, and decision makers concerned about wildfire issues. The DLNR is a key partner to the HWMO in carrying out the CWPP process.

The DLNR supports the creation of CWPPs by identifying and developing maps of communities at risk from wildfires. Map boundaries depict the areas determined by DLNR-DOFAW to have similar features in terms of wildfire hazard characteristics, and categorize communities into high, medium, or low risk based on:

1. Historical fire occurrence.
2. Fuel conditions on the landscape and surrounding community.
3. Human and economic values associated with the community (e.g., homes, business, community infrastructure, areas of high historical, cultural or spiritual significance).

4. Wildland fire protection capabilities, such as the capacity and resources of all agencies and organizations with jurisdiction to undertake fire protection measures.

DLNR's maps do not capture the locations of electrical infrastructure running just outside community boundaries that could potentially pose an ignition risk. However, they provide an assessment of wildfire risk in the communities served by Hawaiian Electric. Figure 2-4 shows the relevant maps of communities at risk from wildfire as developed by the DLNR.

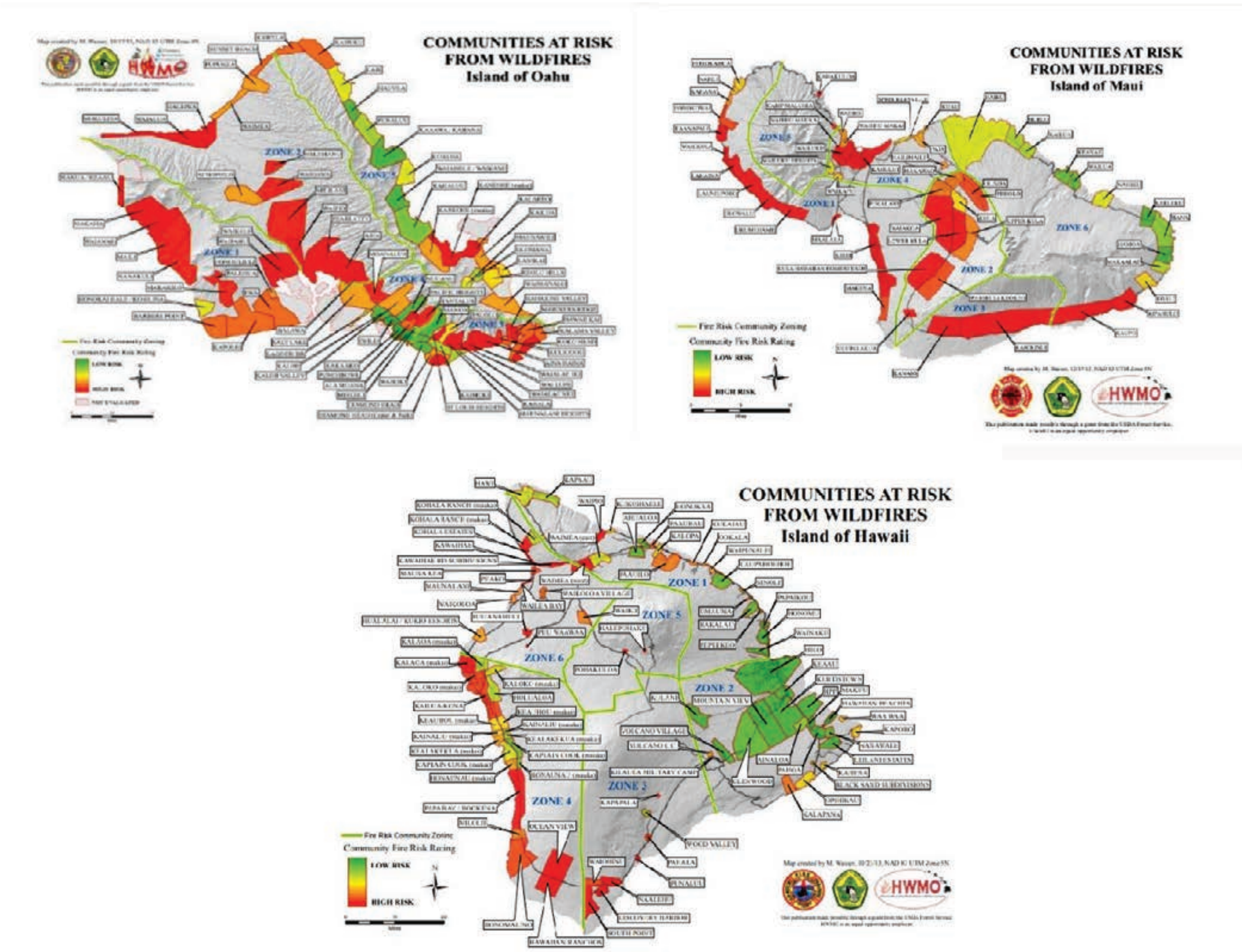


Figure 2-4. DLNR community wildfire risk data

2.3 Overview of High Wildfire Risk Areas

Hawaiian Electric assessed the wildfire risk for its service territory by evaluating the data resources presented above. The risk assessment process was stepwise and applied to each island served by Hawaiian Electric. The following provides a summary of the wildfire risk area assessment process:

1. Vegetation Types and Locations – Hawaiian Electric evaluated and plotted vegetation types in its geospatial tools using the LANDFIRE data sets. The data sets were comprised of nearly 55 vegetation types.

2. Fire history and ignition locations – Hawaiian Electric overlayed fire history, size, and available ignition locations on the vegetation maps. The fire history used was primarily from Pacific Fire Exchange that was available at the time spanned from 1999 through 2022. Additionally, large fires that occurred in Hawaiʻi in 2023 were also included in that analysis.

3. Vegetation Fire Risk – Hawaiian Electric analyzed the fraction of total fires associated with each vegetation type over the time period to identify potential high wildfire risk areas. These vegetation types were grouped into four color categories and incorporated into the service territory maps:

    a. Red – The vegetation type(s) where over 10% of that vegetation type had burned since 1999.

    b. Orange – The vegetation type(s) where over 5% of that vegetation type had burned since 1999.

    c. Yellow – The vegetation type(s) where over 1% of that vegetation type had burned since 1999.

    d. No Color – The vegetation type(s) where less than 1% of that vegetation type had burned since 1999.

    Example: Assume that a certain vegetation type is present in 10,000 acres. If 400 of those acres have burned since 1999, that vegetation type would be colored yellow because 400/10,000 acres = 4%; and the color yellow is used when that burn percentage is between 1% and 4.99%.

    The review of vegetation types and their relationship to historical burns provides valuable insights in a few ways. Firstly, because Hawaii's vegetation is highly correlated to the climate where the vegetation grows, this study helps to identify the climate conditions in an area. Secondly, the amount of fire history of a specific vegetation type gives insight into which vegetation is more likely to allow for the spread of fire. As expected, the drier areas which contain the invasive grasses are more prone to fire growth. Therefore, the study of vegetation types mentioned above indicates where one would expect future fire growth to be more frequent, and of larger size.

    An additional insight gained from this study relates to the concept of vegetation as fuel, and its regrowth. Fires that burn through forests can change that vegetation type for years, by reducing the fuel significantly, and it may take decades to return the trees to their pre-fire abundance. Grasses, on the other hand, can grow back very quickly, even as quickly as one year. So, unfortunately, a grass fire in a given year, can lead to a grass fire the very next year. This indicates the majority of fires in Hawaiʻi don't clear fuel for long periods of time.

4. Hawaiian Electric deployed subject matter experts in transmission and distribution and utility vegetation management, including certified arborists, to field validate the wildfire risk maps. The field validation used a random sampling program to physically confirm the location of Hawaiian Electric assets and relative vegetation types for higher risk areas. Adjustments to the tier-based maps were made to reflect field observations, as appropriate.

An example of the wildfire risk map analysis is depicted in Figure 2-5, with enhanced resolution provided for O'ahu.

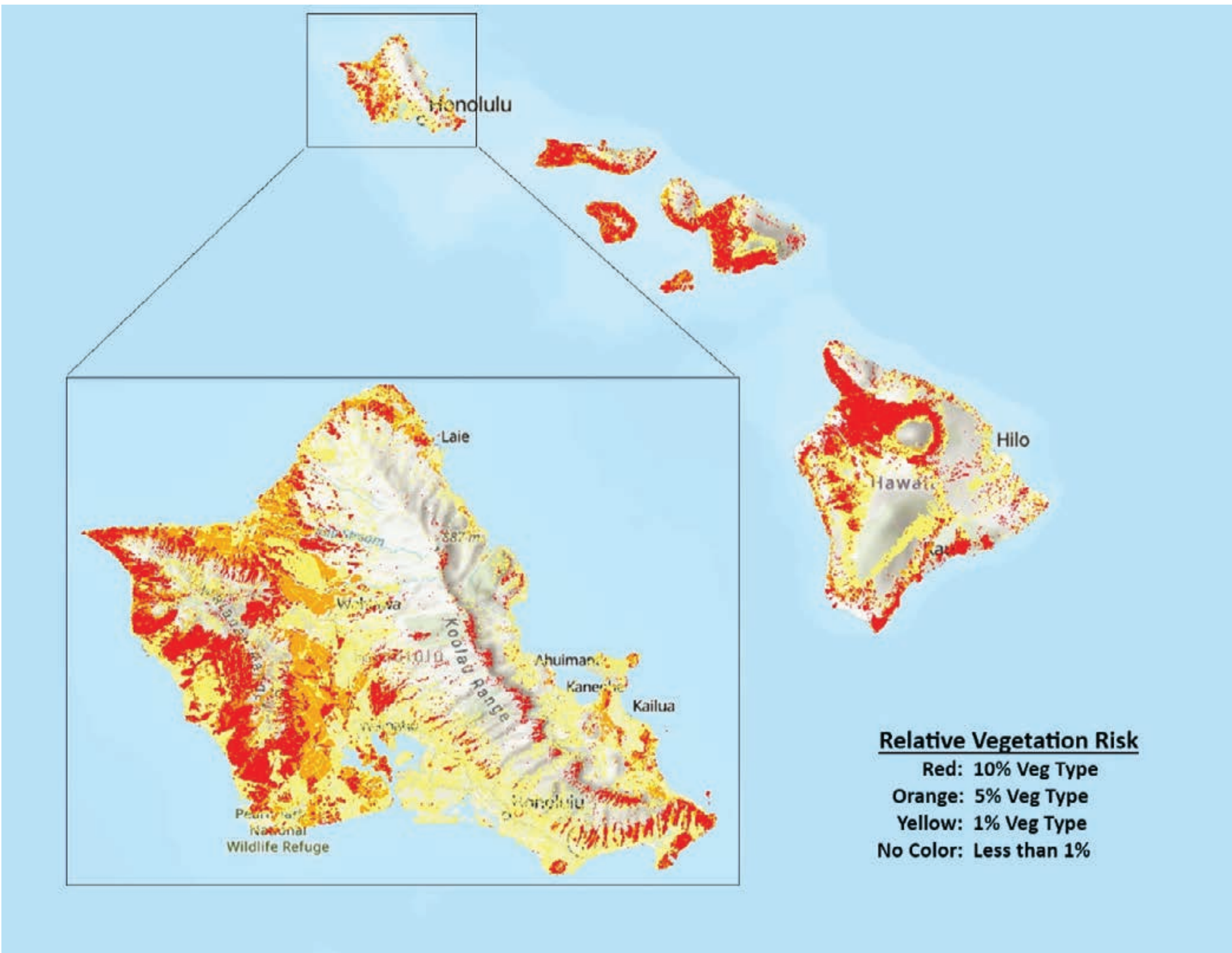


Figure 2-5. Relative vegetation wildfire risk data

With potential risk areas defined, Hawaiian Electric further reviewed its service territory using satellite imagery to visually confirm that vegetation types were accurately represented. Hawaiian Electric then overlayed its infrastructure, including transmission, distribution, substations and generating facilities, on the maps to tailor the risk assessment to the system.

2.4 Overview of Fire Risk Tiers

Hawaiian Electric’s wildfire risk tiers were created to turn the more granular geospatial wildfire risk areas into larger polygons that consider Hawaiian Electric’s infrastructure, trade winds, and the DLNR’s community risk assessments. At a summary level, the wildfire risk tiers are divided into three categories:

Low Wildfire Risk Area or LWRA (Tier 1): Includes areas of more frequent rainfall and lower probability of seasonal droughts (windward sides of elevated terrain), contains vegetation not associated with historic fires, and also includes areas of human development and disturbances that reduce the likelihood of a large, destructive wildfire. A catastrophic wildfire is still possible in areas designated as low depending on severity of conditions and fire suppression resource availability.

Medium Wildfire Risk Area or MWRA (Tier 2): Includes areas where wildfire may cause significant damage to human infrastructure due to fuel continuity and/or terrain. This includes contiguous areas of “orange” as shown in Figure 2-5, that have experienced a historical wildfire. It also includes any contiguous areas of “red” vegetation not included in the high-risk area as described below. The resulting wildfire may be less likely to develop substantial momentum depending on severity of conditions and fire suppression resource availability.

High Wildfire Risk Area or HWRA (Tier 3): Areas that have fuel continuity and population density such that a wildfire has a higher likelihood to become a large destructive or catastrophic event. The high-risk areas consider trade wind direction and speed with the presence of transmission and distribution infrastructure. This includes contiguous areas of “red” vegetation as depicted in Figure 2-5, electrical infrastructure nearby or directly to the northeast, and community(s) or resources in that are or directly west or southwest.

Hawaiian Electric hosted a Wildfire Safety Symposium in April 2024 to engage with governmental agencies, public safety partners, community leaders, emergency and first responders, and other stakeholders regarding WSS initiatives and to create a working group for future collaboration. As part of the Wildfire Safety Symposium, Hawaiian Electric discussed its wildfire risk mapping efforts and solicited input regarding known wildfire risks, community values, and other related concerns and topics. To the extent practicable, Hawaiian Electric has incorporated those observations into its wildfire risk maps which were presented to the working group in July 2024. Details of the feedback can be found in Appendix A. The finalized maps resulting from this collaborative process were used in the operational studies, presented below.

2.5 Operationalized Wildfire Risk Map

The nature of the data forming the tier-based maps can result in areas where multiple risk categories are located in close proximity to one another. In some cases, an individual polygon may be completely surrounded by a different risk category. Such patchwork maps can be operationally challenging and confusing to utility field personnel due to frequent and abrupt changes in risk categories over short distances in which differing inspection standards and programs may apply.

To enhance the effectiveness of the map, Hawaiian Electric refined the tier-based map to create an operationalized wildfire map. The operationalized wildfire map is a wildfire risk map with homogeneous areas of risk categorization designed to enhance operational efficiency and streamline the implementation of programs and technologies across the Hawaiian Electric's system. For example, if a distribution feeder is located in an area predominately categorized as HWRA with small amounts of MWRA and LWRA, the entire risk area surrounding the distribution feeder was adjusted to "High." From an operational perspective, any activity undertaken by Company personnel in that area would be treated as if it were "High" risk, regardless of the designation of each individual hexagon in the original tier-based map. The operationalized maps depicting the three tiers of wildfire risk, can be found in Appendix D.

This three-tier geographic risk system will provide for a more focused and efficient utilization of risk-reducing resources, as well as facilitate an organized rollout of programs that emphasize the highest risk areas in Hawaiian Electric's service territory.

Table 2-1. Transmission and Distribution circuit miles by tier

Distribution (circuit miles)			
District	**HWRA overhead**	**MWRA overhead**	**LWRA overhead**
Hawai'i Island	107	390	1,582
Lana'i	0	25	13
Maui	205	96	283
Moloka'i	7	135	6
O'ahu	39	86	1,074
Transmission (circuit miles)			
Hawai'i Island	90	169	376
Lāna'i	0	0	N/A
Maui	134	34	73
Moloka'i	0	15	N/A
O'ahu	40	76	604

3 RISK MODELING AND MITIGATION ASSESSMENT

To support a thoughtful, risk-informed approach to the 2025-2027 WSS, Hawaiian Electric developed an initial wildfire risk model to 1) estimate current wildfire risk and 2) estimate the effectiveness of certain mitigations to reduce that risk. These two outputs from the risk model provide directional guidance that informs Hawaiian Electric's 2025-2027 action plan in a manner that balances reducing risk, customer affordability, and reliability concerns.

The term "risk model" is used to refer to the collection of analyses for this subject that includes the Quantitative Risk Framework (depicted below in Figure 3-1) and various analyses that work together to achieve the two goals listed above. Risk models have been used in various industries and settings for a long period of time, but those that focus on wildfire risk at electric utilities are relatively new, being used predominately over the past decade.

Wildfire risk models use a combination of actual data, estimated data, and assumptions provided by internal and external subject matter experts (SMEs) to quantify risk and help guide risk mitigation prioritization processes. The accuracy of the model is highly dependent upon the availability and quality of the data, and as described herein, the availability of actual data is limited at present. Various programs contained in this WSS are designed to expand data collection and improve data quality over time, allowing for continual improvements to the risk model. The initial risk model focused on calculating risk associated with overhead portions of individual distribution feeders and risk reduction associated with EFT, PSPS, and system hardening. Other mitigation measures such as asset inspections, vegetation management, and enhanced situational awareness are recognized as contributing to risk reduction through estimated impacts at the system level, but have not been subject to risk analysis or calculations at the feeder level. The model does not quantify the customer impacts of individual mitigation measures such as EFT and PSPS.

The initial risk model reflects and incorporates multiple processes Hawaiian Electric undertook to assess risk, identify risk areas, and field validate risk and potential mitigations. Hawaiian Electric engaged in three main workstreams – development of wildfire risk maps as described in Section 2, interviews of Hawaiian Electric personnel along with field investigations, and risk model development through gathering of operational data. Figure 3-1 depicts the relationship of the various activities that influence the risk model and associated mitigation results.

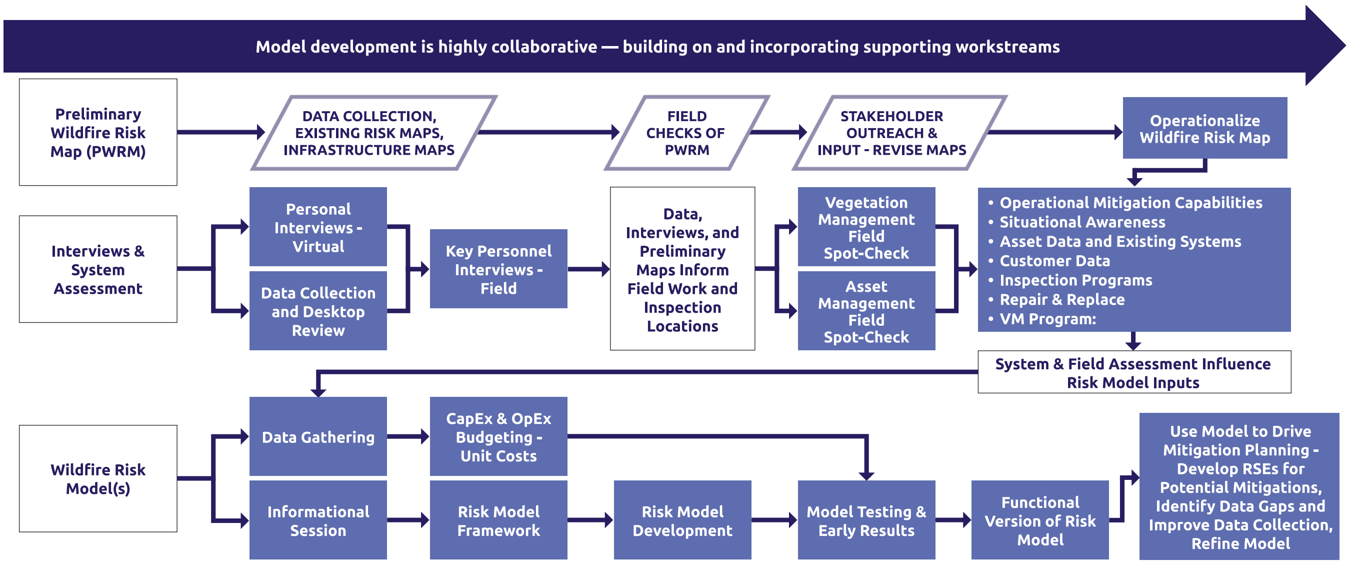


Figure 3-1. Multiple Processes were undertaken to develop the model(s).

3.1 Summary of Risks

Wildfire risk across Hawaiian Electric's service territory is not uniform. Hawaiian Electric's initial risk modeling indicates that a majority of the risk is contained in a relatively small number of distribution feeders located in high wildfire risk areas. As shown in Figure 3-2, the initial risk model indicates that an estimated 65% of wildfire risk is attributable to 20 distribution circuits out of 716 distribution circuits across Hawaiian Electric's service territories. It is currently estimated that the transmission system accounts for 20% of the estimated total wildfire risk.

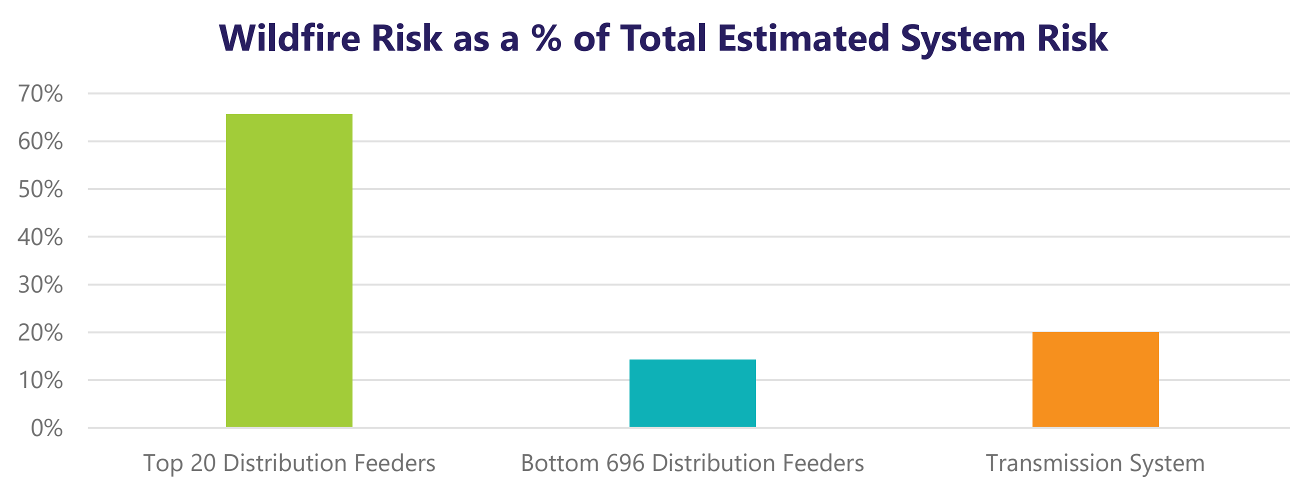


Figure 3-2. Distribution feeders and transmission system wildfire risks.

Figure 3-3 illustrates the estimated risk reduction based upon the covered conductor, initial targeted undergrounding, and EFT mitigations that Hawaiian Electric is currently targeting as part of this 2025-2027 WSS, along with other mitigation measures being deployed, such as the IAP.

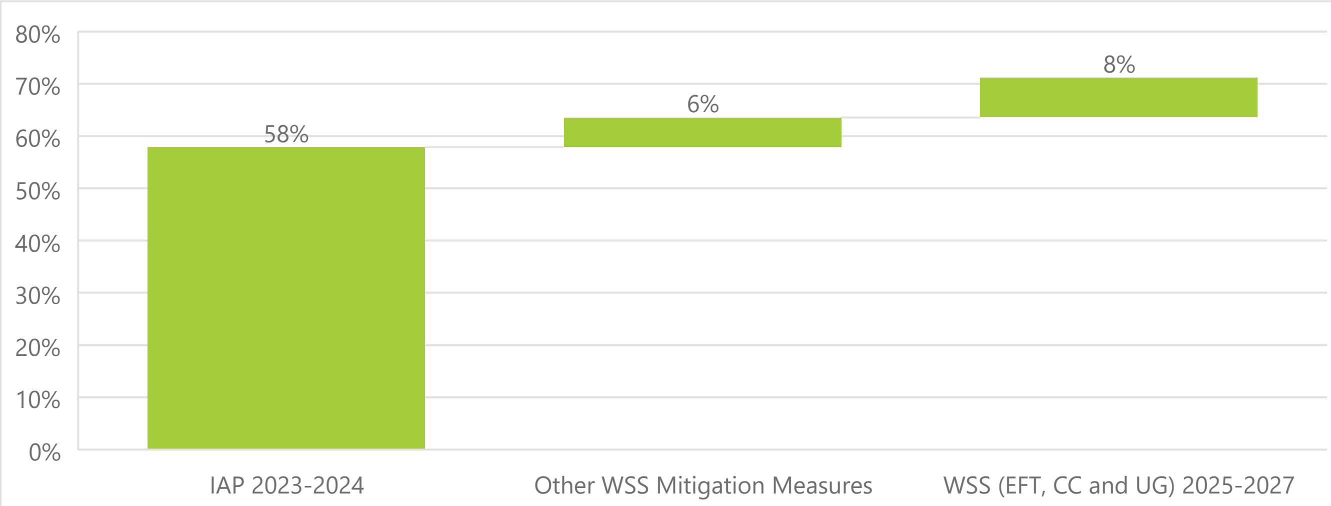


Figure 3-3. Currently Estimated Wildfire Risk Reduction due to the IAP and 2025-2027 WSS

The "IAP 2023-2024" represents IAP work that has been completed through the end of 2024 (e.g., the IAP work as described in Section 1.4.2). The "Other WSS Mitigation Measures" are mitigations that are currently targeted to be deployed in 2025 that build upon IAP work in 2024, such as, vegetation management, asset inspections, expulsion fuse replacements, lightning arrester replacements, among others. Finally, the "WSS (EFT, CC and UG) 2025-2027" category in the figure represents measures in this WSS that are evaluated by the risk model and are currently targeted for implementation in this 2025-2027 WSS. This includes risk reduction from PSPS, EFT, covered conductor and initial Targeted Undergrounding. As a result, based on the current workplans targeted as described in this WSS, it is estimated that by the end of 2027 wildfire risk due to utility equipment may be reduced between 68-72% compared to prior to implementation of the IAP. The range represents an estimated risk reduction based upon the currently targeted range of covered conductor that Hawaiian Electric may reasonably install by the end of 2027. More details on the currently estimated range of mitigation measures are discussed in Section 5.1. Hawaiian Electric may update the currently estimated risk reduction due to the WSS as part of its annual updates to the Commission starting in December 2025.

Table 3-1 lists IAP work that will be completed before the end of 2025. These values are the sum of the first two columns in Figure 3-3 above.

Table 3-1. Hawaiian Electric Wildfire Risk Reduction Estimates of Measures Applied System-wide

Program	Wildfire Risk Reduction %
EFT implemented as of December 2024	29%
2024 PSPS program (residual of EFT)	17%
Transmission Improvements	7%
2024 Vegetation Management Improved	4%
2024-25 Immediate Action Plan work-Distribution	4%
2024-25 Immediate Action Plan work-Transmission	1%
WSS Future (2025-27) Transmission work	1%
Residual Before WSS - Distribution Mitigation	**64%**

3.2 Quantitative Risk Framework

Hawaiian Electric developed an initial risk valuation method called a Quantitative Risk Framework, which considers various impacts from a wildfire and develops a way to quantify those impacts in a manner that allows for comparison across key attributes.

The main components of the Quantitative Risk Framework are: 1) a model for estimating the total average wildfire risk (estimated total wildfire risk or ETWR) at Hawaiian Electric, 2) a Feeder Risk Model that is used to estimate wildfire risk at each distribution feeder to evaluate various mitigations, and 3) to compare various mitigations and their risk spend efficiency (i.e., risk reduction benefit to cost ratio). Figure 3-4 shows the range of inputs, the Quantitative Risk Framework and key results derived from the initial risk model.

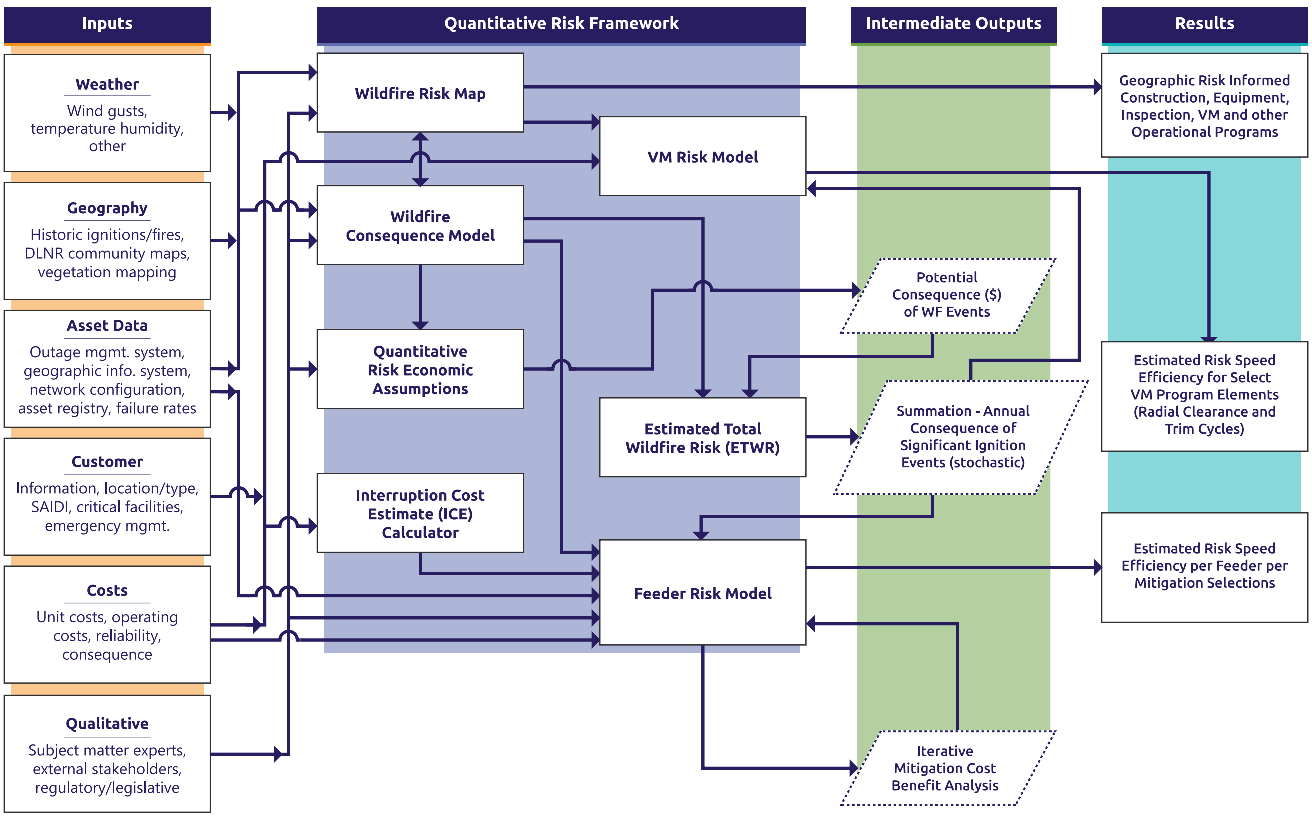


Figure 3-4. Quantitative Risk Framework Schematic

The wildfire risk assessment provides useful data to directionally inform Hawaiian Electric's mitigation and investment decision-making by estimating cost-benefit, where "benefit" is estimated by the amount of annual average risk reduction over the life of the mitigation. While the overall wildfire risk assessment data informs the mitigation approach, operationalizing the risk model results into actual projects depends on qualitative factors (as described in Section 3.7). The following sections provide additional detail regarding the risk model components.

3.2.1 Model Inputs

Weather: Weather information is indirectly incorporated into the risk model via the Wildfire Risk Map, where it was used to understand how wind patterns could affect both the electric infrastructure and the spread of an ignition, if one were to occur. Future versions of the risk model may contain more granular usage of wind data in order to estimate the likelihood and consequences of wildfire risk at various wind speeds. The fire spread model that is used to inform consequences at various locations if an ignition were to occur uses "worst case" wind speeds and humidity levels.

Geography: Geographic information is indirectly incorporated into the risk model via the Wildfire Risk Map. Geographic-based data such as fire history and vegetation were used to generate the tiered Wildfire Risk Map. The tiers are then used in the risk model to better allocate estimated risk across the distribution feeders.

Asset Data: Asset Data is used throughout the risk model to estimate wildfire risk as well as to understand the scope/scale of certain mitigations. For example, the cost of performing covered conductor projects on a particular feeder is directly related to the number of miles of conductor on that feeder. Additionally, the benefit of installing covered conductor is based on the current risks on that feeder, and estimating how covered conductor will lower that risk. This analysis is performed by analyzing the historic outages on that feeder and determining the lower likelihood of those types of outages occurring if covered conductor were to be installed. Five-year historical outage data by feeder was used for this analysis.

Customer: In this initial risk model, customer counts are used to understand the impact of outages. The model uses the standard electric reliability metric of System Average Interruption Duration Index (SAIDI) to measure both the impact from historical outages and how those outages will be reduced with mitigations. As the sole focus of this current risk modeling effort was on wildfire risk and risk reduction, Hawaiian Electric is not currently using customer reliability (improvements) to prioritize wildfire mitigations. However, as highlighted in the 2025-2027 action plan, there are a number of measures being taken to reduce reliability impacts to customers.

Costs: The costs of various mitigations are important inputs to the risk model. Each mitigation has assumptions about unit cost that are based on Hawaiian Electric's past experience with implementing similar projects. For example, covered conductor cost, depending on circuit topology, ranges from $1.2 to $1.8 million per mile and the cost of undergrounding is assumed to be $11 million per mile. These cost estimates are then used in the risk spend efficiency formulas.

Qualitative: Risk considerations cannot always be quantified with precision. There are occasions when human judgment is necessary. For example, the creation of the Quantitative Risk Framework itself is built by applying human judgment to which metrics will be considered for assessment, and also which data sources to use to make those assessments.

Wildfire risk map: See Section 2 for a complete discussion of the Wildfire Risk Map. The map was developed to assist in operating and construction actions; notably for PSPS, equipment asset inspections, vegetation management, and assistance to the risk model, among others. The tiered map (High, Medium, Low) helps Hawaiian Electric develop guidelines and standards. For example, the vegetation management program will be stricter (i.e., more trims, more frequent inspections) in the HWRA compared to LWRA.

3.2.1.1 Distribution Outage Risk Drivers

As noted earlier in Section 3.2.1, asset data was used to provide key inputs to the quantitative risk framework. Historical distribution outages provide data in identifying risk drivers for potential ignitions from electric facilities. Historical outage data was used as a proxy for ignition data to estimate frequency of ignition. Hawaiian Electric is currently improving tracking of ignitions to allow for refined analysis of ignition risk as described in Section 5.2.

The selection of system hardening measures for analysis started with extensive benchmarking across utilities actively implementing wildfire risk management programs. This benchmarking identified the wildfire risk management programs commonly included a portfolio of system hardening measures to reduce the potential for power line caused ignitions.

The most common system reconstruction hardening measures used across the industry are:

- Replacement of existing bare overhead conductor with covered conductor
- Replacement of existing overhead lines with underground lines.

The next step in the process was to identify the system hardening measures most closely matched to power line caused ignition risk in Hawaiian Electric's service area. This step was accomplished by mapping outage causes in a manner that provides the number of historical outage events where system hardening measures may avoid an ignition.

Hawaiian Electric analyzed information recorded in Hawaiian Electric's outage database including the Outage Category, Sub-cause, and Description fields to identify categories of causes of distribution system outage events in the five-year period from 2019 through 2023 that occurred on its overhead system in HWRA. Figure 3-5 shows the results of that analysis.

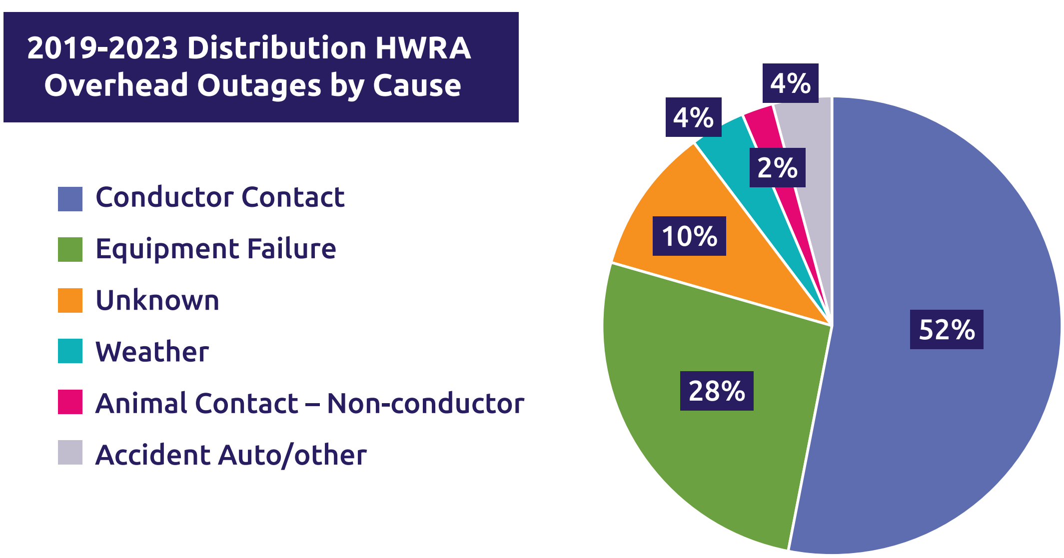


Figure 3-5. 2019-2023 Overhead Distribution Outages by Cause in HWRA

Industry benchmarking has shown that undergrounding projects can mitigate most overhead outage causes that may result in ignition. Covered conductor projects can mitigate outages caused by conductor contact, conductor related equipment failures, weather, animal contacts with equipment and other conductor outage causes that may also result in ignitions.

3.2.2 Risk Attributes

As part of the Quantitative Risk Framework, Hawaiian Electric selected quantifiable risk attributes that would keep the analyses straightforward, transparent, and consistent. This principle led to the inclusion of structures destroyed and acres burned as potential risk attributes, that are based upon fire spread modeling and simulations. Table 3-2 displays the attributes and associated reasonable high-level assumptions incorporated into the Quantitative Risk Framework for the initial modeling. The "Score" listed in the table is equivalent to a monetary value of $10,000 per unit (e.g., $10,000 per acre, $1 million per structure). Other potential risk attributes that are not easy to objectively and separately quantify at this point are not included in the risk model.

Table 3-2. Quantitative Risk Framework (Multi-attribute function)

Attribute	Unit	Value	Score
Structures Destroyed	1 Structure	$1,000,000	100
Acreage Burned	1 Acre	$10,000	1

The attributes used in the Quantitative Risk Framework are meant to capture the broader societal impact from wildfires, as opposed to direct impacts to Company assets. For example, "Structures Destroyed" refers to structures (or buildings) within the general community, not specifically Company-owned structures. These attributes are discussed in more detail below.

The attributes reflected in the table above do not represent all quantifiable risks from wildfire. As Hawaiian Electric gains further experience and gathers targeted data additional attributes may be considered for future model iterations.

Acres Burned: This attribute is a reasonable high-level assumption as to the societal costs for each acre burned. The values used were chosen based on reviewing historical impacts from medium to large fires in the western United States. The consequences include ecological impact, fire suppression costs, lost revenue, and air pollution. Importantly, it does not capture the cost of structures that reside in the acre, which is estimated through the Structures Destroyed attribute. For the purposes of risk modeling, the number of acres burned is estimated through forecasted fire spread modeling, which varies by time, location, and weather. While different acres of land may have different values of impact that depend on many factors, for purposes of this analysis, all acres are given the same valuation. The Quantitative Risk Framework score of "1 per acre" has a financial equivalent of $10,000 (without structures) – a value that provides a high-level assumption of the costs associated with damage from wildfire. Note that this value may be refined in future model iterations and in response to new data.

Structures Destroyed: This attribute is a reasonable high-level assumption as to the societal costs from a structure burning and associated infrastructure being destroyed. The value used is applied equally per structure, is intended to be an average value across the service territory and does not differentiate by commercial versus residential structures. The value does not consider the size of the structure nor the specific property values of any region within the Hawaiian Electric service territory so that the model is not biased toward one community over another. For the purposes of risk modeling, the number of structures destroyed is estimated through forecasted fire spread modeling, which varies by time, location, and weather. The Quantitative Risk Framework score of “100 per structure” has a financial equivalent to $1,000,000 – a value that provides a high-level assumption of the costs associated with damage from wildfire. Due to the definition of what a “structure” is, there are many smaller structures that get included by fire agencies in structure counts. These smaller structures, such as sheds or garages, typically have lower values than residential structures. The $1,000,000 is meant to be an average of all structures. Note that this value may be refined in future model iterations and in response to new data.

3.3 Estimated Total Wildfire Risk

Estimating the total risk associated with wildfires (top-down analysis) is a component to evaluating the effectiveness of mitigation strategies and serves as the starting point to determine the degree that potential mitigations can reduce risk.

For quantification purposes, the risk level is discussed in the context of the “expected value” of the risk in a single year. The technique of applying a top-down analysis to risk modeling has been used at various utilities in the western United States for their wildfire risk analysis. As more data is gathered it may be possible to rely less on a top-down method.

As shown in Figure 3-6, the top-down analysis is then combined with a bottom-up analysis at a feeder level to estimate risk at a more granular level to assist in prioritization of mitigation efforts at the feeders with a higher estimated wildfire risk. The values can be thought of as the conditions present at the end of the year 2023.

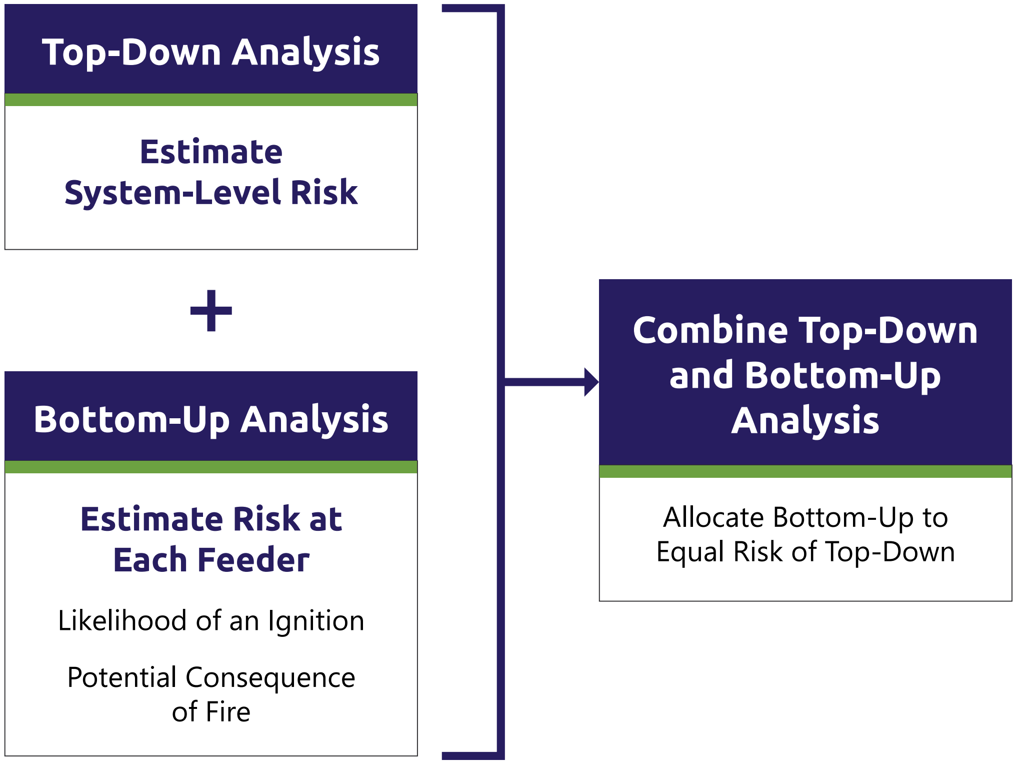


Figure 3-6. Overview of combined top-down and bottom-up approach

Estimated total wildfire risk (ETWR) has been estimated to be $300 million per year. This value is an average and is not intended to suggest that there will be $300 million of wildfire risk each year. The analysis indicates relatively small risk consequences most years, with larger negative consequences occurring rarely. The details will be discussed below. Importantly, through analysis of different scenarios, the amount used as the ETWR did not significantly affect the mitigation projects identified in the model. Put another way, if the ETWR was set to $200 million or $400 million, the projects that will be scheduled between 2025 and 2027 were very similar. The estimation of wildfire risk involves many unknowns. The estimation shown here is not meant to indicate accuracy but best estimates using available data.

3.3.1 Method

Hawaiian Electric considered wildfire risk across its service territories. Data from historical wildfires since 1999 were reviewed. The two main factors in assessing wildfire risk from those historical fires were the acres burned and structure destroyed. Most fires in Hawai'i do not burn structures, which is typical for any region of the United States. Additionally, not all wildfires or ignitions in wildland are known. Typically, only larger fires that burn many acres or destroy structures are well documented.

Comparing historical consequences from wildfire to Hawaiian Electric's wildfire risk maps, it was determined that high wildfire risk and medium wildfire risk are the primary locations of wildfire risk. While fires do occur in low wildfire risk areas, they usually have smaller impacts than those that occur in medium and high wildfire risk areas. Available data indicates that, since 1999, wildfires in low risk areas—from all causes—have accounted for roughly 1% of acres burned in Hawaiian Electric's service territory, and no known history of wildfires destroying structures when a fire originated in low risk areas.[19]

Wildfires that have destroyed structures are rare, with only the 2023 Lahaina event exceeding 50 structures burned. The historical rarity of the fires complicates confidence in predicting their future likelihood. Hawaiian Electric considered many ways to characterize wildfire risk using historical data, as well as including potential higher trends of occurrence due to land use change, climate change, and other factors.

For this WSS, with Hawaiian Electric fully understanding that more work needs to be done on a wildfire risk model, a power-law probability distribution was used, which is also used in California utilities' wildfire analyses. The power law is thought to represent the relative likelihood of small and large wildfires. The power-law distribution was used in two separate ways: 1) using historical data to find the closest power-law distribution, known as "distribution fitting" and 2) using an anchor point on a power-law distribution to set the parameters, then assuming the rest of the curve is sufficiently close.

Both methods will be discussed here briefly. Using historical data, it is possible to "fit" a power-law curve that gives the best approximation to that historical data. This is typically done with statistical software. Due to the low number of historical fires, and the lack of confidence in how well future wildfire risk will compare to prior wildfire events, this method was not meant to be the sole guide for analysis.

The second method uses an estimate of the likelihood of a rare event, then estimates the consequences of the event. Statistical software is then used to find the parameter of the power-law distribution that matches those inputs. In this exercise, Hawaiian Electric used $5 billion every 50 years. In other words, the 98th percentile or P98 was set to $5 billion.

P98 is equivalent to a 1 in 50-year event. Because 49 out of 50 years have less consequence, and 49 out of 50 is equivalent to 98 out of 100. The $5 billion amount is meant to represent all societal impacts from that fire, not limited to acres burned and structures destroyed, but to the entire set of economic and non-economic losses. For the interested reader, the power-law parameters that meet that criteria are 0.03, 0, 10,000,000,000; where the parameters are known as shape, location and scale, respectively.

After reviewing both methods mentioned above, they were sufficiently similar to each other, and that for further analysis, the second method would be used throughout the rest of the analysis due to its simpler approach. These approaches provide an expected value of close to $300 million, and therefore $300 million was used for as the value for the ETWR in the "top-down" method, discussed above.

[19] Acres burned were calculated based on the following resources: https://data-nifc.opendata.arcgis.com/datasets/nifc::wfigs-interagency-fire-perimeters/about, and https://pacificfireexchange.org/resource/fire-data/

.

Later, when the Feeder Model was created, Hawaiian Electric ran sensitivity analysis with respect to many variables. One of those variables that sensitivity analysis was performed was the value of ETWR. Different values between $100 million and $400 million were evaluated. Although there were some changes in the output of the model, there was not a significant change to the ordering of the mitigation projects that are identified as the highest priority; meaning, the projects that were identified for the WSS timeframe did not change significantly while varying the ETWR. There were larger changes on projects that were further down the mitigation list. For example, when the ETWR value is increased to $400 million, more projects with Risk Spend Efficiencies (RSEs, to be discussed in detail below) above 1 were added to the portfolio. And similarly, when the ETWR was decreased, fewer projects had an RSE above 1; but the reduction in those projects mostly affects work that would be done after the WSS period.

3.3.2 Probabilistic Modeling

As mentioned above, Hawaiian Electric uses a power-law distribution to understand wildfire risk, this section goes into more detail on that process. Because wildfire inputs and assumptions have uncertainties, probabilistic techniques allow the analysis to consider potential consequences that span across the ranges of the uncertainties—the destructiveness of fires, the likelihood of fires, as well as the likelihood of Hawaiian Electric being associated to their ignition. The distribution of wildfire risk—as it was thought to be prior to August 2023—is shown in Figure 3-7.

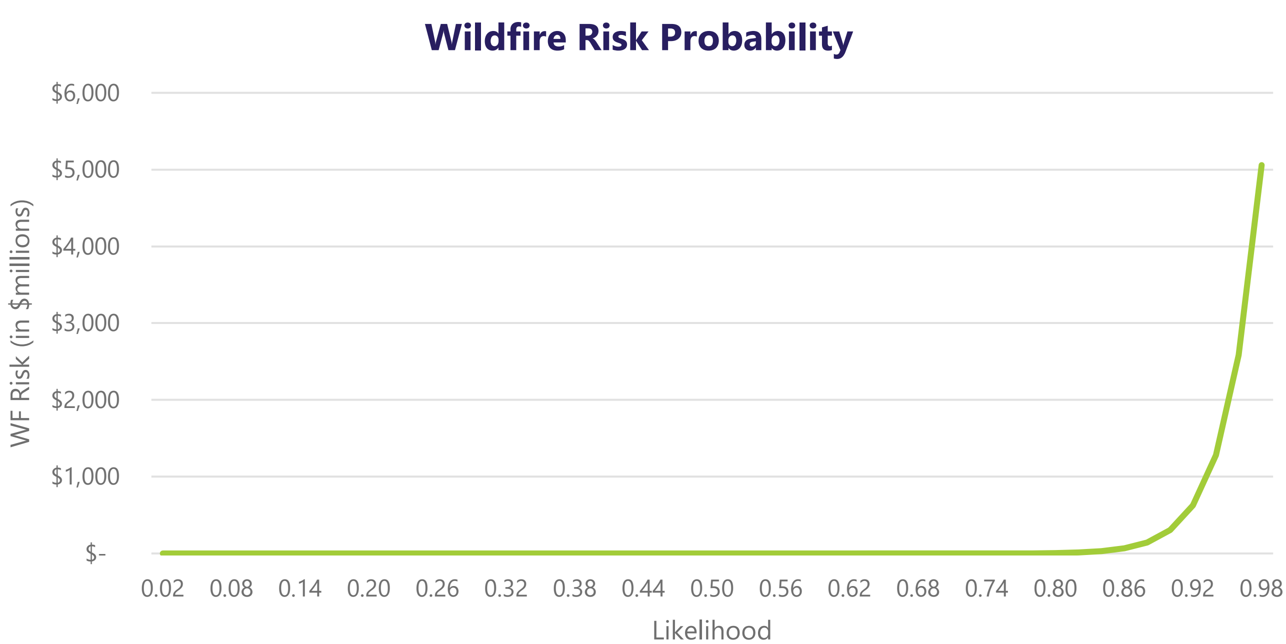


Figure 3-7. Distribution of wildfire risk (prior to August 2023)

The x-axis represents the likelihood of a wildfire occurring in a given year, and the y-axis represents the financial damage if that fire were to occur. Note that the distribution does not rise above a $10 million damage until the line passes to the right of the 0.50 mark. This means that there is less than a 50% chance of a wildfire causing more than $10 million damage in a given year. The curve then accelerates rapidly after

0.80. In other words, approximately 1 out of 5 years, or 20% of years, there is the potential for significant wildfire damage.

As a reminder, the distribution shown in Figure 3-7 represents the amount of wildfire risk that was present *prior* to Hawaiian Electric implementing its wildfire mitigation programs in the last half of 2023.

The distribution of risks are then used to determine the expected annual average risk, which is also known as the expected value. The expected value of the distribution shown above is approximately $290 million, and this value was rounded to $300 million for purposes of risk modeling. Apart from the expected value amount of approximately $300 million, it is possible to create statistics that involved confidence or percentile likelihoods. For example, using the distribution above, there is approximately a P93 or 7/100 chance of a wildfire exceeding $1 billion damage in a given year.

3.3.3 Resulting Estimated Total Wildfire Risk

The ETWR is meant to represent the annual average wildfire risk that was present at the end of year 2023. Since that time, Hawaiian Electric's immediate actions as described in Section 1.4 has resulted in risk reductions. Based on the analyses described above, the currently estimated annual average consequence from ignitions associated to Hawaiian Electric equipment was equivalent to $300 million. This value is the average annual consequence prior to including the impact of any implemented mitigations.

3.4 Risk Spend Efficiency

With a starting point of existing risk established, it is then possible to estimate the risk reduction from mitigations by computing a value known as the Risk Spend Efficiency (RSE) for each mitigation under consideration, using the following formula:

$$RSE = \frac{\text{(Annual Risk Reduction) x (Project Life)}}{\text{Cost of Project}}$$

A mitigation with a RSE greater than 1 means that the benefits outweigh the cost of the mitigation. That is the cost of the project over its life is less than the benefit of the reduced risk over the life of the project. However, it is difficult to include all factors regarding the costs and effectiveness of mitigations into this calculation, so RSE alone may not be determinative as to whether a mitigation should be carried out. For example, a mitigation could have other benefits that are not included in the initial Risk Framework, such as customer service benefits. Conversely, a mitigation could have a cost that is not included, such as the customer impacts of PSPS.

Mitigations that had an RSE calculated were analyzed at the distribution feeder level. Different programs lend themselves to more detailed analysis than others. For example, when considering the risk reduction from undergrounding an existing overhead distribution line, it is possible to use specific information on that distribution feeder to assess the benefits and costs. Table 3-3 summarizes the mitigations and level of analysis considered in the WSS.

Table 3-3. Mitigation Analysis Parameters

Mitigation	Level of Analysis
Enhanced Fast Trip (EFT)	Feeder
Public Safety Power Shutoff (PSPS)	Feeder
Covered Conductor with EFT	Feeder
Undergrounding	Feeder

These mitigations were evaluated by the feeder risk model to determine the most cost-effective combination of mitigations to deploy on each feeder relative to the risk.

The RSE for mitigations in Table 3-3 provide directional guidance to prioritize budget and scope of risk reduction measures. Because there are inherent uncertainties in the assumptions at this early stage of risk modeling, Hawaiian Electric deemed any mitigation with a calculated RSE greater than 0.9 to be within the margin of uncertainty to be considered cost beneficial.

Not all measures or initiatives of this WSS have an estimated RSE; for example, initiatives or programs that are needed to raise situational awareness, that also benefit external agencies, such as cameras, weather stations, and operational risk models that provide fire weather forecasting. There are other programs or initiatives that the risk model recognizes as providing contribution towards risk reduction at the system level (as opposed to the local feeder level) but do not have an associated RSE calculated; for example, vegetation management, asset equipment inspections, replacement of fuses and arresters, pole replacements, among others. These types of programs and initiatives have started under the IAP prior to the WSS and are expected to continue through the WSS period. Additionally, Hawaiian Electric does not yet have the detailed data to determine an RSE at the individual asset level as there are tens of thousands of poles, fuses and arresters on the system.

3.4.1 Enhanced Fast Trip

EFT operational programs reduce wildfire risk by de-energizing the system more quickly in response to fault current. This also includes reclose blocking schemes, which have already been implemented in high risk areas. Although Hawaiian Electric currently operates EFT on a select number of feeders, its experiences with it are new, and therefore reviewing the plans and successes from other peer utilities has informed the proposal in this WSS.

The effectiveness of EFT was estimated based on industry benchmarks. California utilities in particular have commented on the effectiveness of their programs. Those effectiveness values were considered, along with a comparison of the equipment available and maturity of those programs relative to Hawaiian Electric. For these reasons, Hawaiian Electric proposes a lower effectiveness than other more experienced utilities, but will continue to review the EFT program and update its assumptions as time passes.

While EFT programs reduce ignition risk, they can negatively impact reliability. It is expected that customers may experience long sustained outages when EFT and reclose blocking are in effect, when outages might otherwise be momentary.[20] Additionally, outages due to EFT and reclose blocking require patrols before power is restored, which can prolong an outage beyond what would have occurred in a non-EFT situation. See Section 4.5 for further details on EFT. The initial Risk Framework does not quantify the customer impacts of EFT.

3.4.2 Public Safety Power Shutoff

PSPS operational programs reduce wildfire risk by proactively de-energizing certain electric lines during elevated fire weather, greatly reducing the chances of an ignition occurring from that line. Hawaiian Electric began PSPS operations in 2024, leveraging the experiences of other utilities. Like EFT, PSPS programs negatively impact reliability, because during PSPS events, the circuit is taken out of service (an outage is experienced on that feeder). PSPS programs impose mandatory patrols that may prolong the outage. The initial Risk Framework does not quantify these impacts of PSPS.

3.4.3 Covered Conductor

The term "covered conductor" in this section, refers to reconfiguring a portion of electrical distribution system that was built above ground (or overhead) with bare wire to an overhead construction with wire that has an insulating cover on it. Covered conductor reduces the chances that an overhead line will cause an ignition by removing some of the common causation of those ignitions. Many of these contacts, because of the insulation, do not result in an exchange of energy from the line to the object making the contact.

Covered conductor reduces the likelihood of ignitions, however it does not eliminate all ignitions. There are still exposure points where energy can pass to flammable fuels, with undesired events occurring. For example, if a large tree fell on a line with a covered conductor, it is possible the line might snap and expose the conductor underneath. Covered conductor is also more expensive than bare conductor due to higher costs from the conductor itself.

Additionally, because covered conductor weighs more than bare wire, and has a larger cross section that is affected by wind, it is very common to need to replace poles and/or add more supporting infrastructure. See Section 4.4.1 for further details on covered conductor.

3.4.4 Undergrounding

The term "undergrounding" in this section, refers to reconfiguring a portion of electrical distribution system that was built above ground (or overhead) to an underground construction. Undergrounding benefits general reliability by removing the possible cause of many outages that an overhead line can experience; such as animal, plant, or vehicle contacts.

[20] The Institute of Electrical and Electronic (IEEE) standards defines a sustained outage as an outage greater than 5 minutes in duration and a momentary outage as an outage of 5 minutes or less in duration.

While it is possible for underground electric lines to cause sparks and small fires, historically the chances of these events leading to a destructive wildfire is rare. For this reason, many utilities concerned with wildfire risk have spent time studying and implementing undergrounding programs. However, failure of underground equipment can often lead to long repair times and outages to customers.

While approximately half of Hawaiian Electric's distribution lines are underground, there is limited experience with the transition from overhead to underground construction for the purposes of wildfire risk reduction. Because of this, some of the assumptions used in the modeling are a mix of utility benchmark information, Company experience, and SME judgment. Undergrounding is also significantly more expensive than overhead conductors. See Section 4.4.1 for further details on covered conductor.

3.5 Feeder Model

The Distribution Feeder Model informs Hawaiian Electric's overall wildfire risk assessment and action plan for the 2025-2027 WSS, as it provides the RSE for feeder-level work. The Distribution Feeder Model attributes a portion of the ETWR value ($300 million) to each distribution feeder to determine each feeder's wildfire risk. Each feeder's risk also considers various feeder specific attributes such as outage history, estimated probability of ignition, wildfire consequence, and miles of overhead construction. The Distribution Feeder Model then uses each feeder's risk and the assumed cost of mitigation measures and their effectiveness to calculate RSE for the hardening and operational mitigations described above.

Figure 3-8 illustrates the process used by the feeder model to determine the appropriate mitigation for each feeder.

Figure 3-8. Feeder Modeling Process

Additionally, with the feeder level risk estimated, certain programs can use those values to help prioritize where work should be carried out. For example, if it becomes known that two identical pieces of equipment need repair, the feeder risk levels can help prioritize whether one repair should occur before the other.

Ultimately, the Distribution Feeder Model assesses RSE for the specified mitigation measures to help guide determination of the appropriate budget and scope of work for modeled, feeder-level mitigation measures. The feeder model outputs will then be operationalized into actual projects as described in Section 3.7.

3.5.1 Scope of Analyses

The mitigation measures described above (EFT, PSPS, covered conductor, and undergrounding) were analyzed for risk reduction at the feeder level. Feeder-level analysis offers a practical approach because much of what happens on a feeder affects other parts of the same feeder. For example, if an outage occurs at that feeder's circuit breaker, the entire distribution circuit will experience the outage.

There are 716 feeders included in the Distribution Feeder Model that represent the feeders across the entire service territory. The focus for this WSS was to include the mitigations that could be applied at the feeder (or sub-feeder) level, such as system hardening, EFT, and PSPS. This initial model is useful to guide decisions on complex, high cost solutions such as choosing between undergrounding and covered conductor.

3.5.2 Methodology

To perform risk assessment at the feeder level an estimate of the amount of annual average risk on each feeder must be determined.

First, Hawaiian Electric estimated as a reasonable high-level assumption that 80% of the total annual risk is located on the distribution system, or approximately $240 million of approximately $300 million of total system risk. This assumption reflects that there are far more miles of overhead distribution lines and outages that occur on the distribution system as compared to the transmission system. As described in Section 3.8, detailed transmission risk assessment is an area for future improvement.

Second, each feeder had certain historical information collected regarding its characteristics, such as customer counts, length in miles, number of average annual outages, estimated number of average annual ignitions, wildfire consequence modeling, and the geographic location of the feeder. A reasonable assumption was made of how many ignitions had historically occurred on each feeder. This assumption was based on available ignitions and outages recorded on overhead equipment.

Third, for each feeder, Hawaiian Electric estimated the consequence of wildfires occurring on the particular feeder. This data was then used to identify, at a high-level, the maximum number of acres burned and maximum number of structures destroyed for each feeder. The Quantitative Risk Framework was used in this step to convert acres burned and structures destroyed to a single monetized value as described in Section 3.2.2.

The final step was to multiply the estimated probability of ignition rate by the maximum consequence for each feeder. Although this value is not a practical value by itself as an estimate of average annual risk (i.e., it is too large of a value because it assumes that every fire that occurs on that feeder will result in maximum consequences), the value is then used to apportion the total wildfire risk. In other words, the annual average wildfire risk of approximately $240 million discussed above is allocated to the distribution feeders using the relative magnitude of the calculations discussed in this section. In the end, the summation of the risk amounts for each distribution feeder totals the $240 million targeted value.

3.5.3 Model Results

After the model has been created and run, there are various outputs that are then used in the Mitigation Selection process. As mentioned above, the model estimates existing wildfire risk as well as the estimated change in risk from further mitigation efforts. It also produces various information regarding costs and effectiveness of mitigations.

Following are some highlights of model results that are relevant to determining which mitigations to pursue as part of the 2025-2027 WSS.

When evaluating a portfolio of potential mitigations to select with the goal of achieving an estimated 80% overall risk reduction, the portfolio of mitigations with an RSE of 0.9 or greater (risk benefits nearly the same or greater than the cost), the model, as shown in Figure 3-9, estimates that over $1 billion would be required. This cost is high because the mitigations that further reduce risk involve system hardening—covered conductor and undergrounding. These provide incremental risk reduction after the model applies EFT and PSPS. Achieving higher levels of risk reduction would likely require more investment in undergrounding because of its high mitigation effectiveness (i.e., 95%).

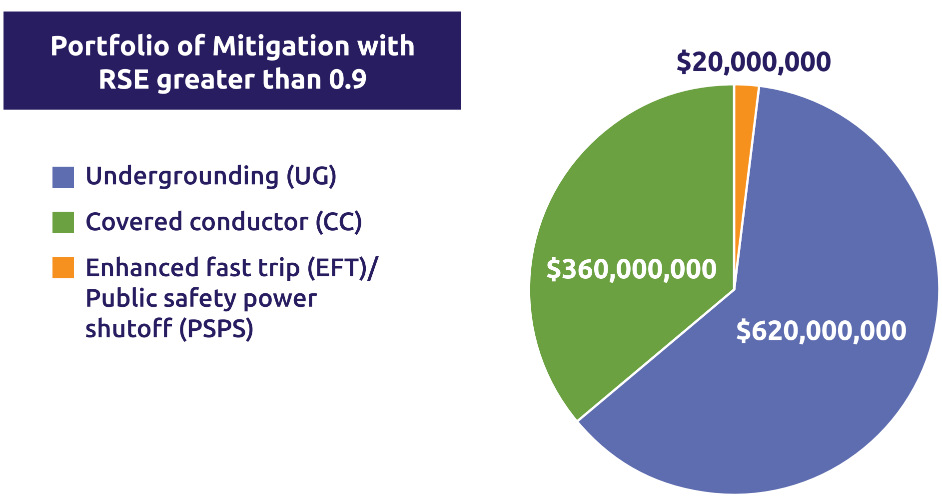


Figure 3-9. Portfolio of mitigations with RSE greater than 0.9

Table 3-4 summarizes the total portfolio of mitigations, by number of circuits, that would result in a risk reduction of 80% from the Year 2023 baseline by island (with RSE > 0.9). For each island, the total number of overhead miles that traverse through a HWRA (Tier 3) and MWRA (Tier 2) are also shown in parenthesis for mitigations that specify covered conductor or underground mitigation. There are a total of 253 of the 716 feeders on the Hawaiian Electric distribution system that do not currently have wildfire risk identified in the model. There are another 360 feeders with wildfire risk greater than $0, but no additional mitigation was identified. These group of feeders either already had EFT enabled by the end of 2024 and the residual risk is not high enough to justify additional mitigation of covered conductor or undergrounding with an RSE greater than 0.9 or the wildfire risk is sufficiently low that EFT did not have an RSE greater than 0.9.

Table 3-4. Total Portfolio of Mitigations, Circuit Count (overhead circuit miles in MWRA and HWRA)

Preferred Mitigation	O'ahu	Maui	Moloka'i	Lāna'i	Hawai'i Island	Total
No Estimated Wildfire Risk	219	11	5	0	18	253
No Additional Mitigation	195	72	6	0	87	360
EFT & PSPS	17	6	3	3	32	61

Preferred Mitigation	O'ahu	Maui	Moloka'i	Lāna'i	Hawai'i Island	Total
EFT & PSPS, Covered Conductor	7 (17 miles)	9 (146 miles)	0 (0 miles)	0	12 (54 miles)	28
EFT & PSPS, Underground	4 (21 miles)	2 (29 miles)	0 (0 miles)	0 (0 miles)	8 (9 miles)	14

Based on the risk model results, and as described in Section 4.5, EFT will be expanded to the majority of high and medium risk circuits that have not already been enabled as of the end of 2024. The risk model selected EFT because of its effectiveness at reducing ignitions and its relatively lower cost to implement. With respect to PSPS, the high fire risk area circuits identified by the risk model are already part of the current PSPS program. While the risk model also suggests that PSPS should be implemented on medium risk circuits, this initial modeling does not factor in the significant customer impacts of PSPS, as noted above. Due to these significant customer impacts, and the need to coordinate any expansion of the PSPS program with emergency responders and the public, Hawaiian Electric is not expanding PSPS to medium fire risk circuits at this time. Hawaiian Electric will continue to review these circuits and available data and evaluate whether the PSPS program should be expanded.

The system hardening component of the planning risk model evaluated the RSE between maintaining the current bare overhead conductor, converting to covered conductor or undergrounding on each feeder. Because these projects have long implementation times and are costly, financial and human resources must be deployed efficiently. Hawaiian Electric is focused on reducing the greatest risk on the identified feeders while balancing affordability and reliability. To start the process of narrowing the scope of 3-year action plan, Hawaiian Electric started with a review of the top circuits by risk according to the risk model outputs. Table 3-5 shows the top 20 circuits, ranked by Pre-Mitigation risk levels, and showing the planning risk model's preferred mitigation, post-mitigation wildfire (residual) risk, and the RSE for the preferred mitigation. A full listing of the risk model outputs is provided in Appendix C.

Table 3-5. Pre-Mitigation Risk Levels with Applied Risk Reduction Mitigations

Island	WF Risk Rank (Pre-Mitigation)	Feeder	Preferred Mitigation	RSE of Mitigation[21]
Maui	1	CKT 1238	EFT, PSPS and UG	1.25
Maui	2	CKT 1282	EFT, PSPS and CC	3.37
Maui	3	CKT 1237	EFT, PSPS and CC	1.25
Hawaii	4	WAIKOLOA 12	EFT, PSPS and UG	6.55
Maui	5	CKT 1236	EFT, PSPS and CC	3.39
Maui	6	CKT 1322	EFT, PSPS and CC	1.53
Oahu	7	MIKILUA 3	EFT, PSPS and UG	1.20

[21] RSE of N/A means that the risk model did not select additional mitigation above existing EFT and PSPS mitigation, which was enabled in 2024; therefore no RSE was calculated.

Island	WF Risk Rank (Pre-Mitigation)	Feeder	Preferred Mitigation	RSE of Mitigation[21]
Oahu	8	KAHE	EFT, PSPS and UG	1.83
Hawaii	9	KAPUA 12	EFT & PSPS	73.01
Oahu	10	MAUKA	EFT, PSPS and CC	1.18
Maui	11	CKT 1657	EFT, PSPS and CC	1.12
Hawaii	12	PUNALUU 12	EFT, PSPS and CC	1.58
Hawaii	13	KEAHUOLU 12	EFT & PSPS	N/A
Maui	14	CKT 1223	EFT, PSPS and CC	4.05
Oahu	15	MIKILUA 4	EFT & PSPS	N/A
Hawaii	16	MAUNA LANI 11	EFT, PSPS and CC	1.00
Hawaii	17	SOUTH POINT 11	EFT & PSPS	46.00
Hawaii	18	KAWAIHAE 11	EFT, PSPS and CC	0.95
Maui	19	CKT 1308	EFT & PSPS	N/A
Hawaii	20	MAUNA LANI 14	EFT & PSPS	N/A

The 20 feeders identified in Table 3-5 are under consideration for covered conductor or future targeted undergrounding projects. This 2025-2027 WSS budgets for an initial number of miles for covered conductor to be allocated among these circuits. The exact circuit segments and projects will be determined upon completion of more detailed analysis as described in Section 3.7. An undergrounding review will also be completed as part of the 3-year action plan to determine targeted undergrounding projects to prioritize, as described in Section 4.4.

3.5.4 Sensitivities

Hawaiian Electric also tested uncertainties around underground mitigation because of the uncertainty in cost and in response to community desires to underground overhead distribution lines, particularly in HWRA. The first scenario shown in Figure 3-10 denoted by the green “x” reduces the cost per mile of undergrounding from $11 million to $6 million per mile due to Hawaiʻi’s high cost compared to utilities on the mainland. The second scenario assumes all overhead distribution is underground, noted in blue triangles. These scenarios are plotted along with the base case.

In all scenarios the model optimizes around achieving 80% risk reduction. In the base and underground at $6 million per mile scenarios, the cost to achieve approximately 77% risk reduction is fairly close until which the curves diverge due to the cheaper assumed cost of $6 million. It can be inferred that the range of risk reduction that the 2025-2027 WSS can achieve, i.e., in the 70% risk reduction range, the models are directionally aligned and are not as sensitive to a “cheaper” underground price. However, there is early divergence in the “all underground” scenario, which means significantly more investment is needed to achieve similar levels of risk reduction.

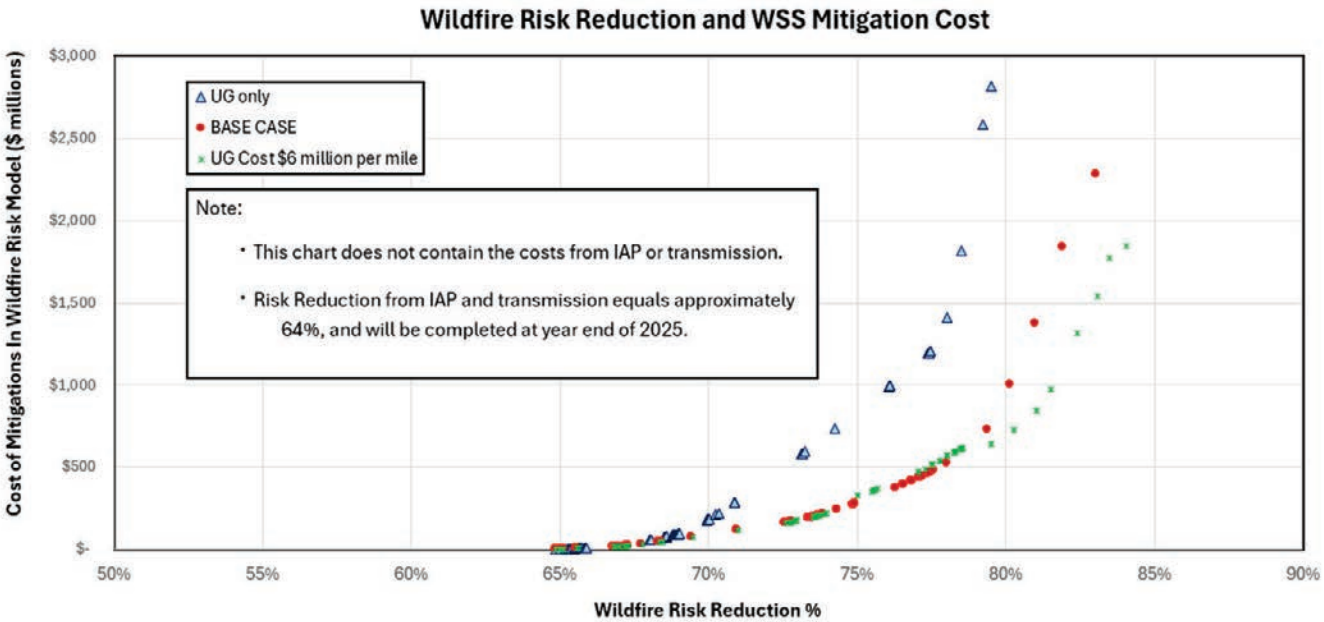


Figure 3-10. Wildfire risk reduction vs total portfolio cost for different scenarios.

3.6 Qualitative Risk Framework

The investment prioritization process allows for an efficient allocation of Hawaiian Electric's budget and resources to mitigate wildfire risk while addressing both operational challenges and stakeholder expectations. As noted in the previous section, the qualitative risk model is not the only determining factor in making investment decisions. The Qualitative Risk Framework, integrated into the investment prioritization process, provides a structured approach to evaluating potential initiatives, helping to focus investments on the most impactful actions.

The need for investment prioritization arises from the complexities of managing multiple risk drivers across diverse geographic regions. With a clear framework for prioritization, Hawaiian Electric can maximize the use of available resources and effectively address the risk factors, ensuring that efforts are strategically targeted for the greatest impact.

3.6.1 Qualitative Risk Framework Methodology

The process for evaluating mitigations includes layers of analysis and decision making. The first step involved quantifying the wildfire risk as described above, which is the largest factor in the decision-making process. The second step was to incorporate other factors in the decision-making process, included in the evaluation are social vulnerability, the presence of critical facilities in proximity to circuits, the reliability benefits of performing these mitigations, and the PSPS reduction impact of system hardening measures. Potential factors to be considered in the future include facility access constraints, and fire suppression difficulty index, among others.

Risk models will continue to be updated as new data becomes available and refined as discussed herein. It is also important to note that full circuits were evaluated in the planning risk model, but it is expected that as more detailed engineering is completed circuits may be broken up into segments to identify priority areas to deploy covered conductor within a circuit because risk may not be uniform across the entire circuit.

3.6.2 Qualitative Risk Framework Attributes

The Qualitative Risk Framework process involves evaluating a range of factors to help guide Hawaiian Electric's wildfire mitigation efforts in a strategic manner. The goal is to help align investments with broader community safety goals, energy equity, operational resilience, and risk reduction strategies.

The qualitative model currently integrates several attributes: Social Vulnerability, Critical Facilities, Egress, Critical Habitats, Reliability Benefit, and PSPS Impact Reduction. These attributes were presented to stakeholders at a wildfire safety working group meeting. Stakeholders seemed satisfied with the attributes; however, they did offer a suggestion to consider critical habitats, which Hawaiian Electric then incorporated. These attributes are analyzed collectively using a high, medium, and low assessment approach to provide directional guidance on which circuit mitigations to pursue first.

Together, the attributes provide a comprehensive framework for prioritizing investments that not only intends to address wildfire risks but also aims at improving public safety, grid reliability and operational resilience across Hawaiian Electric's service territory.

3.6.2.1 Social Vulnerability Index

Social vulnerability, as defined by the Federal Emergency Management Agency (FEMA), refers to the susceptibility of specific social groups to the adverse impacts of natural hazards, including disproportionate risks of death, injury, livelihood disruption, and property loss. For this assessment, Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention (CDC) was utilized. This index is used in emergency preparedness planning to assess community needs. The SVI is calculated at the Census tract level.[22]

To account for social vulnerability among Hawaiian Electric's feeders, SVI values are determined based on the Census tracts where each feeder is located. Hawaiian Electric prioritizes two aspects of SVI that includes socioeconomic status and household composition. For each feeder, the highest SVI value for socioeconomic status is assigned, as well as the highest SVI value for household composition from the respective Census tracts. SVI values are then compared to the average SVI for the region and then translated into high, medium, low categories for a qualitative evaluation in the decision-making process.

[22] See, https://www.atsdr.cdc.gov/place-health/php/svi/svi-interactive-map.html

3.6.2.2 Critical Facilities

In recognition of power needs of critical facilities during emergent situations, including during PSPS. Critical facilities, which are essential to public safety, include infrastructure such as emergency services, government facilities, healthcare, energy, water and wastewater, communications, and transportation sectors. These facilities require additional planning and support to maintain resilience during PSPS events.

Table 3-6. Critical facilities type across Hawaiian Electric Territory

Emergency Services	Healthcare	Government Facilities	Water and Wastewater	Transportation
• Police Stations (Statewide) • Fire Stations (Statewide) • Volunteer Fire Stations *	• Adult Day Care Centers • Hospitals and Medical Clinics • Adult Residential Care Homes	• Public Schools	• Utilities Sewer Pump Station ** • Utilities Sewer Treatment Plant ** • Wastewater Treatment Plants	• Airports • Commercial Harbors

* Critical facilities for Hawaiʻi Island only
** Critical facilities for Oʻahu only available

Figure 3-11 shows the breakdown of critical facilities by type across Hawaiian Electric service area.

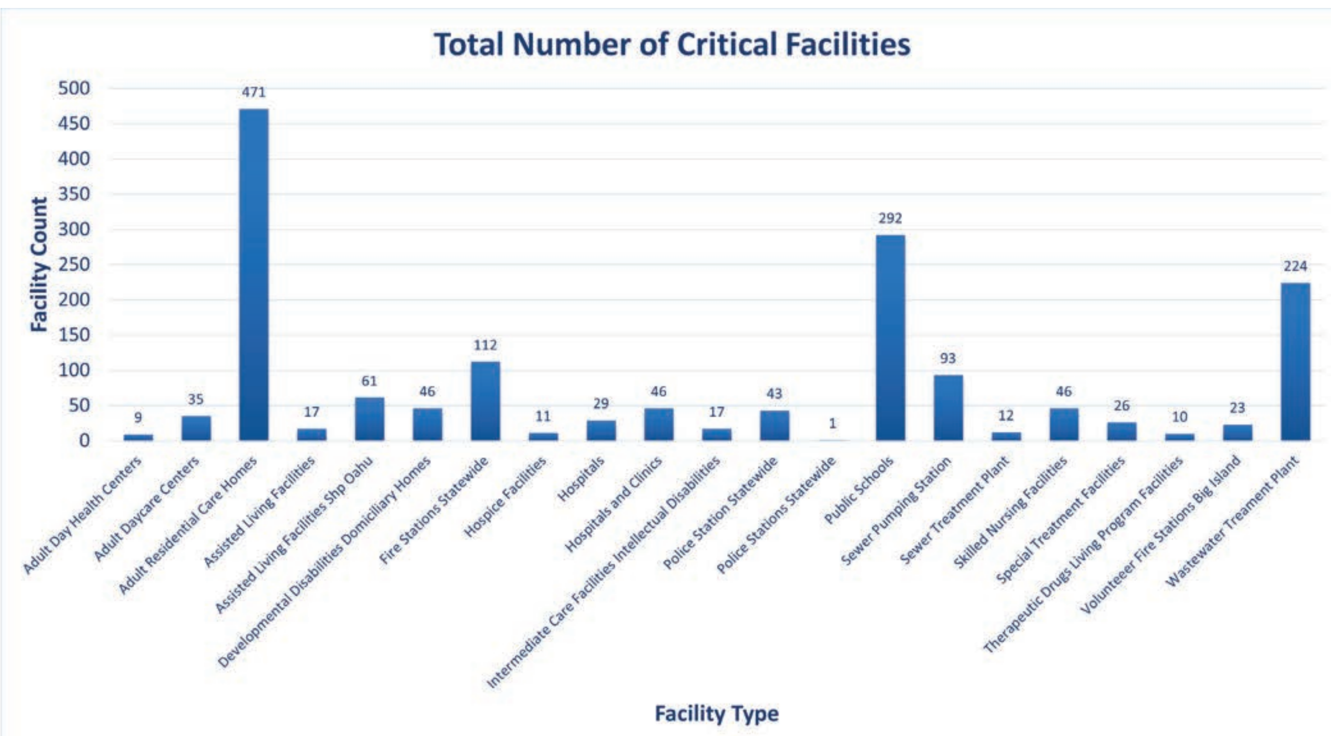


Figure 3-11. Distribution of critical facilities type across Hawaiian Electric territory

In the qualitative risk framework, a feeder is assessed based on the density of critical facilities within a defined buffer zone. Specifically, critical facilities associated with a feeder are those located within a one-mile-radius buffer of the feeder's service area. Feeder service areas with higher densities of critical facilities are considered more critical due to the increased number of critical facilities within their operational range. To evaluate this data qualitatively, Hawaiian Electric compared each feeder's density within the one-mile radius to the average for the area and then used breakpoints of standard deviation to create ranges for a high, medium, or low by circuit assignment.

3.6.2.3 Critical Habitat

Critical habitats, as suggested by the wildfire safety working group, recognizes the need to safeguard Hawaii's critical habitats that are essential for the conservation of endangered species. According to the U.S. Fish & Wildlife Service (USFWS), critical habitats include:

- Specific areas within the geographical range of a species that contain essential physical or biological features for the species' conservation.
- Specific areas outside the species' occupied range, if deemed essential for its survival and conservation.

Critical Habitat is particularly sensitive to environmental disturbances like wildfires, which can impact species survival. In Hawaiʻi, USFWS identified 119,326 acres of federal, state, private, and public lands as critical habitat for 14 species.[23]

To help protect these habitats, Hawaiian Electric uses critical habitat as one of the attributes for prioritizing feeders in wildfire mitigation projects. The goal is to prevent wildfires that could cause environmental damage, especially in areas with federally listed endangered species.

Hawaiian Electric obtained updated critical habitat data from the Hawaiʻi Statewide GIS (Geographic Information System) Program,[24] which included all critical habitat layers provided by the USFWS. Hawaiian Electric then overlaid feeder locations with the critical habitat data. After integrating the critical habitat data with Hawaiian Electric's feeder maps, it was found that approximately 5% of feeders across Hawaiian Electric's territory pass through designated critical habitat areas Figure 3-12. These feeders are of particular concern due to the potential for wildfire-induced damage to fragile ecosystems.

By focusing on these feeders, Hawaiian Electric aims to prevent wildfires from spreading through critical habitats, thereby minimizing environmental harm and protecting Hawaiʻi's endangered species. Habitat was evaluated as a binary assessment: high for feeders that passed through designated critical habitat areas or low for feeders that did not pass these designated areas.

[23] Critical Habitats (USFWS) https://www.fws.gov/project/critical-habitat-12-hawaii-island-species

[24] Critical Habitats GIS data source (Hawaiʻi Statewide GIS Program): https://geoportal.hawaii.gov/datasets/HiStateGIS::areas-of-critical-habitat-consolidated/about

3.6.2.4 Reliability Benefit

Some mitigations can reduce wildfire risk while also providing reliability or faster restoration benefit. Mitigations with a reliability benefit are categorized by decile range but then converted to a high, medium, or low qualitative assessment based on equally distributed circuit count ranges of reliability benefit.

One example is the use of EFT, which improves the grid's ability to quickly detect and isolate faults. However, EFT settings may adversely impact reliability performance by increasing the frequency and duration of outages or service interruptions. While these measures minimize the risk of powerline-ignited wildfires, they introduce challenges related to service reliability, which must be carefully weighed against the safety benefits.

The prioritization process accounts for these trade-offs by evaluating both the wildfire risk reduction potential and the potential impact on reliability metrics, ensuring that Hawaiian Electric implements mitigations that strike a balance between public safety and grid performance. Tranches of reliability benefit were categorized into high, medium and low for the qualitative analysis.

3.6.2.5 PSPS Risk Reduction

Several mitigations enable the reduction of a potential PSPS event. Grid hardening can reduce the need or frequency for PSPS over time, because it enhances the grid's ability to operate safely under severe weather conditions. These long-term investments aim to mitigate wildfire risks and increase operational resilience, ensuring fewer service interruptions due to proactive safety measures like PSPS. Undergrounding of overhead lines may significantly reduce PSPS requirements for those sections by removing exposure to high winds and wildfire risks; however, on circuits with a mix of underground and overhead, PSPS may still be required. Additionally, covered conductor can be an alternative to undergrounding; however, it is not as effective as undergrounding but still may decrease PSPS frequency compared to traditional overhead circuits. The qualitative assessment related to PSPS reduction was that if the mitigation proposed included undergrounding, the PSPS risk reduction benefit was high, whereas if the mitigation included covering conductor, the circuit was noted to have medium risk reduction benefit, and if only EFT was proposed, the PSPS risk reduction benefit was low.

3.6.2.6 Egress Risk

Hawaiian Electric integrates egress risk as a factor in its covered conductor and undergrounding projects. For instance, when a feeder undergoing a covered conductor project runs through an area identified as having high egress risk, Hawaiian Electric may scope the project to include the replacement of wooden poles with steel poles, which are more resilient during fire events.

Prioritized egress areas are identified by overlaying HWMO's egress risk data to Hawaiian Electric's HWRA and MWRA. For feeder prioritization for wildfire mitigation, a binary "Yes" or "No" designation to each feeder is assigned—based on whether any part of the feeder intersects both a high egress risk area and MWRA or HWRA. Feeders that cross both layers are flagged as presenting a risk to safe evacuation during fire events. This binary approach ensures that feeders in HWRA, where evacuation routes are critical, are prioritized in Hawaiian Electric's investment portfolio. A "Yes" designation was noted as high and a "No" designation was noted as low.

This methodology complements Hawaiian Electric's broader strategy, which is discussed in the System Hardening (Egress section). Egress risk is factored into decisions regarding steel pole replacements, undergrounding, and other infrastructure upgrades to safeguard evacuation routes and reduce the potential for wildfire-related disruptions.

Egress risk, alongside other risk factors like Critical Facilities and Social Vulnerability Index, can influence the prioritization of projects. Feeders with higher egress risk are given higher priority in the model, aiming at allocating resources to improve both system resilience and community safety in areas most vulnerable to wildfire risks.

The overall outputs of the Qualitative Risk Model are shown in Appendix C.

3.7 Building an Executable Workplan

As described in this section, the risk model outputs need to be operationalized into individual system hardening projects by defining and prioritizing the individual projects that will be completed under this WSS. The following describes the process and considerations for building an executable workplan. As discussed above, the Feeder Risk Model does not output a prioritization of individual projects. The risk model outputs are at the level of an entire circuit and provide directional guidance on mitigation selection and portfolio construction at the program level.

The risk model and qualitative risk framework attributes each have their own sets of assumptions and limitations. In some cases, other bespoke solutions beyond covered conductor or undergrounding should be considered that are not captured by the model. The following are some illustrative scenarios:

- A line running through a tree tunnel may be able to be removed if electricity can be re-routed, with lower cost upgrades than a hardening project would entail.
- A distribution line serving only a few, sparsely spread customers that is underbuilt on a sub-transmission line may be able to be removed in favor of installing step-down transformers from the sub-transmission level to provide direct service (with aerial cable service lines) to each of the small number of customers/customer groups.
- There may be areas with relatively high risk where a line serves only a single customer. In such a case, a solution that involves more refined and localized fast-trip protection, lower PSPS thresholds, and customer backup power may be more cost-beneficial than hardening.
- A long line may feed an isolated community where a microgrid for PSPS mitigation should be considered in lieu of hardening, at least in the medium term.

Some solutions promoted by the planning risk model may not be technically feasible or practical in a particular location. Permitting requirements, access constraints, and other factors can significantly impact the cost and timeline of mitigations in specific areas. There may be situations where the data underlying risk model assumptions are inadequate for a particular location (e.g., if land use or vegetation makeup has changed since the last update to a fuels dataset). Some of the qualitative factors, such as egress risk, leverage datasets with known limitations, and have much to gain using a case-by-case assessment in situational context. Therefore, subject matter expert judgment is needed to validate the risk model and qualitative attribute assumptions and outputs, define the areas where risk may be most concentrated on each circuit, assess logical break points within circuits to define projects, assess the feasibility of covered conductor or undergrounding, and consider other possible solutions (e.g., line removal, relocation, enhanced protection, etc.).

For a given circuit, the hardening work may comprise smaller portions of the circuit, rather than the entire circuit, at least initially. This is because the risk on a circuit is often not uniformly distributed, but the granularity of the data at this time only allows analysis at the level of the circuit, accounting for the distribution of risk across the circuit between Tier levels, but not at more refined scales of analysis.[25] For example, the feeder risk model may indicate covered conductor should be applied to a circuit. After closer evaluation, it may be determined that the risk is highly concentrated in a particular area, and the surrounding vegetation, egress, and other qualitative factors may be such that undergrounding warrants further consideration. Conversely, the risk model may select undergrounding as the preferred solution for a circuit, but undergrounding may not be technically feasible or practical. The optimal solution for some circuits may include a combination of covered conductor and undergrounding in different parts of the circuit, while other areas on a circuit may not be as high a priority to harden with covered conductor or undergrounding in the short term (compared to implementing another project on another circuit).

Once circuit segments for hardening have been better defined and an initial feasibility screen has been applied, this more granular information can be fed back into the risk model to re-evaluate the mitigation selection for each circuit segment. The qualitative framework, at the circuit segment level, is then introduced. The combination of quantitative and qualitative factors, and SME evaluation is then used to prioritize and schedule individual projects for implementation.

3.7.1 Process

The following sections describe the analytical steps in the process Hawaiian Electric plans to take in developing a workplan for covered conductor projects.

3.7.1.1 Run the Quantitative Feeder Risk Model and Construct the Hardening Portfolio

As described in the Quantitative Risk Framework detailed in Sections 3.4 and 3.5, the Feeder Model is used to determine the preferred mitigations based on the risk spend efficiency of various mitigation options presented to it. Because the consequence and probability of ignition is completed at the feeder level (based on the level of data currently available), the model assumes that risk is uniformly distributed across the entire portion of a feeder within a given Tier. This is useful in providing directional results as to the severity of a circuit's risk, as well as the general magnitude of covered conductor and undergrounding that is cost effective to pursue at the portfolio level.

[25] Future enhancements will include creating and collecting the data necessary to enable more granular application of the risk model, as discussed in Section 3.8.

The feeder risk model results identified approximately 217 circuit miles of covered conductor and 58 circuit miles of undergrounding to achieve an 80% reduction in wildfire risk systemwide. For this 2025-2027 WSS, the magnitude of covered conductor selected by the model was proportioned to each of Maui County, Hawai'i Island, and O'ahu roughly based on each service territory's share of the total covered conductor miles identified by the model. The action plan specifies installation of 15-70 circuit miles of covered conductor in this 2025-2027 WSS (starting in 2026), which would reflect a pace to complete the 217 miles identified by the risk model by 2033. As discussed further in Section 4.4.2, Hawaiian Electric will continue to review locations for undergrounding and give updates in annual WSS filings. Additionally, Hawaiian Electric will underground approximately 2 miles of distribution specific to the Lahaina area in this 2025-2027 WSS (to be implemented through the existing Resilience Program).

3.7.1.2 Prioritize Circuits for Further Evaluation

While the feeder risk model was used to inform the magnitude of covered conductor and undergrounding work at the portfolio level, as well as to calculate the total risk at the level of entire circuits, more granular evaluation is necessary to define and prioritize individual projects for implementation. For example, Maui and Hawai'i Island in particular have long circuits (e.g., 60+ miles). Strictly following the risk model and applying mitigations to entire circuits would result in potentially long duration projects and an inability to spread investment to other high-risk circuits. Given that risk is often not uniformly distributed within a circuit, further analysis is needed to define and prioritize high priority subsections of circuits for mitigation. This way, individual projects at the circuit segment level can be developed and prioritized, resulting in more targeted, cost-effective risk reduction.

The analysis to define circuit segments for project development and prioritization, conduct feasibility screens, and develop preliminary scope alternatives is a labor and time-intensive process. Therefore, circuits must be prioritized for these more detailed evaluations. The next step involves sorting the feeder risk model output by annual residual risk after the model has calculated risk reduction from measures implemented as part of the IAP and implementation of PSPS or EFT, if applicable. The top circuits by remaining residual risk are then further analyzed to divide the circuits into logical project segments based on risk and other factors, as described in the following section.

Hawaiian Electric selected the top 20 highest risk circuits (based on wildfire risk, but with consideration of qualitative model results at the feeder level),[26] along with six additional circuits based on subject matter

---

26 The qualitative model does not include the PSPS or Reliability attributes in this stage of analysis at the feeder level, as scoring these attributes requires the solution to be known. As discussed above, the solution selected by the feeder risk model at the whole feeder level may not ultimately apply to all individual project segments within a feeder. Therefore, pre-supposing the final solution that will be applied to a feeder at this stage can skew the prioritization of feeders for scoping if the final solution differs from the initial solution promoted by the feeder risk model. These two attributes are introduced when the qualitative model is re-run at the individual project level in order to support project prioritization.

expertise, to be further evaluated. The total overhead circuit miles comprising these 26 circuits far exceed the amount of work that can be completed over the next three years. This ensured that the evaluation considered whether circuits with relatively lower quantified wildfire risk should be considered for higher mitigation priority after field validation of model assumptions and consideration of qualitative factors.

3.7.1.3 Define Priority Circuit Segments for Mitigation

The main objectives of this phase are to 1) divide circuits into logical segments for project solutioning and prioritization, and 2) conduct an initial feasibility screening for solution options. Hawaiian Electric is using a combination of desktop analyses and field visits to consider factors including, but not limited to: locations of historical outages, fire history, detailed fire spread modeling output, vegetation/fuel, observed ingress/egress risk, circuit operations, accessibility, possible sectionalization to minimize PSPS impacts or for more refined fast-trip operation, solution feasibility, and other potential solutions.

3.7.1.4 Rerun the Risk Model and Prioritize Projects

Estimates of probability of ignition, consequence, cost, and feasibility constraints are then used to calculate the RSE for each mitigation option for each defined circuit segment. The model's preferred mitigation for each circuit segment is then selected, generally based on highest RSE, but subject to subject matter expert validation and qualitative factor consideration. It is important to note that there may be situations where subject matter expert judgment determines that a solution other than the calculated highest RSE option should be pursued, including solutions that are not modeled by the risk model, as discussed in the introduction to Section 3.7. Allowing for this type of engineering judgment in the process is necessary given inherent limitations of modeling techniques to represent the world as it is, and helps to better ensure that the solutions selected provide the best value to customers and communities.

Next, the selected projects for each circuit segment are then sorted by RSE from high to low to derive a prioritized list of projects by calculated cost effectiveness for wildfire risk reduction. Exceptions are then made to the prioritization based on consideration of the qualitative risk scores described in Section 3.6. For example, two projects may have very similar RSEs when considering wildfire risk alone, but one circuit may have a higher qualitative score based on factors such as egress risk or social vulnerability, which are not quantified by the planning risk model.

Any high potential undergrounding projects would then be part of the undergrounding analysis as discussed in Section 4.4.2.

3.8 Future Model Updates

The management of wildfire risk is a long-term, programmatic commitment that will progress and evolve over time, and extend well beyond this 2025-2027 WSS. This evolution will require focused diligence in the application of data enhancements, data analytics, refinement to wildfire risk and spread models, and the direct application of these analytical solutions to field processes, which Hawaiian Electric will continue to advance in the areas outlined below, and as depicted in Figure 3-12.

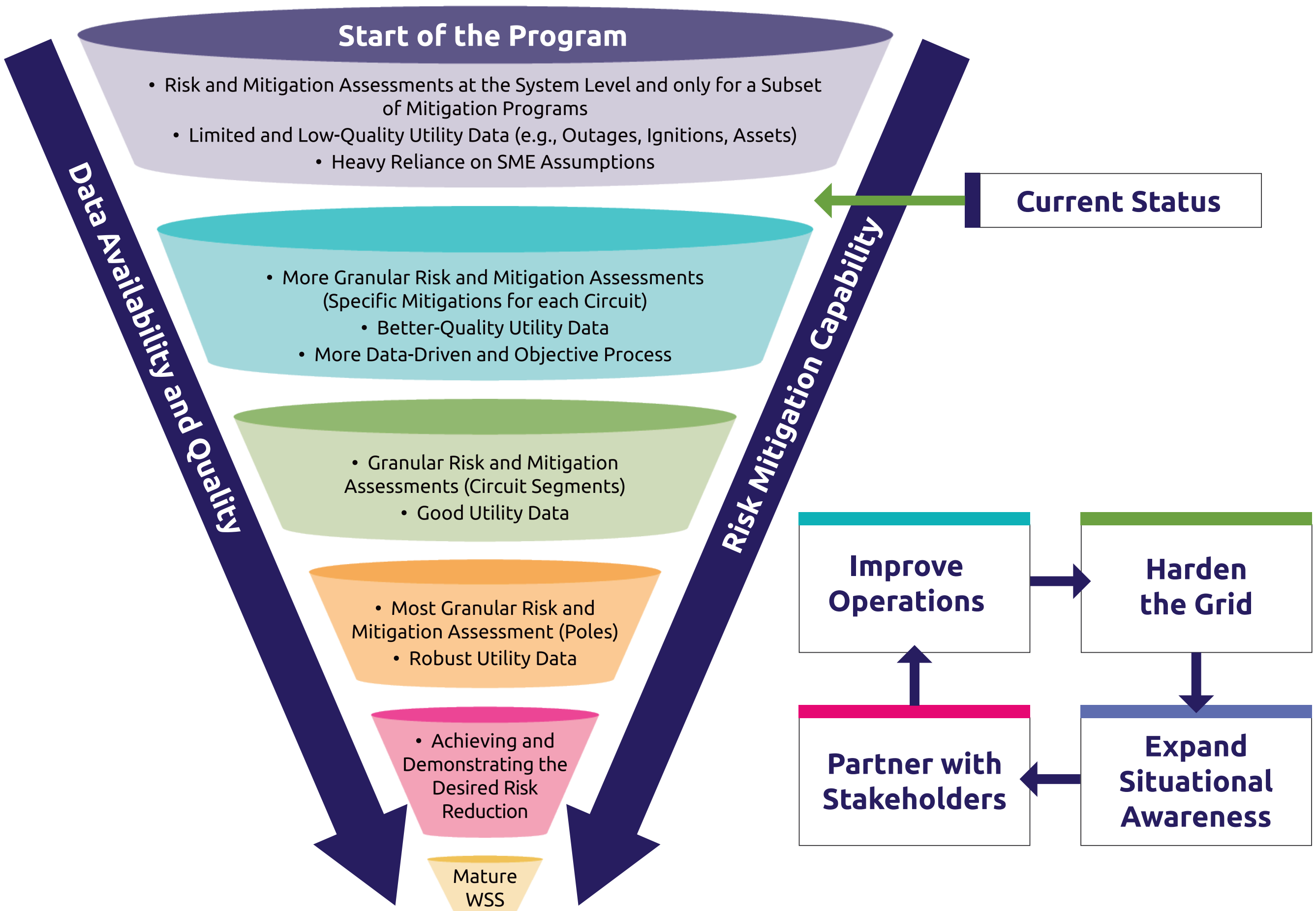


Figure 3-12. Model update process

This data will lead to the next evolution of risk assessment and mitigation planning that is specific to Hawaiian Electric's infrastructure and climate considerations.

3.8.1 Data Collection Programs

Data is part of advancing wildfire risk and spread models and implementing a comprehensive maturing wildfire risk mitigation program. More detailed data collection can drive more accurate model results such as asset failures, ignition probability, and the potential negative consequences of fires.

Data enhancements will be addressed by building upon current procedures and programs to validate the existing data sets (e.g., electric asset data) and/or establish and operationalize data collection and recording processes (e.g., outage data, ignition data, vegetation data). Data enhancements and collection programs are a long-term process that will be designed to collect electric asset data, environmental data, risk assessment and fire modeling data, and operational data. Much of the data detailed below are part of current processes and enterprise systems, and data enhancements would be primarily focused around improving validation and accuracy of those data collection procedures.

3.8.1.1 Electric Asset Data

- Location: Validation of current GIS location of Hawaiian Electric's electric assets (power lines, poles, transformers, substations, etc.)
- Asset Types: Validation of current inventory of asset types (e.g., conductor material and size)
- Pole Loading: Pole loading data
- Condition: Ensure accurate information on electric assets health status
- Age: Asset age, installation data and maintenance schedule
- Equipment Failure Rates: Historical equipment malfunctions data
- Inspection and Maintenance Records: Inspections and maintenance logs and recordkeeping

3.8.1.2 Environmental Data

- Weather Data: Wind speed and direction, temperature, humidity, precipitation and any other identified data, for predicting fire risk
- Climate Data: Long-term trends in temperature and drought conditions to inform strategic planning and resource allocation
- Vegetation & Fuel Data: Vegetation types, fuel moisture levels, and density around infrastructure to gauge fire spread potential
- Topography Data: Terrain, elevation, slope, and aspect data, as these influence fire behavior and spread

3.8.1.3 Risk Assessment & Fire Modeling Data

- Historical Ignition Data: Historical and ongoing ignition data, including cause, location, spread, assets involved, and environmental data
- Outage Information: Quality outage information, precise location (latitude/longitude), accurate mapping to circuits
- Mitigation Cost Data: Accurate mitigation cost estimates (e.g., covered conductor, undergrounding, PSPS, EFT, etc.)
- Mitigation Effectiveness: Utility-specific mitigation effectiveness
- Fire Spread Models: Predictive models that use historical fire data, weather, vegetation, and topography to predict fire spread
- Customer Risk Information: Accurate customer information, construction data, census data, egress/ingress information
- Historical Fire Incident Data: Past wildfire occurrences, including cause, location, spread, and response time (to refine risk models)

3.8.1.4 Operational Data

- System Data: Data from cameras, sensors, and drones that are used for situational awareness
- Power Line Operational Data: Data on current, voltage, and load to detect anomalies or faults that may cause ignitions

3.8.2 Future Analytics

The initial wildfire risk planning model employed for this WSS includes estimating RSE, circuit-based analyses of likelihoods and consequences, analyses of impacts of various mitigations, among others. The next evolution of wildfire risk planning modeling should build upon the structure of this model version but will add additional parameters and learnings that may include:

- Sub-circuit (or segment level) analysis for distribution circuits
  - Fire spread model output
  - Outage rates by wind speed
  - Ignition rates by wind speed
  - Overall risk
  - Risk reduction due to proposed mitigations
- Reliability impacts (both positive and negative) from wildfire mitigations, particularly PSPS and EFT
- Incorporation of transmission circuit-level risks and mitigation effectiveness
- Condition and asset-based ignition and outage analyses
  - Examples: age of pole, size of wire, proximity to trees, etc.
- Improvement of wildfire consequence attributes, expanding beyond acres burned and structures destroyed to incorporate:
  - Additional analyses on health/safety concepts through studies of egress/ingress, vulnerable communities, construction methods and age
  - Evaluations of animal and plant species habitats to understand the impacts from wildfire
  - Collaborative workstreams that identify culturally sensitive areas
  - Emergency response attributes based on collaboration with local fire agencies to incorporate their lessons learned on different geographies and their ability to respond in a timely manner
- Revisit probabilistic distributions of wildfire risk through the process of best-fitting historical and modeled wildfire events. Probability distributions can then be used with more confidence to communicate the likelihood of fires exceeding certain thresholds. This type of data can be used in discussions with the community at large and with financial organizations such as credit agencies, insurance companies, and investment firms.

The next versions of wildfire risk planning models will incorporate improved datasets gathered by Hawaiian Electric, its advisory partners, and government and academic institutions to include inspection data, improved ignition data, and the longer duration outage data related to locations where EFT has been in place. In addition, the modeling will utilize improved wildfire spread modeling that covers full climatology and vegetation of Hawai'i, which can then be used at a level more granular than the feeder level.

4 ENHANCED WILDFIRE SAFETY STRATEGY

This section describes the various strategies Hawaiian Electric will implement for wildfire mitigation through enhanced safety measures, from vegetation management and weather monitoring to structure inspections, new technology, system hardening, and operational practices, as well as community education and engagement through partnerships. Hawaiian Electric will refine and adjust the enhanced WSS as new information and data become available and lessons are learned.

4.1 Situational Awareness

Situational awareness refers to the ability to monitor environmental conditions in order to make operational decisions in an effective and timely manner. It covers a broad range of systems and tools that include video cameras, weather stations, vegetation and fuel condition monitoring, and coordination with field personnel and public safety partners, among others, to inform operational and/or response actions for the utility and emergency responders.

Situational awareness supports the identification of both current and prospective wildfire mitigation measures. The development of more detailed meteorological data provides foundational infrastructure and analytical capabilities. The establishment of these capabilities is anticipated to enhance risk models and wildfire safety mitigation strategies progressively.

In 2024, Hawaiian Electric began constructing enhanced situational awareness frameworks at the localized circuit level to deepen its understanding of how meteorological conditions influence the likelihood of significant wildfire ignition, thereby posing a threat to public safety. This initiative included installing weather stations throughout elevated fire risk areas. The data amassed and scrutinized through this process is available to stakeholders, fostering resilience within Hawaiʻi's communities by adopting a data-centric approach to minimize risks effectively.

Moreover, the installation of artificial intelligence enhanced high-definition cameras is underway to bolster the support for communities vulnerable to wildfires. These cameras, positioned strategically and monitored 24-hrs per day, provide real-time, 360-degree observations of high-risk areas. The camera feeds are accessible for monitoring and emergency response purposes, enabling emergency responders and utility personnel real-time data for potential fire outbreaks, thereby facilitating prompt and informed response efforts.

Enhanced situational awareness is anticipated to facilitate more localized weather and fire potential forecasting. The current practice of assessing and communicating fire threats at a statewide level may inadvertently neglect localized high fire threat conditions that do not escalate to statewide concern. In working group meetings, the NWS indicated that the 53 weather stations Hawaiian Electric deployed in 2024 will significantly increase their capability to forecast fire weather threats. Previously, the state did not have a robust weather station deployment. Hawaiian Electric understands that forecasting for the state was mainly based upon readings at the Honolulu International Airport.

The integration of new data from these technologies marks a pivotal first step in developing sophisticated forecasting capabilities. These advancements will enable more efficient communication with partner agencies and the public, ensuring timely alerts when more local high-risk conditions are detected. This proactive approach is essential for safeguarding communities and managing resources more effectively in the face of imminent fire threats.

4.1.1 Environmental monitoring and data collection systems

Wildfire mitigation weather monitoring include real-time monitoring and forecasting of weather conditions which could be conducive to the spread of wildfire. This includes coordination and interpretation of data from public sources, company-owned weather stations, artificial intelligence-enhanced cameras, and third-party services. Also included is providing advance notice to Hawaiian Electric personnel regarding red flag warnings, fire weather watches and high wind warnings/wind advisories, as well as determining when conditions may exist for PSPS and for EFT enablement. Hawaiian Electric primarily utilizes the NWS for its weather forecasting along with a third-party weather forecasting service.

The following are the anticipated steps that Hawaiian Electric is considering for the creation and development of its meteorological and fire science group over the next three years:

- Hire meteorology staff as requirements grow.
- Develop additional situational awareness tools, such as the Fire Potential Index (discussed in Section 4.1.2.2), that can inform evaluation of current and near-term wildfire risk across the service territory.
- Collect and analyze fire weather data to further support study of the relationship between wind speeds and undesired events such as outages and ignitions.
- Determine appropriate weather data sources, ranging from existing public sources to the addition of company-owned weather stations.
- Build relationships throughout the company and with relevant outside stakeholders such as local fire suppression agencies, NWS, and various emergency organizations.
- Collect ignition data with enough granularity to allow for analysis. Create a standard for the definition of an ignition and utilize trained personnel to collect data in a consistent manner and in a way that it can be linked to other Company data such as locations of assets and outage events if possible. (As described in Section 5.2)
- Network with other utilities to share experiences.

4.1.2 Enhanced Meteorology Capabilities

This section describes the components of meteorological and fire science capabilities that Hawaiian Electric is working to develop over the next three years that can be beneficial for utility wildfire operations. This includes localized weather forecasting, fire weather forecasts, and operational risk models and tools.

4.1.2.1 Weather Forecasting

Hawaiian Electric currently utilizes the NWS advance warnings for fire threat conditions, including red flag and wind advisory or high wind warnings, and third-party services such as StormGeo for daily fire weather forecasting.[27] While the Red Flag and wind warnings are crucial in signaling potential wildfire risks, they are broad statewide alerts that lack the detailed granularity required for precise risk management at the asset level. To ensure that mitigation measures, such as PSPS, are implemented effectively and in a manner that minimizes power disruptions, Hawaiian Electric is working to develop circuit-level forecasts that can provide detailed information on fuel conditions and wind speeds as part of its broader operational risk model efforts described in Section 4.1.2.3.

Hawaiian Electric is looking to develop the following capabilities for circuit-level forecasting:

1. **Meteorological Resources:** The establishment of an in-house meteorology team with specialized training in fire-weather characteristics will be invaluable. As the collection of data from weather stations and fuel measurements increase, a professional team capable of analyzing this data will be instrumental in informing the relevant departments within Hawaiian Electric. This will not only shape the response and mitigation strategies as wildfire events are forecasted but will also enhance stakeholder engagement with various organizations throughout the state. Such collaboration fosters a comprehensive understanding of wildfire risks and supports development of more resilient measures to safeguard our communities.

2. **Expansion of Weather Stations:** To capture the nuanced micro-variations in topography, Hawaiian Electric will continue the deployment of additional weather stations. Hawaiian Electric has already installed 53 weather stations in high risk areas; and plans to perform additional analyses to identify and deploy additional weather stations in high and medium risk areas.

3. **Circuit-Level Analysis Tools:** Advanced tools can accurately forecast fire conditions and wind speeds at the circuit level. The increased availability of data from weather stations and fuel measurements will facilitate the downscaling of forecasts to specific circuit levels, and enhance the quality of fire threat assessments.

[27] A Red Flag Warning is a weather warning issued by the NWS when the combination of drought and weather conditions increases the risk of wildland fire.

4. **External Resources (Public Safety Partners):** Public Safety Partners, including first responders, can assist in the gathering of environmental condition data and provide condition reports on active wildfire situations.

By integrating meteorological expertise, expanded weather station networks, and sophisticated circuit-level analysis tools, Hawaiian Electric should be better equipped to manage wildfire risks proactively.

4.1.2.2 Fire Potential Index

High fire weather conditions are characterized by the convergence of combustible fuel conditions and strong winds, which together facilitate the rapid spread of wildfires. To enhance the utility of the weather station network being deployed, the development of an FPI can be beneficial. This index is a practice among utilities with advanced wildfire mitigation and PSPS programs, and is typically forecast over a seven-day period. FPI is used to guide decision-making for fire watch protocols, including initiating a PSPS event or enabling EFT and reclose blocking.

FPI is a number derived from variables that include fuel moisture, humidity, wind speed, and air temperature. It is used as an aid in determining the potential for wildfire ignition and spread specific to regional areas. The development of an FPI model, however, requires access to a broader range of data than what is currently available to the public, as well as increased computational power to perform detailed analyses down to the circuit level for PSPS application. Hawaiian Electric intends on acquiring this capability as part of its broader operational risk model efforts.

4.1.2.3 Operational Risk Model

By integrating new weather forecasting and FPI capabilities with existing situational awareness measures, Hawaiian Electric can transition to a more sophisticated operational framework. This framework can complement data obtained from NWS and other relevant agencies, and also contribute to enhanced service reliability for customers.

To incorporate these beneficial capabilities into its operations, Hawaiian Electric plans on acquiring an operational wildfire risk model that informs real-time operational decision-making, including PSPS and EFT and reclose block enablement/disablement. Capabilities Hawaiian Electric seeks to acquire as part of the operational risk model include:

- A method to forecast weather, fuels, and fire potential at the circuit level to be able to forecast pre-established de-energization criteria days ahead.
- Methodology should include both a forward and backward look at weather, fuels, and fire potential to 1) establish PSPS criteria, and 2) compare current forecasts with historical events. Both forward and backwards looking data sets should be at the same spatial resolution.
- Establish an FPI model (or equivalent) based on weather and surface and canopy fuels to understand live and dead fuel characteristics that could propagate a wildfire under fuel driven or wind driven events.
- Calculate the potential real-time propagation severity of a wildfire at specific locations based on weather profiles, vegetation, fire history and topography.

- Integrate with high-definition video cameras to identify latitude and longitude of potential ignitions and develop fire propagation and associated consequence models in near real-time, to the extent possible.
- Ability to provide daily and/or seasonal assessments of fire potential.
- Identify elevated fire threat conditions and PSPS risk criteria and integrate with local weather stations to improve real-time situational awareness of fire conditions.

4.1.3 Weather Station and Camera Deployment Strategy

Hawaiian Electric made significant progress in improving situational awareness in 2024 through the deployment of 53 weather stations and 44 camera stations that are also being utilized by NWS, county fire departments, emergency management agencies, DLNR-DOFAW, and other key stakeholders. The 2024 efforts focused on deployment in high risk areas. Between 2025–2027, Hawaiian Electric will augment deployment in high risk areas and expand into medium risk areas to provide more statewide coverage.

4.1.3.1 Weather Station Deployment

Hawaiian Electric is installing a network of weather stations in wildfire-prone areas to provide information about sustained and maximum (max) gust winds, temperature and relative humidity to help the Company monitor, predict and respond to fire weather conditions. The scope of the additions in 2024 included installation of 53 weather stations on four islands (23 on Maui, 15 on Hawaiʻi Island, 13 on Oʻahu and 2 on Molokaʻi). The weather stations, as shown in Figure 4-1, were installed in 2024 at a cost of $1.3 million, of which approximately 50% is provided by federal funds allocated under the federal Infrastructure Investment and Jobs Act (IIJA).

Figure 4-1. Sample Hawaiian Electric weather station on Oʻahu

Hawaiian Electric contracted with Western Weather Group, the same provider of weather stations that the three large California utilities utilize, for weather station equipment and support services. The weather stations are mounted on Hawaiian Electric utility poles and are solar powered with battery back-up. They record every ten (10) minutes the temperature, relative humidity, wind speed (sustained and max gust) and direction—meteorological data that will help Hawaiian Electric make informed decisions relative to wildfire mitigation.

Hawaiian Electric is sharing weather station data with NWS, academic institutions, and other weather forecasting services to help improve the State's ability to accurately monitor and forecast potential fire weather conditions. An example of one of the ways that external stakeholders can access the publicly available Hawaiian Electric weather station data is shown in Figure 4-2.

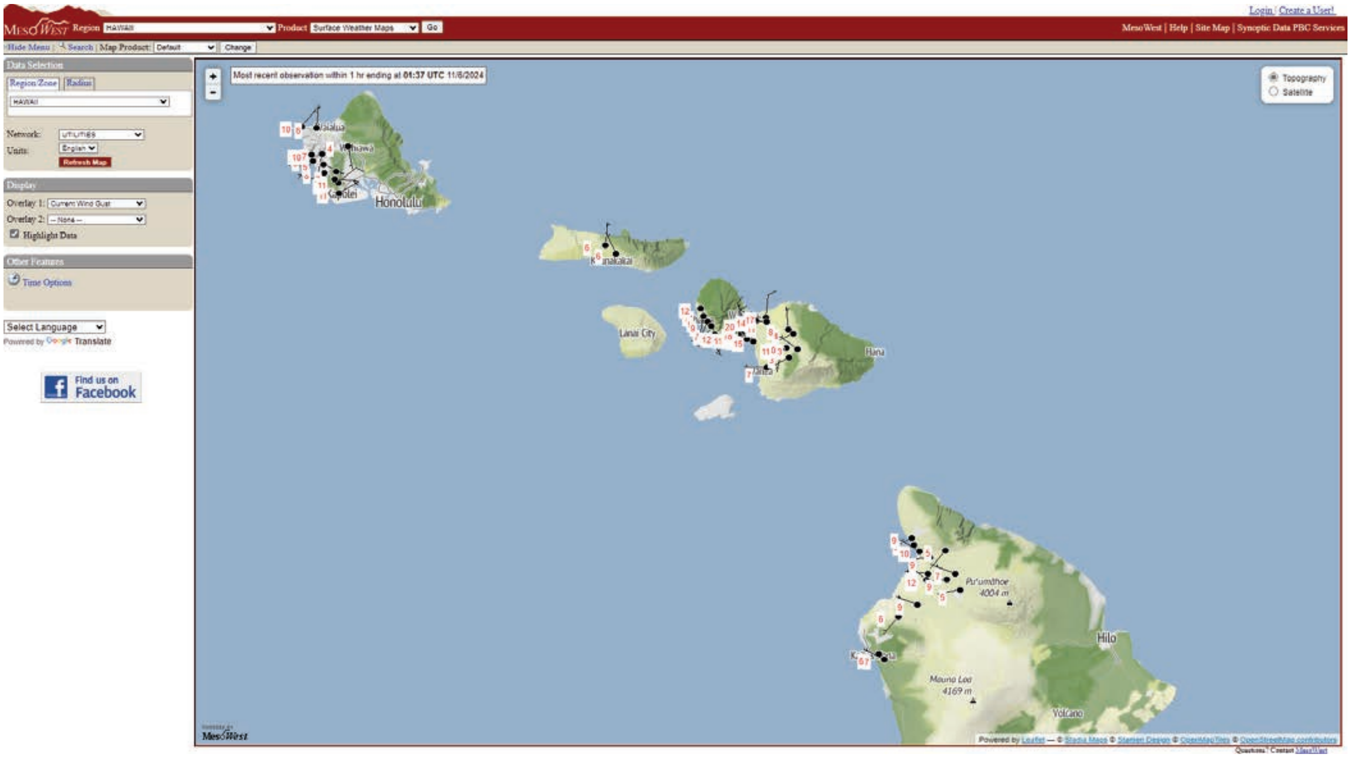


Figure 4-2. Publicly available Hawaiian Electric weather station data on MesoWest

From 2025 to 2027, Hawaiian Electric plans to install additional weather stations as necessary (locations to be informed by wildfire risk modeling) to support PSPS program evolution. In addition to the standard weather station sensors described above, the Company plans to pilot some future weather stations with rain gauges, soil temperature/moisture probes, and fuel temperature/moisture sticks. Hawaiian Electric plans to collaborate with the NWS and Western Weather Group to identify potential locations for future weather stations. Locations will be prioritized by their ability to augment existing high risk circuits with additional weather stations (e.g., installing another weather station on the opposite end of a circuit or sectionalizing device), installing weather stations for the first time on medium risk circuits, and strategic locations that may assist the NWS with their fire weather forecasting capabilities.

As part of its PSPS process as described in Section 4.5.4, Hawaiian Electric utilizes a real-time dashboard to monitor localized weather for circuits that are part of the PSPS program. A simplified illustration of the dashboard is shown in Figure 4-3, that is based on readings from Hawaiian Electric-deployed weather stations.

Circuit	Wind Gust (mph)	Humidity (%RH)	PSPS criteria met
Kaheawa 2	51.67	60.34	NO
Kaheawa 1	51.67	60.34	NO
MPP – Lahainaluna	51.67	60.34	NO
MPP – Kaheawa 1	51.67	60.34	NO
MPP – Kaheawa 2	51.67	60.34	NO
Waena – Pukalani	41.36	44.47	NO
Waena – Kealahou	41.36	44.47	NO

Figure 4-3. Illustrative view of Hawaiian Electric localized weather dashboard sample

4.1.3.2 Camera System Deployment

In 2024, Hawaiian Electric began deploying a network of high-resolution video camera stations (each location includes two cameras to provide a full 360-degree view) using artificial intelligence technology to provide enhanced situational awareness and early detection of ignitions in elevated fire risk areas near company infrastructure. The first camera station was installed in Lahaina and there are now 44 operational camera stations across the islands (13 on Maui, 13 on Hawaiʻi Island, 15 on Oʻahu, 2 on Molokaʻi, and 1 on Lānaʻi).

Figure 4-4. Sample Hawaiian Electric deployed AI-assisted video camera on Maui

Hawaiian Electric has plans to strategically deploy these AI-assisted camera stations to monitor electrical infrastructure in HWRA and MWRA across the service territory. As of the end of 2024, 99.3% of high risk and 81.8% of medium risk transmission spans, and 94.8% of high risk and 67.4% of medium risk distribution spans, are monitored by at least one AI-backed video camera station.

In support of this work, Hawaiian Electric signed a 5-year contract with California-based ALERTWest. ALERTWest installs and maintains the camera stations as well as provides 24/7/365 monitoring for potential ignitions by experienced wildfire safety professionals who reside in their Operations Center. The software platform is widely used by the California Department of Forestry and Fire Protection (CAL FIRE), all three large California utilities, and other utilities in fire-prone areas in the continental U.S. The video cameras are augmented by artificial intelligence to detect smoke and other early indications of fire in real-time. This allows first responders and emergency personnel to support mutual aid situations and have access to the tool when needed.

The software platform's pan, tilt, zoom features constantly scan their surroundings, completing one 360-degree sweep every two minutes. Utilizing artificial intelligence, the system detects changes from previous images and highlights them with a red rectangular box on the screen. This, coupled with 24/7 human verification, helps eliminate false alerts caused by mist or dust. If a suspected ignition is detected, the ALERTWest Operations Center staff reviews the camera imagery to ensure there is sufficient visual evidence before notifying Hawaiian Electric and emergency response agencies via phone, text, or email alerts.

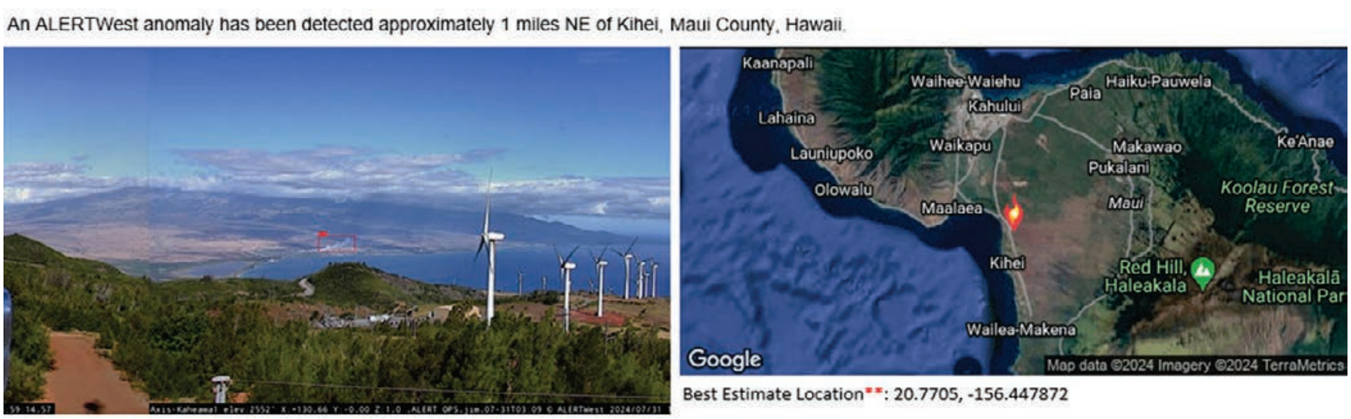


Figure 4-5. Sample alert first responders and Hawaiian Electric received from one of the AI-assisted camera stations

The cameras' live feeds are generally accessible to the public on the ALERTWest website at www.alertwest.org. Hawaiian Electric plans to deploy additional standard video camera stations, as well as begin installation of new mini cameras to achieve desired viewshed of HWRA and MWRA. These mini cameras will enable Hawaiian Electric to have a higher density of video cameras, ensuring network redundancy and enhanced triangulation capabilities, as well as allowing Hawaiian Electric and emergency responders to detect and monitor potential ignitions from different vantage points, some of which are difficult to see with standard camera stations due to Hawaii's unique topography.

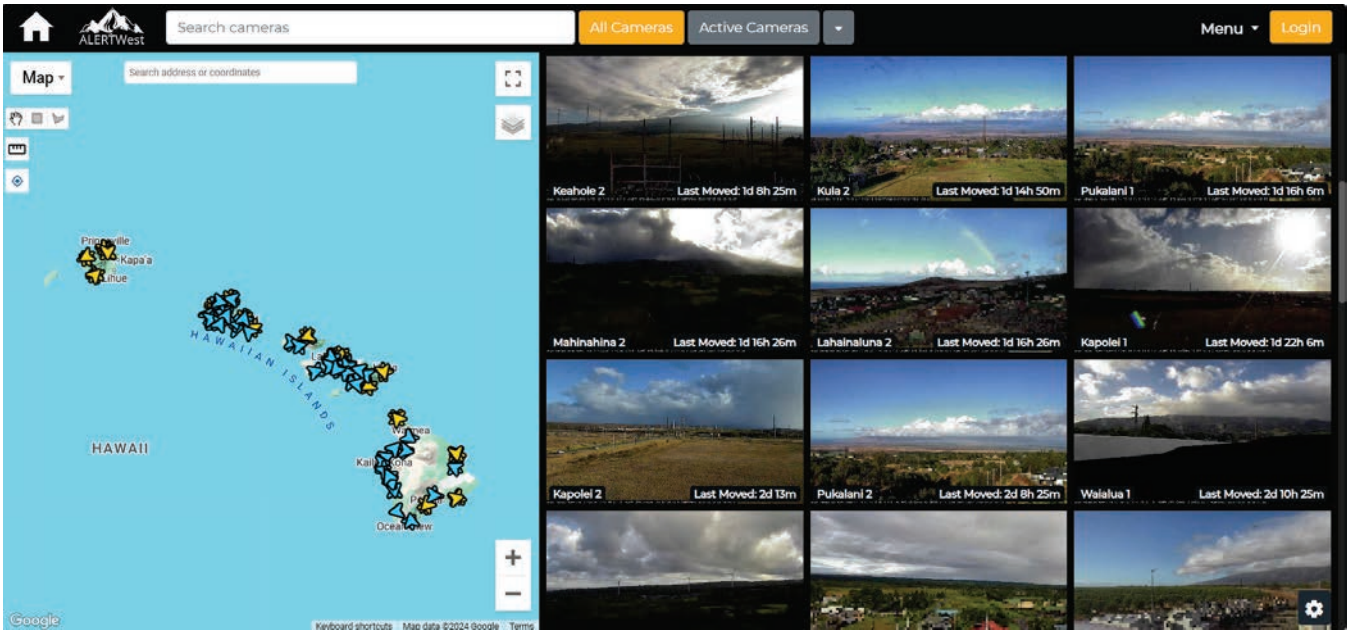


Figure 4-6. Publicly available ALERTWest dashboard

Figure 4-7. Sample live stream viewshed from the Lahainaluna camera station

4.1.4 Watch Office

Hawaiian Electric plans to establish a wildfire-focused Watch Office over the next three years. The Watch Office will monitor local, state, and national media; internal and external weather products; and provide situational awareness within the Hawaiian Electric, particularly concerning wildfires. Hawaiian Electric will adjust the composition of the Watch Office as it continues to gain experience operating this new utility function.

4.1.5 Spotters

Hawaiian Electric has formalized and implemented procedures to deploy human spotters at strategic locations on all the islands during red flag conditions as issued by NWS, where feasible. Spotters are trained to call the appropriate company personnel to report hazardous observations and provide information to System Operations from the field as requested. The following are examples of the types of issues spotters look for:

- Any active fire or smoke
- Any flash in the area near a powerline, substation, or transformer
- Sparking caused by powerlines making contact during high wind events
- Downed/broken/badly leaning poles
- Downed/broken powerlines
- Vehicle accidents involving poles or electrical equipment
- Loud noises near electrical equipment that follow a flash
- Vegetation contacting or at risk of contact with electrical infrastructure
- Airborne debris, especially, if debris is close to powerlines
- Inclement weather conditions upon arrival and any significant weather changes that might impact equipment and/or public safety
- Any calls or reports from third parties, the public or first responders about hazards (sparks, flashes or loud noises, poles down, lines down, etc.)

On Oʻahu, Maui and Hawaiʻi Island, some spotters are stationary provided they have good vantage points, while other spotters are tasked with roving specified areas. Given the smaller workforce size, Molokaʻi and Lānaʻi use spotter crews that rove throughout the island during red flag events. Spotter locations can be adjusted throughout the course of an event as necessary.

As Hawaiian Electric improves its situational awareness capabilities, it is increasingly leveraging these capabilities and may be able to reduce the number of spotters during red flag events.

4.1.6 Summary of Situational Awareness Scope and Cost

Table 4-1, summarizes the cost and scope of the Situational Awareness investments that support implementation of the WSS, through the monitoring of environmental conditions necessary to make critical operational decisions.

Table 4-1. Situational Awareness Scope with Estimated Costs

Projected Scope	Current 2025–2027 Goal	2025–2027 Estimated Costs
Watch Office	Build watch office staff and meteorological capability, training and office space	$9.0M
Weather Stations	Deploy additional weather stations as necessary (locations to be informed by wildfire risk modeling) to support PSPS program evolution	$9.1M

Projected Scope	Current 2025–2027 Goal	2025–2027 Estimated Costs
Cameras	Install additional standard camera stations and mini cameras to achieve desired viewshed of HWRA and MWRA	$8.6M
Wildfire Risk Model for Operations and Forecasting	Acquire forecasting tools to inform operational decisions on EFT, reclose block and PSPS	$4.6M
Fuel Sampling Program	Inform and update risk models with state of vegetation and fuels	$1.2M

4.2 Vegetation Management Program

Utility vegetation management programs are designed to protect infrastructure from vegetation, reduce potential injury to the public, and limit interruptions of electric services. Hawaiian Electric's comprehensive wildfire vegetation management program will incorporate tree pruning, tree removal, brush control/removal, and ground clearing around higher-risk infrastructure. These measures reduce the frequency of vegetation interfering with or coming into contact with electrical equipment, resulting in fewer vegetation caused outages and ignitions.

The Hawaiian Islands contain five different ecoregions: 1) Tropical Moist Forests, 2) Tropical Dry Forests, 3) Tropical High Shrublands, 4) Tropical Low Shrublands, and 5) Northwest Hawai'i Scrub. The Hawaiian Islands natural ecosystems warrant concern due to a rise of invasive plant species like Albizia tree (*Falcataria moluccana*), molasses grass (*Melinis minutiflora*), cane grass (*Cenchrus purpureus*), fountain grass (*Cenchrus setaceus*), and guinea grass (*Megathyrsus maximus*).

Hawaiian Electric is designing its wildfire vegetation management program based on the International Society of Arboriculture (ISA) Best Management Practices and the American National Standards Institute (ANSI) standards including the following:

- Occupational Safety and Health Administration (OSHA) Standard 1910.269
- ANSI Z133 – Safety Standard for Arboricultural Operations
- ANSI A300 Part 1 Pruning
- ANSI A300 Part 7 Integrated Vegetation Management (IVM)
- ANSI A300 Part 9 Tree Risk Assessment
- ISA Utility Tree Risk Assessment Best Management Practices

With the implementation of this WSS, Hawaiian Electric will develop vegetation management work plans that are informed by the wildfire risk model and the multi-tiered wildfire risk map, historical information (customer requests, outage/ignition data, last date worked, etc.) and Quality Assurance/Quality Control (QA/QC) program findings. As part of this transitional program, Hawaiian Electric will perform the following activities:

- Develop system wide annual work plans
- Formulate budget requirements according to workload, compliance and need
- Assign work packages to vegetation management vendors
- Respond to emergent issues/customer requests and assign to contractors as appropriate

- Resolve any customer/landowner disputes or interferences (not able to be resolved first by the vendor)
- Perform QA/QC activities of the vegetation management vendors to monitor for compliance with contract and Hawaiian Electric's wildfire vegetation management standards
- Develop data analytics, reports and evidence of compliance as required

Hawaiian Electric contracts with qualified vegetation management vendors to safely provide field services and complete work prescriptions.[28] The vegetation management vendors will provide the following services:

- Create prescriptions (contract utility forester vendors only)
- Provide field execution activities (prune and remove trees and vegetation and control brush) according to company specifications
- Resolve customer disputes/interferences (initial attempt)
- Record required work details in designated company software system
- Respond to company emergency restoration efforts when needed

4.2.1 Wildfire Vegetation Management Program Components

Hawaiian Electric's wildfire vegetation management program will include the following activities to help protect the electrical distribution, transmission and substation assets in high and medium risk areas: 1) vegetation management inspections for pruning and hazard tree identification and mitigation, 2) facility clearance around higher-risk facilities on a limited and emergent basis, 3) QA/QC of inspection and tree work, 4) vegetation management wildfire corridor maintenance, and 5) wildfire vegetation management employee and contractor training. Table 4-2 below provides an overview of these activities that will ramp up in 2026 and 2027. Hawaiian Electric is currently targeting a 12-to-18-month cycle for vegetation management inspections in all of HWRA and for prioritized circuits in MWRA as informed by the risk model outputs and local knowledge and experience of Hawaiian Electric's arborists.

[28] Prescriptions refer to a unique plan for work on an individual property and typically describes in detail the trees to be pruned, removed, treated, etc., and are created by inspectors for each property/site.

Table 4-2. Wildfire vegetation management Program Components

No.	Task	Targeted Cadence	Scope Summary
1	Inspection of High Risk Wildfire Areas - Annual Maintenance & Work Execution	12-18 months	Wildfire Routine Maintenance is an ongoing maintenance activity in high and medium risk areas. Creates a standard minimum clearance achieved at time of work of 10 feet of clearance on distribution and up to 25 feet of clearance on Transmission rights-of-way Adds an objective of always maintaining 4 feet of clearance and tracking any exception trees. Targets additional removal of trees using the risk model and Utility Tree Risk Assessment Best Management Practices to identify target trees.
2	Mid-Cycle Inspection for Hazard Trees and Radial Clearance& Work Execution	As Prescribed	Wildfire Mid-Cycle Program is a new process that will be added, as appropriate, to the vegetation management program in identified high risk areas and prioritized circuits in medium risk areas. Includes mid-cycle re-inspection for radial clearance encroachments. Add a mitigation prioritization for identified high priority trees.
3	Facility Clearance	As Prescribed	Facility Clearance includes clearing around poles/structures and/or substations on a limited and emergent basis in high and identified medium risk locations. Clearing of vegetation occurs inside and outside substation perimeter in high and identified medium risk areas on a limited or emergent basis.
4	QA/QC	Ongoing	QA/QC is a new activity to include wildfire vegetation management activities. Performed by employees and/or contractors who are ISA Certified Arborists, with a preference for Tree Risk Assessment Qualification (TRAQ) credential.
5	Training	Annually – Employee and Contractor	Employees and contractors involved with vegetation management wildfire mitigation activities. Annual refresher on fire situational awareness, WSS program changes/updates, tree risk assessment review, customer communication, among other topics Employees will participate in emergency response preparedness drills/training

4.2.1.1 Vegetation Management Wildfire Routine Maintenance Activity

The vegetation management Wildfire Routine Maintenance (clearance) occurs on both transmission and distribution systems in HWRA and MWRA locations and includes vegetation management work activities performed on a risk informed, time-based interval. Hawaiian Electric is currently targeting a 12 to 18 month cycle for all of the HWRA and for prioritized circuits in MWRA as informed by the risk model outputs and local knowledge and experience of Hawaiian Electric's arborists. Wildfire Routine Maintenance is driven by wildfire risk, asset location, reliability, and vegetation conditions to meet Hawaiian Electric's risk-based vegetation management standards and applicable regulations. The objective of Wildfire Routine Maintenance Activity is to achieve minimum of a 10-foot clearance on all open wire distribution conductors (<12.5 kV) at the time of work and maintain a 4-foot clearance zone from energized equipment at all times –

see Figure 4-8. Overhang clearances should be maintained to mitigate the impact of branch failure based upon species characteristics and distance from conductors. Wildfire Routine Maintenance activities are initiated in the field through assessment and identification of tree conditions that could present potential ignition risk and/or encroachment into the 4-foot buffer zone and the identification of hazard trees. Due to some species in the Hawaiian Islands, the inspection interval may need to be shortened, or trim clearance increased due to the fast growth rates of trees, grass (Facility Clearance initiatives only), and brush.

Hawaiian Electric's vegetation management contractors consider tree species and proper pruning techniques according to ANSI A-300 Standards when conducting pruning activities to achieve the minimum clearance distance on distribution and up to 25 feet from conductors on transmission system voltage (>23 kV) dependent on land ownership rights, laws/regulations and within easement rights – see Figure 4-9. Wood and slash management are components of vegetation management operations that are commonly chipped on site and removed from the property the same day work is performed, unless vegetation management operations occur in remote locations where vegetation removal is not practicable, and unless alternative options such as cut and slash management or blowing chips onto right-of-way have been arranged. Property owners may also request the vegetation material be left on site as chipped material for groundcover or landscape. Vegetation management contractors are required to remove vegetation material associated with vegetation management field activities from the channel and banks of watercourses (rivers, streams, lakes, wetlands, etc.) in accordance with environmental regulations and best management practices.

Herbicides are used where applicable to prevent regrowth from cut stumps or to reduce brush stem count. Tree growth regulators are substances designed to reduce vegetative growth by interfering with natural plant processes. They are a good tool to be used only in limited circumstances such as historic street trees. Tree growth regulators and herbicides are chemical control methods utilized to eliminate or decrease undesirable plant material.

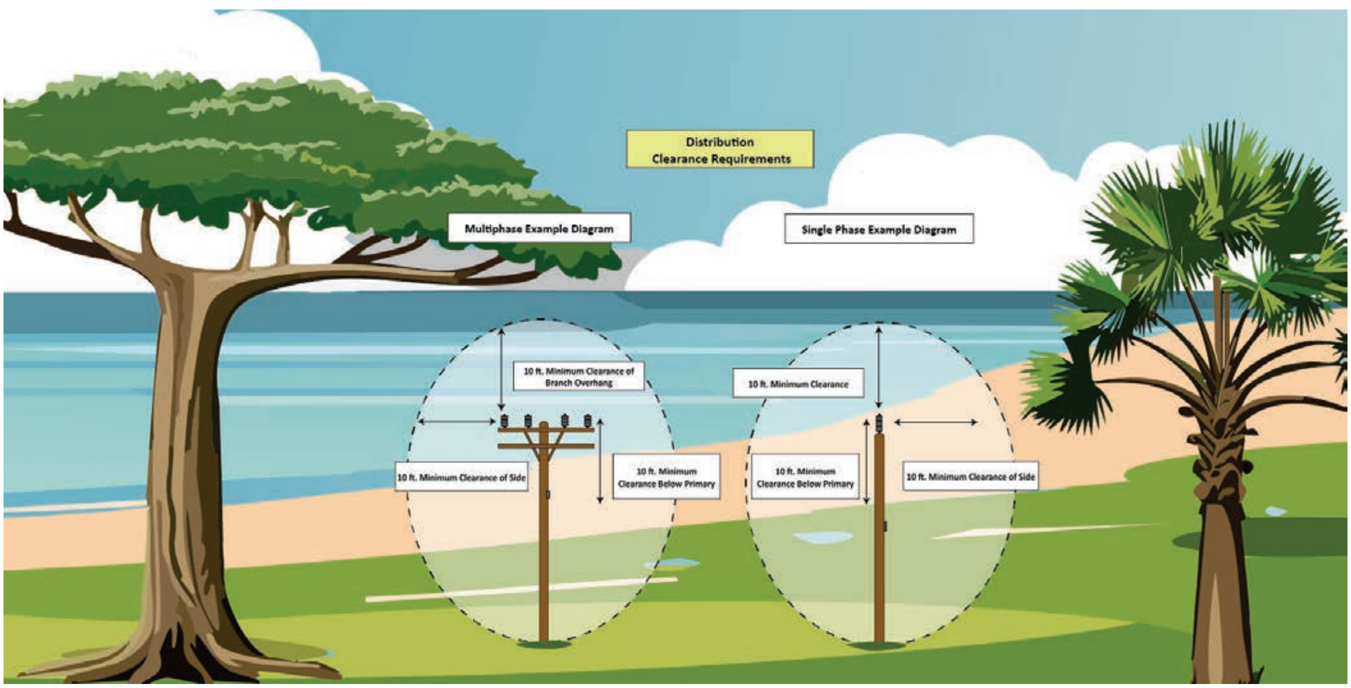


Figure 4-8. Distribution right-of-way clearance specifications

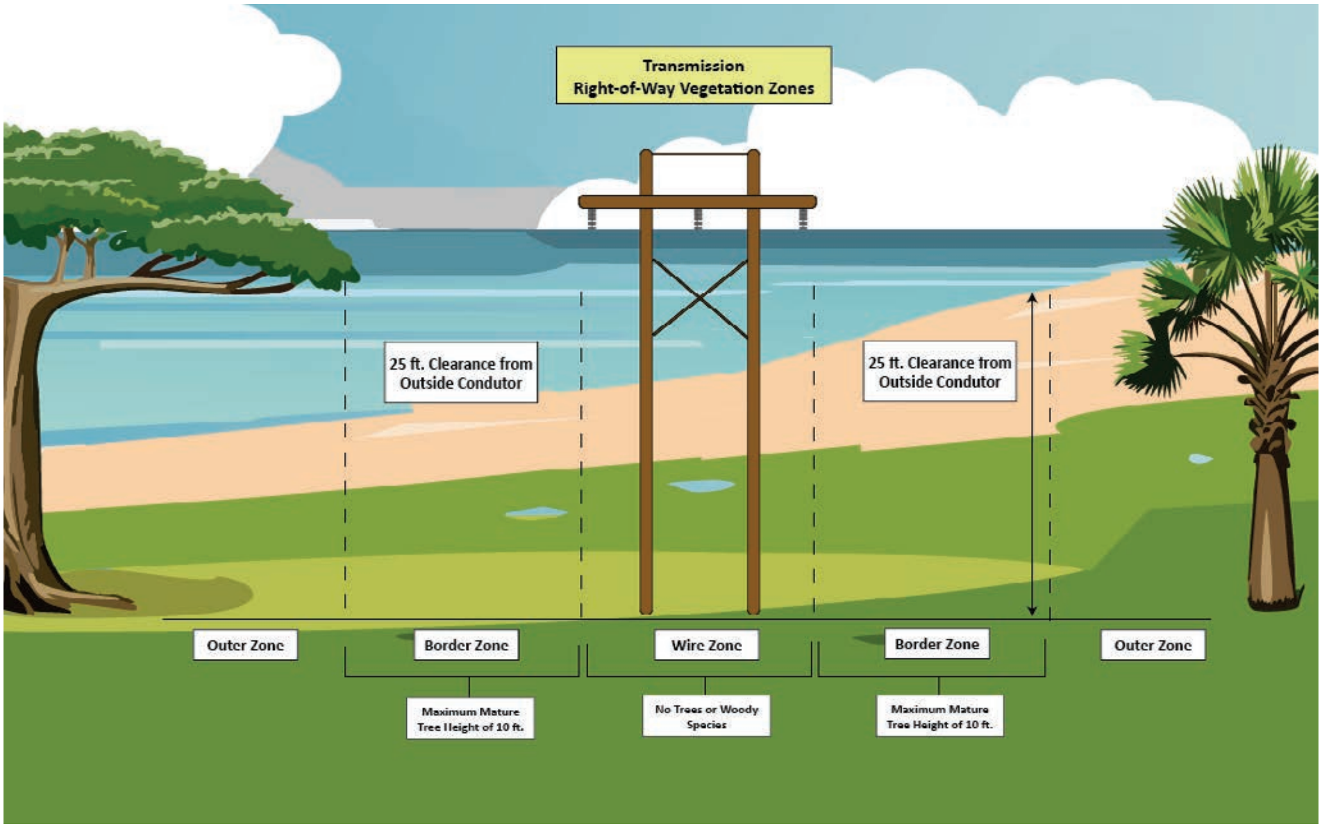


Figure 4-9. Transmission right-of-way clearance specifications

Identification of hazard trees in HWRA will be conducted by trained inspectors (with a preference for ISA Tree Risk Assessment Qualification (TRAQ) credentials). Tree species with a higher risk of susceptibility to insect or disease activity, high growth rate potential, failure characteristics, or are known to be responsible for increased outage rates may be preemptively targeted to achieve clearances.

Hawaiian Electric's hazard tree program will employ two levels of utility tree risk inspections:

1. Level 1 inspection is a limited visual assessment of trees to identify trees which require pruning or removal for the cycles. The inspection considers tree growth and the potential need to abate hazardous conditions.

2. Level 2 inspection is a 360-degree visual assessment of a tree where the crown, trunk, canopy, and above-ground roots are evaluated for specific hazards to the electric infrastructure. A Level 2 inspection is performed only if a tree is identified for further inspection during the Level 1 inspection.

Hawaiian Electric employees or contracted vegetation management inspectors conduct a Level 1 inspection on trees that can strike the primary conductor, secondary conductor, or utility infrastructure (i.e., pole or guy wire) if the tree or tree parts were to fail. If the inspector identifies a dead, declining and/or diseased tree, they will perform a Level 2 inspection, if qualified, or document the tree location for a follow-up inspection. Tree(s) identified that have a moderate or high probability of failure and pose an unacceptable risk to facilities will be mitigated as a hazard tree.

4.2.1.2 Vegetation Management Wildfire Mid-Cycle Inspection Program

Hawaiian Electric's vegetation management Wildfire Mid-Cycle Inspection Program is a new program which will provide mid-cycle field assessments and mitigation activities for hazard trees and radial clearance encroachments on an as-needed basis in specified high risk and prioritized medium risk areas for both transmission and distribution. The program is designed to address the likelihood of tree and conductor contact to reduce potential ignition sources. The main goal of this program is to identify and mitigate trees that show signs of insect/disease infestations, are dead or declining, have been subjected to recent grade changes, have exposed or damaged roots, are structurally unsound, and may not maintain radial clearances or fail prior to the next maintenance cycle.

4.2.1.3 Vegetation Management Wildfire Facility Clearance

Facility Clearance is not a WSS program; it is an activity performed on a limited and emergent basis and designed to establish a woody vegetation-free zone around assets to reduce ignition potential in identified high and medium risk locations.

Facility Clearance - Transmission & Distribution

The Facility Clearance activity for assets and substations is performed on a limited and emergent basis and when it is performed it will be executed to the specification in Figure 4-10andFigure 4-11 specific to the type of equipment. The Facility Clearance for distribution and transmission consists of a **10-foot vegetation-free radius and 8-foot vertical clear zone** and to remove all brush, limbs and foliage of living trees and/or dead, diseased branches vertically to the height of the conductors on qualifying distribution poles – see Figure 4-10.

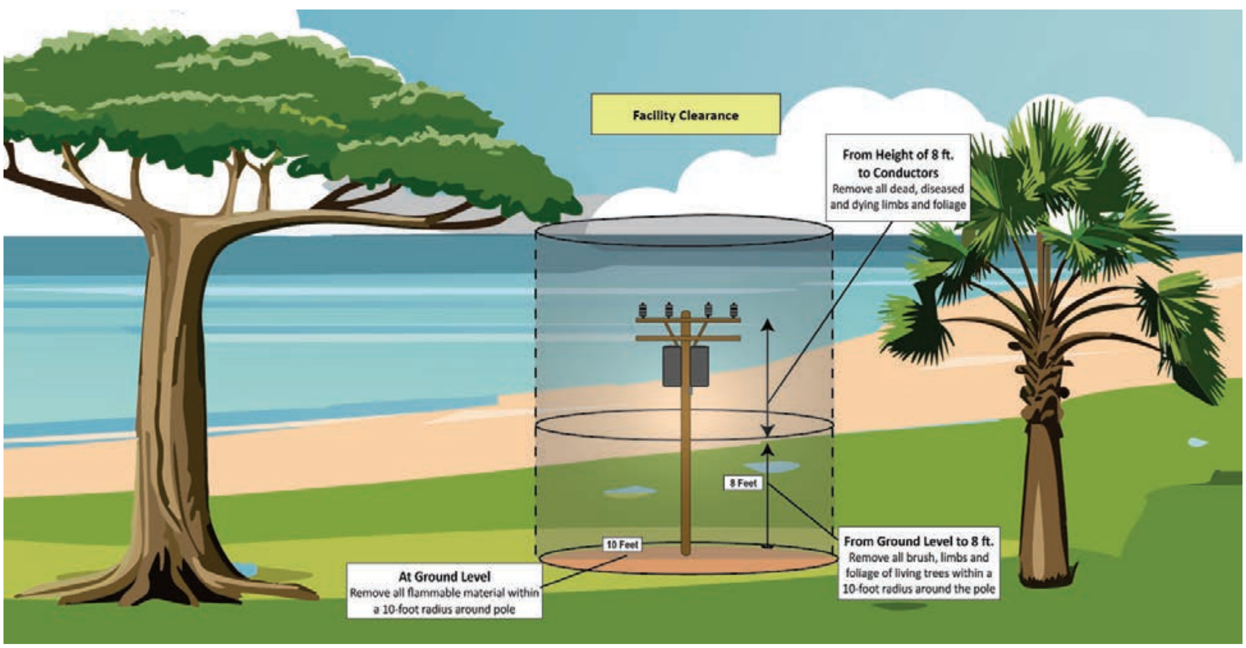


Figure 4-10. Facility Clearance – transmission and distribution assets

Facility Clearance - Substations

Vegetation is removed from a 10-foot distance from the perimeter of the substation fences for safety and security purposes (see Figure 4-11).

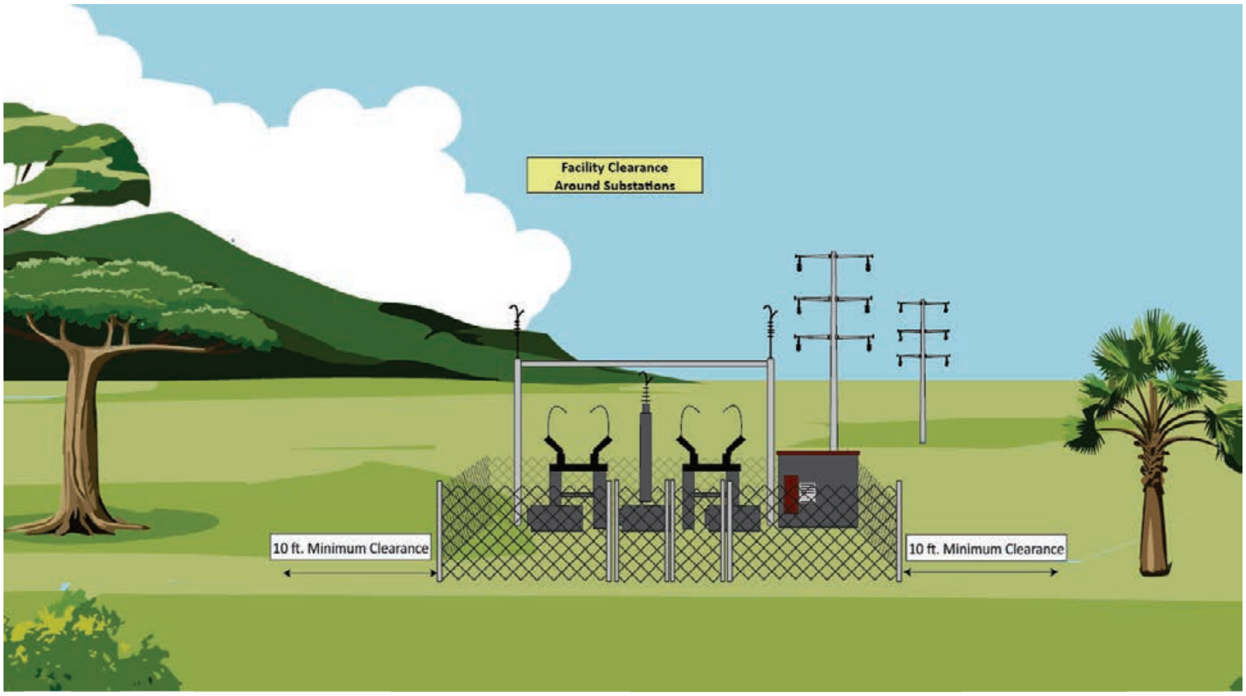


Figure 4-11. Facility Clearance - Substations

4.2.2 Vegetation Management Wildfire Quality Assurance/Quality Control

Vegetation management QA/QC can foster accountability and support execution of work in conformance with Hawaiian Electric's standards, as well as help identify potential gaps or issues to facilitate continuous improvement. Hawaiian Electric is developing a QA/QC process to evaluate the effectiveness of the wildfire vegetation management program. It will assess vegetation management activities in identified HWRA and MWRA locations and document trees that were missed or have insufficient clearance according to the standards. The QA/QC program will confirm customer refusals (including those not previously recorded), and the process to complete such refusals. QA/QC results will be used to adjust program activities, provide additional training where needed, and measure adherence to specifications and standards.

4.2.3 Summary of Vegetation Management Scope and Cost

Table 4-3, below, describe the current targets and estimated costs to implement the vegetation management programs described herein. These activities are expected to ramp up starting in 2026.

Table 4-3. Vegetation Management Scope with Estimated Costs

Projected Scope	Current 2025–2027 Target	2025-2027 Estimated Costs
Level 1 Inspection for HWRA and MWRA	90% Compliance	$ 2.7 million
Radial Clearance Distribution for HWRA and MWRA	90% Compliance	$17.8 million
Radial Clearance Transmission HWRA and MWRA	90% Compliance	$14.0 million
Facility Clearance	90% Compliance	$0.887 million
QA/QC and Training	Targeting 25-30% of all work performed in HWRA and MWRA including Level 1 inspections, Radial Clearance and Hazard Tree Removal and consistently document all findings.	$0.910 million

4.3 Asset Inspection Programs

The wildfire asset inspection program that Hawaiian Electric is developing provides for frequent inspections of its transmission and distribution assets in wildfire risk areas in order to reduce the potential for component failure and ignitions, as well as strengthen system reliability. This program will be a checklist informed process, where a qualified electrical worker reviews the integrity of electrical structures, supporting infrastructure (guy wires, push poles, etc.), framing, conductors, equipment, conformance with design standards, and any other notable observations. Any conditions that are identified during the inspection that need remediation will be scheduled for maintenance. Hawaiian Electric will validate completion of work to company standards through a QA/QC process.

This systematic approach is depicted in the following Figure 4-12.

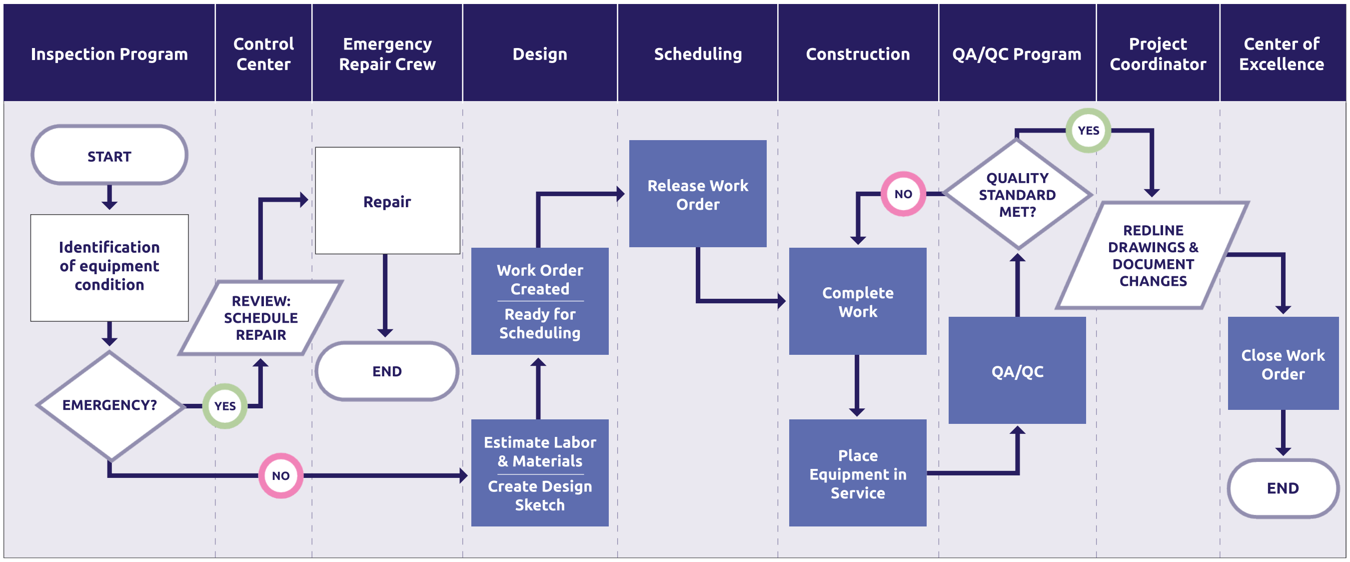


Figure 4-12. Overall Asset Maintenance Program Workflow

The following sections summarize the types of inspections and the maintenance action priority matrix for repairing identified deficiencies. Also included is a description of the supporting asset inspection QA/QC Program that is being developed.

4.3.1 Distribution Asset Inspection and Remediation Programs

As shown in Figure 4-13, distribution asset inspections are conducted via the following programs: ground inspection, aerial inspection (including the utilization of drones and/or helicopters), intrusive pole inspection (also called Pole Test & Treat), and infrared inspection.

Details of each inspection program are provided in this section. Assets in HWRA will be subject to a ground or aerial inspection annually, assets in MWRA will be inspected on a 3-year cycle, and assets in LWRA on a 5-year cycle. For intrusive pole inspections, assets will be inspected on a 10-year cycle regardless of risk location.

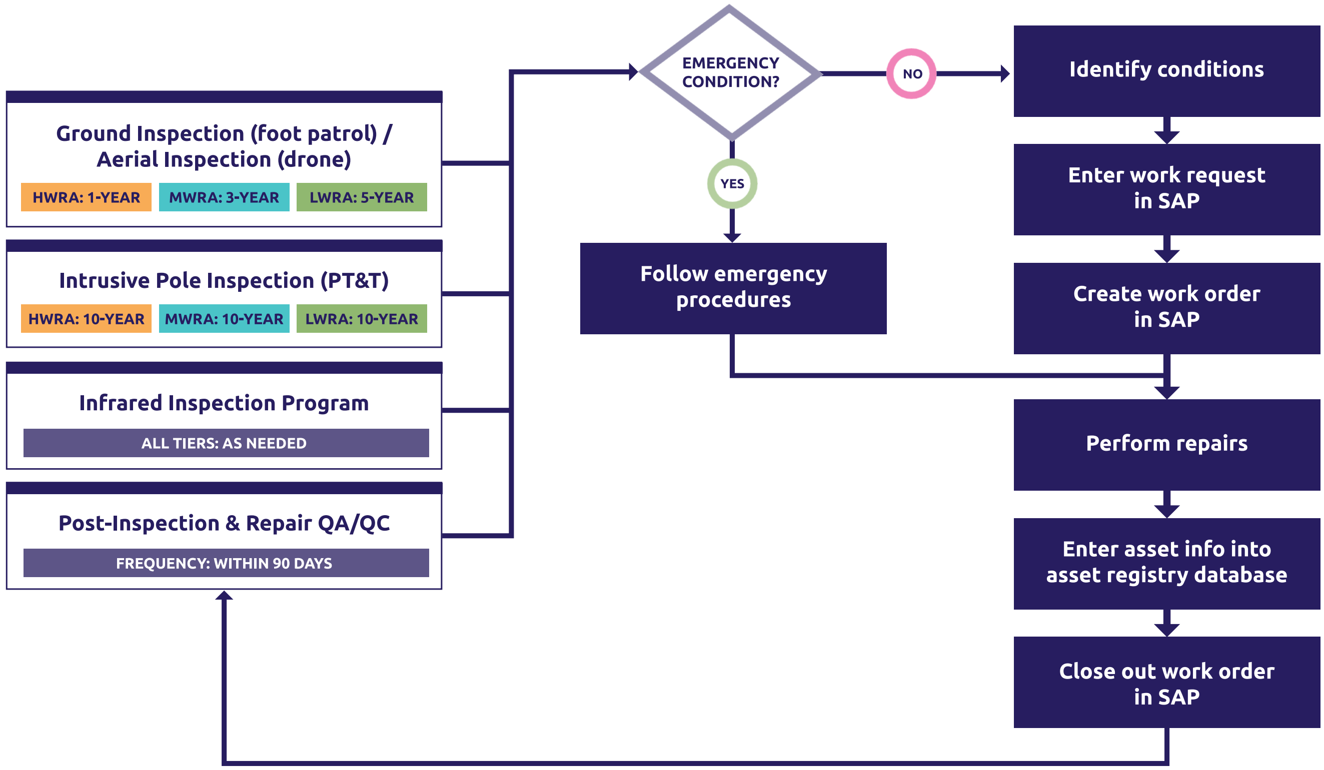


Figure 4-13. Distribution inspection and repair workflow

The wildfire asset inspection program is being designed to assess the condition of assets to address the risk associated with utility infrastructure causing wildfires. The inspection program is checklist based and draws on the expertise of qualified electrical workers. The purpose of the checklist is to ensure consistency between inspections and inspectors, and to focus attention on the potential wildfire risk aspects of utility infrastructure. This checklist-based program will be applied consistently across Hawaiian Electric's service area. The frequency of inspections is tied to the relative wildfire risk as depicted on Wildfire Risk Maps (Section 2).

As depicted in Figure 4-13 above, work orders or "maintenance tags" will be created for any identified conditions and identified work will be prioritized and tracked. Completed work orders will be subject to a QA/QC process to validate conformance with company standards. The following provides additional detail regarding Hawaiian Electric's inspections programs, maintenance prioritization, and QA/QC processes.

4.3.1.1 Ground-based and Aerial Asset Inspections

Hawaiian Electric will perform asset inspections using ground-based personnel, aerial resources, or a combination thereof every year for distribution assets located in HWRA, every 3 years for MWRA, and every 5 years for its remaining assets. Above ground visual inspections of assets are performed by qualified electrical worker inspectors utilizing a predefined checklist.

Hawaiian Electric has a fleet of drones and licensed operators that perform inspections of assets in higher wildfire risk areas. Drone inspections capture high-definition imagery of poles and other circuit assets from above the structures, which can complement the information being collected from the detailed ground inspections. Drones can be utilized on an as-needed basis to inspect poles and the associated equipment from above, to identify conditions that may not be visible from the ground, as well as in difficult-to-access locations.

The stored imagery, once collected, will then be analyzed through a desktop review by qualified electrical worker inspectors. A standard matrix will be utilized to classify conditions or deficiencies that have the potential to impact public safety and/or reliability, or for items that may not be in regulatory compliance. Hawaiian Electric may also utilize aerial equipment such as a helicopter in strategic situations to inspect and capture videos and pictures of utility assets. This may allow for quicker review of electrical assets.

Ground inspections enable the inspector to visually inspect the base of the structure (including guys and anchors). Aerial inspections provide a top-down view of the structure (pole tops, crossarms, tie wires, etc.). Ground and aerial inspections will utilize a checklist to verify that structures, conductors, and equipment meet specific risk reduction, engineering and construction standards. The basic checklist will focus on ignition issues but may include additional items as needed.

4.3.1.2 Intrusive Pole Inspection (Pole Test & Treat)

The Pole Test & Treat program includes partially excavating around the pole and drilling into it (both above and below ground level) to identify internal decay and estimate the pole's remaining strength, and to either apply treatments to protect and extend the life of the pole or make a recommendation for the reinforcement or replacement of the pole, based on the test results and wood strength rejection criteria. This intrusive pole assessment identifies poles that are significantly weakened through decay, weathering, or other physical damage, and that may not meet NESC remaining strength requirements. Hawaiian Electric is targeting a 10-year cycle for intrusive pole inspections for all areas. Hawaiian Electric is also piloting technology (called THOR Poletest™) that utilizes seismic waves to assess the integrity of the pole, for a non-intrusive assessment of internal decay and remaining strength. The Company will determine whether and to what extent to incorporate this tool into the inspection strategies based on the results of the pilot.

4.3.1.3 Infrared Inspections

Hawaiian Electric will utilize thermographers or infrared-enabled drone imagery as needed to inspect select distribution assets in high wildfire risk areas based on risk analyses. The intent is to identify potentially hazardous hot spots requiring remediation.

4.3.1.4 Correction of Deficiencies Identified through Inspections

Deficiencies identified as a result of the inspection processes will be entered in the managed maintenance computer program as maintenance tags/work orders. These work orders will be prioritized based on the criticality of repair times as described in Table 4-4.

Table 4-4. Distribution Maintenance Action Priority Matrix

Maintenance Priority Ranking	Description	Required Response Time
A	Failed component with or without service interruption.	Immediate; standby required

Maintenance Priority Ranking	Description	Required Response Time
Hot B	Failure imminent. Component is damaged or no longer suitable for intended use. Failure or interruption of service is imminent.	Within 72 hours
B	Evidence of significant wear, corrosion, or damage.	Within 3 months
C	Evidence of moderate to minimal wear, corrosion ,or damage.	Within 12 months
D	Minor wear, corrosion, or damage.	Within 5 years

4.3.2 Transmission Asset Inspection and Repair/Replacement Programs

As shown in Figure 4-14, transmission asset inspections are conducted via the following programs: ground inspection, aerial inspection (including the utilization of drones and/or helicopters), intrusive pole inspection, Light Detection and Ranging (LiDAR), and infrared inspection. Details of each, including the related frequency on a risk tier basis (if applicable) are provided below.

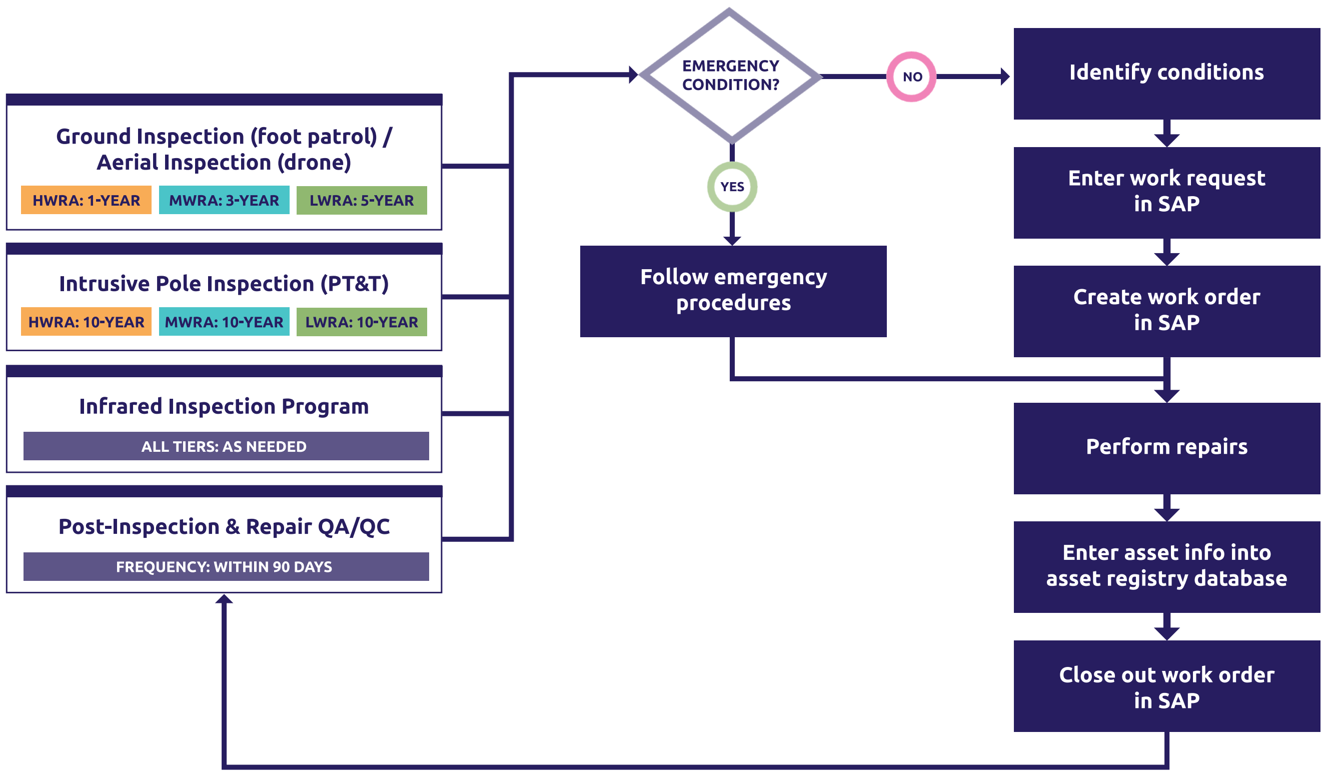


Figure 4-14. Transmission inspection and repair workflow

The transmission inspection program is checklist based and relies on the expertise of qualified electrical workers. The purpose of the checklist is to ensure consistency between inspections and inspectors, and to focus attention on the potential wildfire risk aspects of utility infrastructure. This checklist-based program will be applied consistently across Hawaiian Electric's service area. The frequency of inspections is tied to the relative wildfire risk as depicted on Wildfire Risk Maps (Section 2).

As depicted in Figure 4-14 above, work orders or “maintenance tags” will be created for any identified conditions that require remediation, and completed work orders will be subject to QA/QC processes to confirm conformance with company standards. The following provides additional detail regarding Hawaiian Electric’s transmission inspections programs, maintenance prioritization, and QA/QC processes.

4.3.2.1 Ground-based and Aerial Asset Inspections

Hawaiian Electric will perform transmission asset inspections using a combination of ground-based and aerial resources every year for transmission assets located in HWRA, every 3 years for MWRA, and every 5 years for its remaining assets. Above ground visual inspections of assets are performed by qualified electrical worker inspectors utilizing a predefined checklist.

Hawaiian Electric has a fleet of drones and licensed operators that perform inspections of assets in high wildfire risk areas. Drone inspections capture high-definition imagery of poles and other circuit assets from above the structures, which can complement the information being collected from the detailed ground inspections. Drones can be utilized on an as-needed basis to inspect poles and the associated equipment from above, to identify conditions that may not be visible from the ground, as well as in difficult-to-access locations.

The stored imagery, once collected, will then be analyzed through a desktop review by qualified electrical worker inspectors. A standard matrix will be utilized to classify conditions or deficiencies that have the potential to impact public safety and/or reliability, or for items that may not be in regulatory compliance. This imagery will also be utilized to capture equipment data for inclusion in the asset registry database. Hawaiian Electric may also utilize aerial equipment such as a helicopter in strategic situations to inspect and capture videos and pictures of utility assets. This may allow for quicker review of electrical assets.

Ground inspections enable the inspector to visually inspect the base of the structure (including guys and anchors). Aerial inspections allow a top-down view of the structure (pole tops, crossarms, tie wires, etc.). Ground and aerial inspections will utilize a checklist to verify structures, conductors and equipment meet specific risk reduction, engineering and construction standards found during inspections. The basic checklist will focus on ignition issues but may include additional items as needed.

4.3.2.2 Intrusive Pole Inspection

This program is applied to transmission poles that are made of wood, using the procedures that were previously described in the distribution “Intrusive Pole Inspection” section.

4.3.2.3 Infrared Inspections

Hawaiian Electric will utilize thermographers to inspect select transmission assets on an as-needed basis in high wildfire risk areas to identify potentially hazardous hot spots requiring remediation. Infrared technology will continue to be utilized based on a risk analysis, as needed basis.

4.3.2.4 Correction of Deficiencies Identified through Inspections

Correction of deficiencies will follow a similar process as described in Section 4.3.1.44.3.1.4.

4.3.3 Distribution and Transmission Asset QA/QC Inspections

Hawaiian Electric is developing a QA/QC inspection program to help drive the accountability and success of the Company's inspection programs and validate that maintenance activities are completed to standards. As part of the QA/QC process related to inspection activities, a subset of approximately 5% of assets will be re-inspected on an annual basis.

The QA/QC inspection program will include monitoring and reporting in the following areas: a) inspection consistency, b) identification of conditions that require remediation based on the established checklist, c) timely completion of corrective work, and d) adherence to established standards which are applicable to repairs as well as new construction.

4.3.4 Summary of Asset Inspection Scope Cost

Hawaiian Electric will perform asset inspections of distribution and transmission assets using a combination of ground-based and aerial resources as described in this section. Hawaiian Electric started its HWRA and MWRA asset inspections in 2023/2024 and completed high risk area inspections and commenced with asset inspections in medium risk areas. In 2025, Hawaiian Electric will complete the rest of the MWRA and re-inspect HWRA. In 2026 and 2027, Hawaiian Electric will inspect HWRA again. The overall costs for inspections are shown in Table 4-5 below. Beginning in 2025, Hawaiian Electric will perform QA/QC checks as described earlier.

In 2024 Hawaiian Electric incorporated the Thor Poletest™ advanced pole inspection technology in the asset inspection program. Asset inspectors can quickly assess wood pole condition using an advanced technology hammer that collects and transmits data to an interactive data portal providing real time data on the pole's condition.

Hawaiian Electric will continue other inspections which are not included in the WSS budget such as intrusive pole inspections (Pole Test & Treat) on all Tiers on all islands, regular helicopter transmission visual inspections and low risk area ground and aerial inspections at 5-year intervals.

Table 4-5. Asset Inspection Scope with Estimated Costs

Projected Scope	Current 2025–2027 Target	2025-2027 Estimated Costs
Detailed Inspections	95% compliance: Complete annual HWRA inspections, 3-year cycle for MWRA, 5-year for LWRA Test & treat on 10-year cycle Post Inspection & Repair QA/QC within 90 days	$15.3M
Inspection Repairs	HWRA: 95% compliance with Hot B 90% compliance with B MWRA: 65% compliance with Hot B; 60% compliance with B	$38M

Projected Scope	Current 2025–2027 Target	2025-2027 Estimated Costs
QA/QC	5% of poles	$1.4M

4.4 Grid Hardening

Hawaiian Electric is hardening its electric system by strengthening the overhead transmission and distribution infrastructure to be more resilient to conditions that can result in utility-related wildfire ignitions. System hardening includes the implementation of ignition-reducing and fire-resistant equipment enhancements and construction standards. The focus of the system hardening program addressed in this WSS is specific to the high and medium wildfire risk areas.

Hawaiian Electric is using a comprehensive approach to identify a portfolio of risk mitigation initiatives starting with modeling the wildfire risk in its service area to understand the specific risk drivers and consequences. The next step involves identifying—through extensive benchmarking with other utilities and historical outage data analysis—the range of system hardening mitigation options available to Hawaiian Electric, and evaluating these options based on specific wildfire risk drivers and consequences.

For covered conductor and Targeted Undergrounding, the risk model described in Section 3 is used to identify the highest risk circuits and the preferred system hardening options for those circuits. These preferred mitigation options are then evaluated by Hawaiian Electric's subject matter experts through engineering analysis, assessment of field conditions, and project execution feasibility analysis to arrive at specific mitigation projects that will be applied on each circuit. Plans for other mitigations, such as Transmission/Sub-Transmission Line Hardening, Expulsion Fuse Replacement, Lightning Arrester Replacement, and Pole and Structure Replacement are developed outside of the risk model, but leverage aspects of the risk analyses developed for the risk model such as feeder risk, fire spread, and fire consequence to aid program/project development and prioritization.

Hawaiian Electric will collect data on the efficacy of the 2025 programs (and every year thereafter) and may make adjustments for its 2026 and 2027 WSS plans accordingly. This may include modifications to targets for EFT, PSPS, vegetation management, system hardening, equipment replacement measures, etc.

4.4.1 Covered Conductor

Like most of the industry, Hawaiian Electric's overhead lines largely use bare conductor. Conductor contact, which can be a source of wildfire ignition, includes contact between power lines as well as contact with objects such as vegetation, animals, balloons, or other foreign objects. Hawaiian Electric analyzed 5 years of outage data and determined that about 50% of unplanned outages on overhead distribution circuits in HWRA were associated with conductor contact. There are several ways to reduce these types of conductor contacts, such as adding space between conductors, shortening spans, vegetation trimming, covering conductors as discussed in this section, and undergrounding.

Covered conductor is a term for overhead conductive wire that is enclosed in a multi-layer polymer sheath that helps to prevent line-to-ground and phase-to-phase faults caused by contact between lines or with objects, reducing the probability of utility-related ignitions. An additional benefit of using covered conductor is improved reliability, including reduced EFT-related outages.

Covered conductor is heavier than standard bare conductor, and has a higher wind loading profile, resulting in greater stress being put on the supporting structures. As a result, Hawaiian Electric also performs pole loading analyses as part of the engineering phase of reconductoring projects to determine if the existing structures have adequate strength, and whether new, stronger structures may be needed. The utility industry is studying whether the sturdier construction standards and properties of covered conductor may allow higher wind speed thresholds to be utilized for establishing PSPS activation criteria.

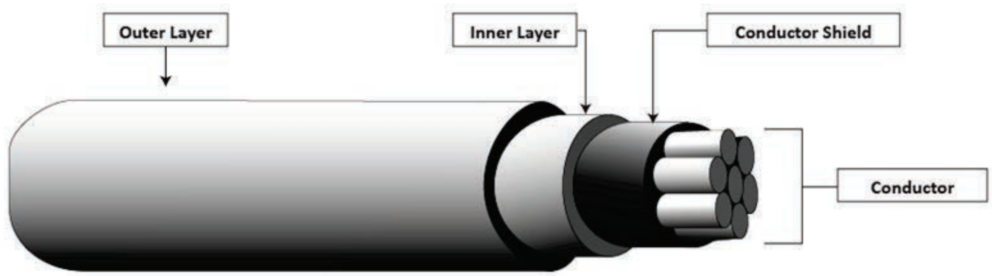


Figure 4-15. Cross sectional view of covered conductor

To fully realize the wildfire mitigation benefits of covered conductor, Hawaiian Electric is developing covered conductor installation standards to cover exposed energized components including splices, connectors, and equipment connections with coverings to reduce the risk of arcing.

In this WSS, Hawaiian Electric will focus on the application of covered conductor to circuits operating at 15 kV and below. Future standards may include covered conductor standards for applications up to 46 kV. Currently, covered conductor for applications above 46 kV is not widely produced by cable manufacturers.

Based on Hawaiian Electric's outage cause analysis and benchmarking with the three large California utilities, the planning risk model uses a range of ignition reduction effectiveness values from 30% to 90% for covered conductor, depending on the pre-mitigation outage cause profile of each circuit.

As discussed in Section 3.7, the planning risk model and qualitative models are first run at the entire circuit level to inform the magnitude of the covered conductor program and to support prioritization of more detailed project development efforts. Desktop and field analyses are then used to segment circuits into logical project boundaries, validate model outputs, and conduct initial feasibility screens. The risk model and qualitative models are then re-run at the level of SME-defined circuit segments to identify and prioritize individual covered conductor projects.

Over the 2025–2027 WSS, Hawaiian Electric is currently targeting to install approximately 15 to 70 circuit miles of covered conductor. This current targeted range is reflective of this being the first covered conductor program for Hawaiian Electric. In addition, the targeted range is based upon Hawaiian Electric's current estimate of what is reasonably achievable in consideration of cost, affordability, and the supply of skilled workforce. Hawaiian Electric may adjust the current estimated targets based on new data collected and experience learned over the next three years, particularly after 2025 ignition data and actual covered conductor cost data is collected. Covered conductor projects will also include replacing poles as necessary, as well as replacing expulsion fuses and other equipment within the project boundaries.

4.4.2 Targeted Undergrounding

Converting existing overhead distribution lines to underground can significantly reduce the potential for ignition from conductor contact and equipment failure. Undergrounding may also reduce the need for PSPS during extreme wind events, depending on the grid topology and the location of undergrounded segments within a circuit. Additional benefits of undergrounding include improved reliability by reducing outages (including EFT-related outages), reduced emergency restoration activities during storm events, and reduced need for vegetation management activities. However, undergrounding is the most costly system hardening mitigation option on a per-mile basis and can take significantly longer to implement than other mitigations. Hawaiian Electric recognizes the expressed desire of communities, particularly in HWRA, to have overhead lines converted to underground. As described in this section, Hawaiian Electric will conduct analyses to evaluate costs relative to benefits of undergrounding and other alternatives to enhance safety in the most at-risk communities.

Converting existing overhead lines to underground is a costly, complex, and time-consuming process. Particularly in a retrofit situation (as opposed to new greenfield build), constraints such as environmental impacts, cultural impacts, iwi kupuna, traffic impacts, permitting, identifying land, coordination with other users of existing poles, easements for underground equipment (i.e., switchgear and transformers), and system design considerations must be evaluated when identifying an undergrounding project. Further, geological conditions along the proposed route play a critical role in the feasibility and cost of undergrounding. Some locations may not be suitable for undergrounding due to steep or rocky/mountainous terrain, volcanic or rocky soils, waterway crossings, heavy vegetation that must be cleared for construction, heightened potential for erosion, environmental conditions that can limit heavy equipment access and operations, and inability to maintain necessary clearances between Hawaiian Electric and other utility infrastructure. Additionally, the permitting, easements, infrastructure restoration, and environmental restoration processes for undergrounding can be complex, requiring approvals from property owners and multiple local, state, and federal agencies.

Analysis of Hawaiian Electric's outage data indicates that nearly all outage causes relevant to potential ignition causes could be mitigated by undergrounding the existing overhead system. Based on this outage cause analysis, the absence of historical ignition cause data, and benchmarking of the three large California utilities, a 95% ignition reduction effectiveness is initially used in the planning risk model analysis.

Hawaiian Electric's WSS Targeted Undergrounding plan for 2025–2027 will be composed of two "tranches" of undergrounding. The first tranche is to conduct underground feasibility studies to determine the specific undergrounding projects to build upon its initial Targeted Undergrounding Program. The second tranche is an initial undergrounding of approximately two miles of overhead power lines in critical safety areas in Lahaina with a community working group convened to provide area-specific knowledge and input. This project represents the amount of undergrounding that was slated to be completed under the 5-year Resilience Program (which runs through 2029) with partial federal grant funding. Through the community group, additional areas to underground in Lahaina may be identified. This is discussed in more detail in Section 4.4.2.1 below.

A feasibility study as an initial step for a broader undergrounding program is prudent to reduce the inherent uncertainty in an existing overhead powerline to underground conversion project. Given the high cost, cost variability, longer project duration, schedule variability, variety of scope alternatives, and feasibility constraints of undergrounding projects, Hawaiian Electric plans to conduct in-depth undergrounding studies in 2025 for potential undergrounding projects, including cost and schedule estimates on a project-specific basis for high potential projects, which will inform the development of future undergrounding projects. The annual updates to the WSS will include continue new information and changes to mitigation measures developed from these studies.

As discussed in Section 3.7, due to the level of granularity of currently available data, the risk model applies mitigations at the entire circuit level and treats the risk on a circuit as uniformly distributed throughout the portions of the circuit in high wildfire risk areas and medium wildfire risk areas, respectively. In reality, the risk along a circuit is often non-uniformly distributed. Upcoming studies will evaluate which specific portions of circuits have risks that may warrant undergrounding as the preferred alternative, considering wildfire risk as well as other considerations such as ingress/egress risk. Feasibility analyses will also be conducted, as some identified high-risk segments may not be feasible to underground. Scope and construction alternatives will also be evaluated to consider which options are most cost-beneficial for potential undergrounding projects. For example, Hawaiian Electric plans to evaluate options such as:

- Scope alternatives
  - Undergrounding primary electrical lines only: This option entails undergrounding only the distribution primary lines, while secondary and service lines remain overhead.
  - Undergrounding all primary, secondary, and service electrical lines: This option is the most comprehensive, but also the most costly and complex, as it involves undergrounding customer-owned facilities and impacts customer property and therefore requires customer and landowner agreements.
  - Hybrid options: Options may include, for example, undergrounding all primary electrical lines, as well as secondary electrical lines that run parallel to the primary lines. Options such as this would be designed to minimize impacts to customer property and would leave customer service poles and lines overhead.
- Construction alternatives
  - Conventional undergrounding: This option involves completely undergrounding facilities by digging trenches and placing cable in conduit below ground.
  - Ground-Level Distribution Systems: This is a method currently being piloted at PG&E that involves covering power lines with a protective enclosure either at ground level or partially below ground in shallow trenches.
  - Above ground cable options: Other alternatives may include placing cable above ground, such as installing cable in conduit mounted on low-lying above-ground structures.

The studies will also consider the time value of risk. Given the complexities of undergrounding projects, undergrounding projects can take many years to implement. If no other hardening is completed on identified segments in the intervening years, the risk reduction for such segments will rely on non-hardening measures such as EFT, PSPS, vegetation management, and asset inspections until undergrounding is implemented. Alternatively, other hardening options such as covered conductor can be implemented in the interim to reduce risk until undergrounding can be implemented. However, this entails incurring the installation cost of both solutions, and may mean removing the covered conductor from service before its expected service life. Hawaiian Electric plans to ensure that undergrounding projects promoted represent the best overall solution to cost effectively reduce risk.

Based on the results of these studies in 2025, Hawaiian Electric may propose to modify the 2025–2027 WSS plans to begin additional undergrounding projects within the 2025–2027 timeframe (i.e., in the next annual update of the WSS). Given the typically longer duration of undergrounding projects, it is possible that some of the undergrounding projects initiated through this process will not begin construction until after the 2025–2027 WSS timeframe.

4.4.2.1 Commitment to Explore Undergrounding in Lahaina

Restoration of electrical infrastructure is an important element of the Lahaina Long-Term Recovery Plan created by the County of Maui. As the county is the lead agency in determining the master plan for the rebuilding of Lahaina, including utility infrastructure, Hawaiian Electric is working to ensure alignment with the county's objectives. In recognizing and understanding community feedback regarding the desire to place utilities underground as part of the long-term rebuilding, Hawaiian Electric is committed to starting with an initial portion of approximately 2 miles of underground service in areas identified as strategically important for public safety. Given the complexities of moving overhead infrastructure underground, and the need for alignment with county plans, the preliminary undergrounding project in Lahaina would include consultation with a community working group convened by Hawaiian Electric and consisting of Lahaina community members, leaders, stakeholders, government agencies, and technical experts. As the working group gains understanding of the physical, environmental and financial components of underground conversion, and how these elements intersect with the county master plan, the group would help inform potential design details based on their technical and/or area-based knowledge. The group would also consider innovative technologies and techniques in use or being researched at other utilities to determine their appropriateness for use in Lahaina. The success of this collaboration could be used as a model for future community engagement on undergrounding conversions across the islands.

4.4.3 Transmission/Sub-Transmission Line Hardening

Wildfire ignitions associated with transmission and sub-transmission lines can be attributed to equipment failures resulting in downed wire, conductor-to-conductor contact during high wind events, and pole or structure failures, among other causes. This initiative will harden or rebuild sections of transmission lines to address common failure modes and risk drivers.

The scope of transmission/sub-transmission line hardening projects can include combinations of the upgrades described below, up to and including full rebuild. Determination of the recommended enhancements will made during the project scoping phase based on evaluation by Hawaiian Electric's subject matter experts.

Hawaiian Electric has preliminarily identified the following transmission and sub-transmission lines for hardening:

- **69 kV Lahaina #2 Mauka to Napili:** Specifically, the portion of this 69 kV transmission line running from Lahaina to Mahinahina in West Maui.
- **69 kV Kaheawa to Lahaina:** Specifically, the portion of this 69 kV transmission lining running through Lahaina in West Maui.
- **69 kV 8200:** This 69 kV transmission line runs through the Waikoloa area on Hawai'i Island.
- **46 kV Wahiawa-Mikilua:** Specifically, the portion of this 46 kV sub-transmission line running from Wai'anae Valley to Schofield Barracks on O'ahu.
- **46 kV Kahe-Mikilua:** This 46 kV sub-transmission line traverses Nanakuli and Maili on O'ahu.

These transmission and sub-transmission lines were selected based on high relative consequence outputs from the planning risk model, along with consideration of asset age, condition, historical performance, and other factors. Over the 2025–2027 WSS, Hawaiian Electric plans to harden approximately 19 circuit miles of transmission and sub-transmission line, inclusive of hardening to be performed through the Resilience Program.

4.4.3.1 Conductor Replacement

Overhead transmission line conductors that are deteriorated, have numerous splices, or are smaller may have a higher risk of failure and thereby present ignition risk. Considerations for replacing existing transmission line conductor include asset age, condition, maintenance history, and reliability and operational performance history.

4.4.3.2 Pole/Structure Replacement

Considerations for replacing existing transmission poles/structures include wildfire risk analysis, asset condition, maintenance history, location, and structure function. Determination of whether poles will be replaced will be made during the project scoping and design phases based on the considerations noted above and evaluation by Hawaiian Electric's subject matter experts. The selection of pole materials for replacements will factor considerations such as fire resilience, strength consistency, failure mechanisms, constructability, environmental conditions, initial and maintenance costs, service life, and availability.

4.4.3.3 Conductor Clash Risk Mitigation

High wind events increase the potential for conductors to clash into one another, resulting in arcs or sparks that can fall to the ground. Assessing and mitigating conductor clash risk will be a consideration when scoping transmission/sub-transmission hardening projects, particularly for lines with historical outages caused by conductor clash. The risk for conductor clash tends to be higher on longer spans, spans that transition between horizontal and vertical configurations, and spans with a mix of conductor types. Optimal mitigation measures vary depending on the situation in the field and may include reframing transmission poles to increase conductor spacing, installing new, mid-span poles to shorten spans, installing insulated line spacers, re-tensioning existing conductors, or other options.

4.4.3.4 Shield Wire Replacement

Shield wire (also known as static line or overhead ground wire) is used to protect transmission lines from lightning strikes causing outages or equipment damage. Hawaiian Electric has identified ⅜-inch galvanized steel shield wire on transmission circuits as a higher risk shield wire material that should be considered for replacement. In high wind conditions, deteriorated overhead shield wire or supporting components can break, causing the overhead shield wire to fall into the energized transmission line below it, possibly generating sparks that can fall to the ground and cause an ignition. Insulators and clamps holding the wire on top of the pole may also break in high wind conditions.

When scoping projects proposed in wildfire risk areas, Hawaiian Electric will identify and may replace shield wire where necessary within proposed project boundaries.

4.4.4 Expulsion Fuse Replacement

Fuses are used in the distribution grid to protect equipment and isolate faults to smaller areas. Expulsion fuses are a type of fuse commonly used on Hawaiian Electric's distribution system and across the utility industry. When a fault occurs, the high current causes the fuse element within the fuse to melt, creating an electric arc inside of the fuse tube. A special material inside the expulsion fuse forms a gas when exposed to the heat of the arc, blowing the arc out of the fuse through a process known as "expulsion." This expulsion process can cause hot material to be expelled from the fuse tube, which has the potential to ignite flammable vegetation around the fuse.

In 2024, Hawaiian Electric began replacing existing expulsion fuses in high wildfire risk areas with fuse models designed to reduce the potential for the release of sparks or high temperature material during operation. Hawaiian Electric also installed new fire-safe fuses on unfused laterals and incorporated fuse sizing reviews according to the circuit's load to enhance protection coordination. By fusing unfused laterals and resizing fuses where necessary according to the circuit's load, this initiative also reduces the time it takes to clear a fault, thereby reducing the fault energy and the probability of ignition.

As noted above, expulsion fuse operations present an ignition risk if the fuse is in close proximity to dry vegetation. Hawaiian Electric has just begun implementing its expulsion fuse replacements and has not yet been able to estimate the associated mitigation effectiveness specific to Hawaiian Electric's service territory. California utilities included expulsion fuse replacement mitigation programs to reduce wildfire ignition risk in their 2023-2025 Wildfire Mitigation plans. PG&E and SDG&E reporting shows that no ignitions have been associated with the operation of fire-safe fuses.

Hawaiian Electric plans to continue implementing the Expulsion Fuse Replacement program through the 2025–2027 timeframe, and is currently targeting to replace or install about 13,600 fuses, which would replace all overhead existing expulsion fuses in the HWRA and MWRA.

4.4.5 Lightning Arrester Replacement

Lightning arresters are essential equipment designed to protect electrical equipment from the damaging effects of power surges or lightning strikes. Failure modes of many common lightning arrester models can pose an ignition risk. Since 2024, Hawaiian Electric has been replacing its existing arresters with new models equipped with a device that operates in the case of thermal overload to prevent arcing, sparking, or ejecting hot particles that could become an ignition source. Hawaiian Electric plans to continue this program and replace roughly 2,600 arresters in its wildfire risk areas between 2025–2027. Hawaiian Electric is currently targeting to complete arrester replacements in the HWRA and MWRA by the end of 2027.

4.4.6 Pole and Structure Replacement

4.4.6.1 Deteriorated Pole Replacement

The strength of wood poles can degrade overtime, making them susceptible to failure during high-wind events. Hawaiian Electric has existing system-wide asset sustainment programs that replace or restore poles when identified as necessary through its inspection programs. When poles and equipment are replaced, the new poles installed will meet Hawaiian Electric's current design standards and policies, which may result in larger, stronger poles.

Hawaiian Electric plans to continue its existing pole inspection and deteriorated pole replacement program with elevated priority given to poles in the high and medium wildfire risk areas. The number of poles replaced will be determined consistent with the existing replacement program objectives, so replacement targets are not included in this WSS.

4.4.6.2 Cellon Poles and Poly-Filled Poles

Cellon poles refer to utility wood poles that used Cellon gas as part of the pole's initial treatment. Cellon poles have become known in the industry to be prone to both shell rot below groundline, as well as dry rot that can be present at groundline or higher up the pole (beyond where it is common industry practice to conduct intrusive inspections). Like other utilities in the industry, Hawaiian Electric has noted that Cellon poles are rejected by intrusive inspections at a higher rate than other wood poles.

Poly-filled poles are poles that have undergone a reinforcement process where polyurethane or similar materials are injected into areas of the pole that have decayed or weakened over time. This process was intended to restore the pole's structural strength without the need for full replacement. This type of restoration method is not common practice in the industry. Poly-filled pole strength cannot be accurately determined, so visual inspections have historically been relied upon to determine whether a poly-filled pole should be replaced. Some Cellon poles have also been injected with poly-fill.

This initiative currently plans to replace about 650 Cellon and Poly-filled poles between 2025–2027.

4.4.6.3 Pole Loading

Due to the differences between prior and current design standards and applicable codes, many existing poles on Hawaiian Electric's system that were designed prior to 2007—the year the Hawaiʻi PUC adopted NESC 2002—do not meet NESC 2002 structural loading criteria. Whenever a pole replacement is required for planned work, Hawaiian Electric designs the new pole to meet or exceed current NESC 2002 structural loading requirements. In addition, when implementing covered conductor projects, Hawaiian Electric will ensure that all poles within the project boundaries are designed to meet or exceed NESC 2002 requirements. This replacement of poles to meet or exceed current code and standards will help to reduce the risk of pole failures in high wind events that could result in wildfire ignitions.

Since pole replacements that increase the structural loading capacity of poles are bundled with other initiatives in the WSS (e.g., covered conductor, deteriorated pole replacements, Cellon and poly-fill pole replacements, expulsion fuse replacements that necessitate pole replacements, etc.), a specific pole replacement target for pole loading is not included in this WSS.

4.4.7 Ingress/Egress Risk Mitigation

In emergency scenarios such as wildfires, restrictions to ingress and/or egress can have ramifications for public safety. In a wildfire event, safeguarding the unimpeded travel of emergency responders into the affected area and community evacuation away from the fire is critical.

From the utility perspective, there are two primary scenarios in which power infrastructure contributes to ingress/egress risk:

1. Power line infrastructure failures can ignite a fast-moving fire that burns into ingress/egress routes.
2. Power line infrastructure failures in hazardous weather can cause the power line infrastructure to fall into roadways, physically blocking ingress/egress routes.

Every wildfire is distinct, and the dynamics of a particular event may cause multiple roads to become blocked or travel to be restricted in unexpected ways. Furthermore, due to the nature of the built infrastructure, with power lines providing service to homes and buildings and requiring access to maintain, power lines usually run along or close to roadways. It is important to develop ways to define and prioritize areas with ingress/egress risk, along with methods to mitigate those risks.

For this 2025–2027 WSS, Hawaiian Electric is leveraging ingress/egress risk assessments that were completed by the HWMO in 2012. HWMO's analysis focused on categorizing the ingress/egress risk level of individual communities into high, medium, or low risk, based on factors including the number, width, and grade of roadways used to enter and exit the community. In addition to HWMO's risk assessments, Hawaiian Electric is also leveraging local knowledge and internal subject matter expertise to identify high risk ingress/egress areas. Section 4.4.8 below discusses efforts to continuously improve methods to define, prioritize, and develop design criteria for ingress/egress risk.

Ingress/egress risk is influencing Hawaiian Electric's system hardening plans at multiple levels:

1. **Project prioritization:** Ingress/egress risk is a dimension of Hawaiian Electric's qualitative analysis that – in addition to the risk model's quantitative risk analysis – influences the order in which circuits are prioritized for mitigation. See further discussion in Section 3.6 and Section 3.7.
2. **Project scope:** The location of ingress/egress risk on a circuit is one of the factors considered as Hawaiian Electric's planning engineers and other SMEs determine the specific portions of the circuit that should be hardened.
3. **Project design criteria:** For hardening projects, portions of circuits in identified high ingress/egress risk areas may be subject to alternative design criteria, such as alternative pole construction (including more stringent designs or alternative materials) or undergrounding.

There are no standalone 2025–2027 WSS targets for ingress/egress risk mitigation, because ingress/egress risk mitigation is planned to be incorporated into other initiatives. As described above, ingress/egress risk is a consideration in project prioritization, scope, and design criteria. Egress risk mitigation is largely planned to be incorporated into Covered Conductor, Transmission/Sub-transmission Line Hardening, and Targeted Undergrounding projects.

4.4.8 Areas of Continuous Improvement

Hawaiian Electric is committed to continuous improvement of its data, policies, practices, standards, and planning/design criteria in relation to system hardening. Hawaiian Electric has identified the following areas of focus for continuous improvement efforts:

1. Covered conductor standards.
2. Ingress/egress risk evaluation.
3. Undergrounding analyses.
4. Overhead transmission and distribution line structural design policy and practices.
5. Design criteria for line reconstruction and new line extensions (e.g., Rule No. 13).

4.4.8.1 Covered Conductor Standards

Hawaiian Electric is currently developing enhancements to its covered conductor engineering and construction standards to cover exposed energized components including splices, connectors, and equipment connections with coverings to further reduce the risk for contact that could cause an ignition. To this end, Hawaiian Electric has been collaborating with other leading utilities in the United States who have more mature programs and standards for covered conductor installation in order to leverage lessons learned and best practices.

4.4.8.2 Community Ingress/Egress Risk Evaluation

As referenced in Section 4.4.7, Hawaiian Electric is currently leveraging a combination of HWMO ingress/egress risk assessments and subject matter expertise to identify areas with high ingress/egress risk. Identification of high ingress/egress risk areas informs planning at multiple levels, including project prioritization, project scoping and project design criteria.

Evaluating and addressing ingress/egress risk is a complex challenge for several reasons, including, but not limited to, the following:

1. Multiple scales of analysis: Ingress/egress risk can be evaluated at various levels, from individual streets, to neighborhoods, to larger communities. Each level has its own unique set of variables and interactions, making it challenging to create a comprehensive risk assessment that accounts for all scales simultaneously.
2. Interconnectedness: The risk at one level of analysis can influence and be influenced by risks at other levels. For example, a region may comprise several neighborhoods, each with multiple ways in and out. However, there may be only one major road that can be used for evacuation from the broader

region. If travel along that major road is constrained, this may affect egress from a large fire that impacts a significant portion of the region. Evaluating risk at only the neighborhood level might cause one to miss the influences of risk events at the larger scale.

3. Data granularity and availability: Different scales of analysis require different levels of data granularity. Detailed data might be available for individual streets but not for larger areas, or vice versa. For example, the HWMO ingress/egress risk assessment provides risk ratings at the level of neighborhoods (as this is aligned with the purpose of HWMO's study, which was to support the creation community wildfire hazard assessments) but does not identify the specific streets that pose an egress risk to various sections of the neighborhood, nor analyze risk at the level of more major roads providing ingress/egress for larger groups of neighborhoods.
4. Dynamic and evolving risks: Every wildfire is unique. Dynamic risk events such as wildfires can rapidly change the risk profile of an area. For example, a town with multiple collector or arterial roads may see fire burn into both roadways, or may see fire burn into one roadway, while fallen trees simultaneously block connecting streets to the other roadway. As a result, an area that may have otherwise been characterized as lower risk, may suddenly see its risk profile increase dramatically.
5. Resource allocation: Hardening improvements, such as undergrounding or other alternative construction approaches (e.g., stronger overhead structures or structures composed of alternative materials), are more costly than the default design approach for overhead lines. Therefore, targeted application of hardening improvements to the highest risk areas is necessary, given the economic constraints of customer bill impacts and utility budgets. As mentioned in Section 4.4.7, communities with only one way in and out are pervasive throughout the state. Also, as mentioned above, risks are spread across multiple scales of analysis (e.g., from neighborhood streets to major roads). This makes it difficult to determine where costly hardening improvements, such as undergrounding or alternative overhead construction, should be targeted for deployment.

Over the 2025–2027 WSS period, Hawaiian Electric plans to conduct studies and collaborate with external stakeholder agencies to improve the definition, identification, and relative risk quantification of high ingress/egress risk areas and roadways. Hawaiian Electric also plans to develop criteria for how ingress/egress risk should be addressed through hardening measures.

4.4.8.3 Undergrounding Analyses

As discussed in detail in Section 4.4.2, Hawaiian Electric plans to conduct in-depth studies that will evaluate project-specific risk, feasibility, costs, schedules, and alternatives for potential undergrounding projects. These studies may result in modifications to the 2025–2027 WSS plan to begin work on undergrounding projects.

4.4.8.4 Structural Design Policy and Practices

Hawaiian Electric is currently evaluating its structural design policies and practices, with a particular focus on two areas: 1) pole material selection, and 2) wind design.

Practices for overhead transmission and distribution structure material selection vary considerably throughout the industry. For example, SCE prefers to use composite poles for certain types of distribution poles, and wood poles wrapped in a fire-retardant mesh for other distribution applications in wildfire risk areas. Similarly, PG&E generally installs either wood or composite poles in its wildfire risk areas when implementing distribution hardening efforts, depending on the situation. SDG&E emphasizes the use of steel poles in its wildfire risk areas. Portland General Electric Company has been replacing wood poles with ductile iron poles. For distribution applications, Hawaiian Electric typically utilizes either wood poles wrapped in a fire-retardant mesh or steel poles in wildfire risk areas (and less frequently, composite or concrete), with the choice of material depending largely on situation-specific design constraints, as well as constructability and environmental considerations.

Each pole material type can have advantages and disadvantages with respect to characteristics such as strength consistency, breaking strength under a given set of criteria, ductility, failure mechanisms, fire resilience, susceptibility to environmental factors in various environmental contexts, construction methods and considerations in various contexts, maintenance needs, life expectancy, material cost, procurement logistics, and other factors. Hawaiian Electric plans to conduct a study of pole materials to evaluate these factors and lifecycle costs to determine whether its current practices and design criteria should be modified.

Hawaiian Electric has also been evaluating its wind design policies. Apart from unplanned emergency replacements (which are generally installed like-for-like), all installations of transmission and distribution poles and structures today are designed to meet or exceed NESC 2002 requirements, which were adopted by the PUC in 2007.

While the specific NESC 2002 wind design rules incorporate a matrix of situational factors and cannot be readily expressed in a simple, apples-to-apples manner in terms of windspeed values without some oversimplification, Hawaiian Electric estimates that poles at or below 60 feet above ground that are designed per NESC 2002 requirements are designed to withstand winds that range from roughly around the low to mid Category 1 hurricane range (for a structure on flat open terrain subject to minimal topographic effects). This corresponds to a risk level that exceeds a 50-year mean recurrence interval (MRI) wind event for most areas within Hawaiian Electric's service territories (when considering topographic effects), and ranges from slightly below to slightly above a 100-year wind event for many areas in Hawaiian Electric's service territories. For structures over 60 feet above ground, Hawaiian Electric estimates that poles designed per NESC 2002 requirements for the Hawaiʻi region are designed to withstand winds on the border of the Category 1 to Category 2 hurricane range (for a structure on flat open terrain subject to minimal topographic effects). From a risk perspective, this design exceeds a 50-year wind for nearly all areas in Hawaiian Electric's service territories, and also exceeds a 100-year wind for most areas in Hawaiian Electric's service territories (when considering topographic effects).[30] As a point of comparison with the broader industry, a 50-year wind

[30] While the extreme wind loading criteria (applicable to structures over 60 feet above ground) in NESC 2002 references 50-year MRI wind maps from ASCE 7-98, the resulting application of design rules under NESC 2002 specifies inflated wind speed values for hurricane regions such as Hawaii, Florida, and Louisiana, which results in design rules that far exceed the 50-year MRI wind in some of these regions.

design is common industry practice for transmission structures, which are typically designed stronger than distribution structures.

Hawaiian Electric is currently conducting a study to evaluate alternative risk-based design approaches and incorporation of location-specific effects in the design. For example, the study is evaluating whether for a given design criteria, designs in different locations should generally be equalized on the same MRI wind rather than the same absolute wind load, particularly given the complex topography of the Hawaiian Islands compared to other regions in the country. This may result in differentiated wind loading requirements depending on location (NESC 2002 requirements would always be met at a minimum, as has been mandated by the PUC, while some areas would potentially be designed for wind loadings that exceed NESC 2002 requirements).

This is contrasted with NESC 2002, wherein for example, all structures over 60 feet above ground are designed for a 105 mph 3-second gust wind regardless of location, which results in designs that correspond with a highly conservative risk level in some areas (up to roughly a 300-year MRI wind for some areas) and a less conservative risk level in other areas, depending on the local effects of topography and other factors. Hawaiian Electric is also evaluating whether transmission and distribution structures should design for the same risk level, which is a topic of long-standing debate in the industry.

4.4.8.5 Design Criteria for Line Reconstruction and New Line Extensions

While the focus of this System Hardening strategy is on proactive hardening of existing transmission and distribution infrastructure to cost-effectively reduce risk, it is also important to consider how to avoid increasing risk on the system when installing new lines wildfire risk areas, as well as where and how best to incrementally decrease the risk on the system when implementing non-WSS-driven projects on existing lines.

To this end, Hawaiian Electric plans to evaluate its broader planning standards and design criteria in wildfire risk areas to determine where system hardening-type designs should be applied when constructing new lines or reconstructing existing lines. For example, this may include criteria specifying where and when solutions such as covered conductor should be applied for non-WSS-driven projects in wildfire risk areas, such as customer or system planning-driven projects. This effort may result in tariff modifications that Hawaiian Electric may submit to the Commission at a later time.

4.4.9 Summary of System Hardening Scope and Cost

Table 4-6 shows a summary of the current targets for Grid Hardening work as described in this section. As Hawaiian Electric gains more experience and collects additional data, adjustments to the targets may be made in future WSS updates.

Table 4-6. Grid Hardening Mitigation Scope with Estimated Costs

Grid Hardening Mitigation	Current 2025–2027 Targets*	2025-2027Estimated Costs
Covered Conductor	Approximately 15-70 miles on high risk distribution circuits	$60 million
Targeted Undergrounding	To-be-determined number of circuit miles, pending feasibility studies. Additionally, approximately 2 miles in Lahaina	Amount pending feasibility study, but will include up to $4 million for the Lahaina project
Expulsion Fuse Replacements	100% of fuses replaced in HWRA and MWRA (approximately 13,600 fuses)	$54 million
Arrester Replacements	100% of arresters replaced in HWRA and MWRA (approximately 2,600 arresters)	$9 million
Cellon-Treated and Poly-Filled Pole Replacements	On pace to complete replacement of cellon poles in 11 years (approximately 650 poles)	$18 million
Transmission/Sub-transmission Line Hardening	Harden 19 circuit miles on high risk transmission circuits	$42 million

**Actual values may deviate from the estimates presented in this WSS to reflect data and experiences gained by the Company during deployment.*

4.5 Operational Practices

There are two main operational tools utilized under the WSS: EFT and PSPS. These proactive mitigations enhance public safety through real-time operational adjustments in fire risk areas during specified fire weather conditions.

EFT is a protective setting that automatically shuts off power more quickly when the system detects a disturbance, such as a tree limb coming in contact with a power line. Lines remain de-energized until a visual inspection of the affected area is performed and deemed safe to energize. EFT also includes reclose blocking, which prevents automatic attempts to re-energize following an unplanned outage. The PSPS program serves as a broader mitigation strategy that preemptively shuts off power to specific circuits or entire feeders in severe weather conditions.

4.5.1 Enhanced Fast Trip

EFT automatically de-energizes power lines quickly following a fault to reduce the risk of a fire ignition by reducing the electrical energy at the fault location. EFT schemes incorporate reclose blocking to eliminate the possibility of protection equipment automatically re-energizing a power line after the initial fault is cleared to further reduce the risk of a power line caused ignition. These EFT settings are commonly used by electric utilities to help reduce the probability of ignitions in their high fire threat areas during elevated fire weather conditions. EFT allows for powerlines to remain in-service during periods of elevated risks, but with enhanced protection settings designed to trip the appropriate sectionalizing device once a fault is detected.

To successfully implement the EFT, several investments are required:

- Replacement of electromechanical circuit breaker relays to microprocessor relays, where necessary
- Enablement of Supervisory Control and Data Acquisition (SCADA) remote control capability on circuit breakers and distribution line reclosers to enable real-time operational flexibility to enable/disable EFT mode
- Installation of additional line recloser(s), where needed, to detect and clear faults that may occur further away from existing protection equipment and to minimize the adverse reliability impacts for customers outside the fire risk areas
- Installation of sub-transmission sectionalizing switches at fire risk area boundaries
- Installation of fault current indicators that are able to work with the fast-trip speeds to more efficiently identify the location of the problem for troubleshooters

Implementation of communication with EFT and reclose blocking settings allows utilities to adjust operations dynamically based on weather forecasts that pose a potential wildfire threat and supports operational wildfire risk mitigation. EFT with communications enables the utility to proactively adjust protection equipment settings based on weather conditions that increase wildfire risk and enhances public safety through real-time operational changes. Hawaiian Electric's grid modernization advanced distribution management system project also supports these safety measures by investing in communication upgrades to support WSS implementation.

Under normal operating conditions, electrical faults typically cause fuses to operate, which de-energizes the portion of the line where the fault occurred. In such cases, upstream substation circuit breakers and line reclosers generally do not trip because they are designed to respond more slowly allowing downstream fuses to blow first. If a fault occurs upstream of any fuses, reclosers and substation relays will trip, but they are programmed to reclose automatically multiple times to restore service if the fault is temporary. When EFT is activated, relays and reclosers operate with much faster response times and higher sensitivity, meaning the line recloser can usually trip before the fuse operates.

With automatic reclosing disabled, the entire section of the grid downstream from the line recloser will be de-energized, while the area between the line recloser and the substation remains powered.

Figure 4-16 shows what can happen when an electrical fault (such as may be initiated by a tree limb falling on a power line) occurs downstream of a fuse on a line that is not EFT-enabled. In this situation, the recloser (referenced as "sectionalizing device" in the figure) trips open at its normally programmed sensitivity, then automatically recloses. In this example, the fault is still present after the reclose, and the fuse will operate, causing the customers downstream of the fuse to have a sustained outage while customers between the recloser and the fuse remain in service.

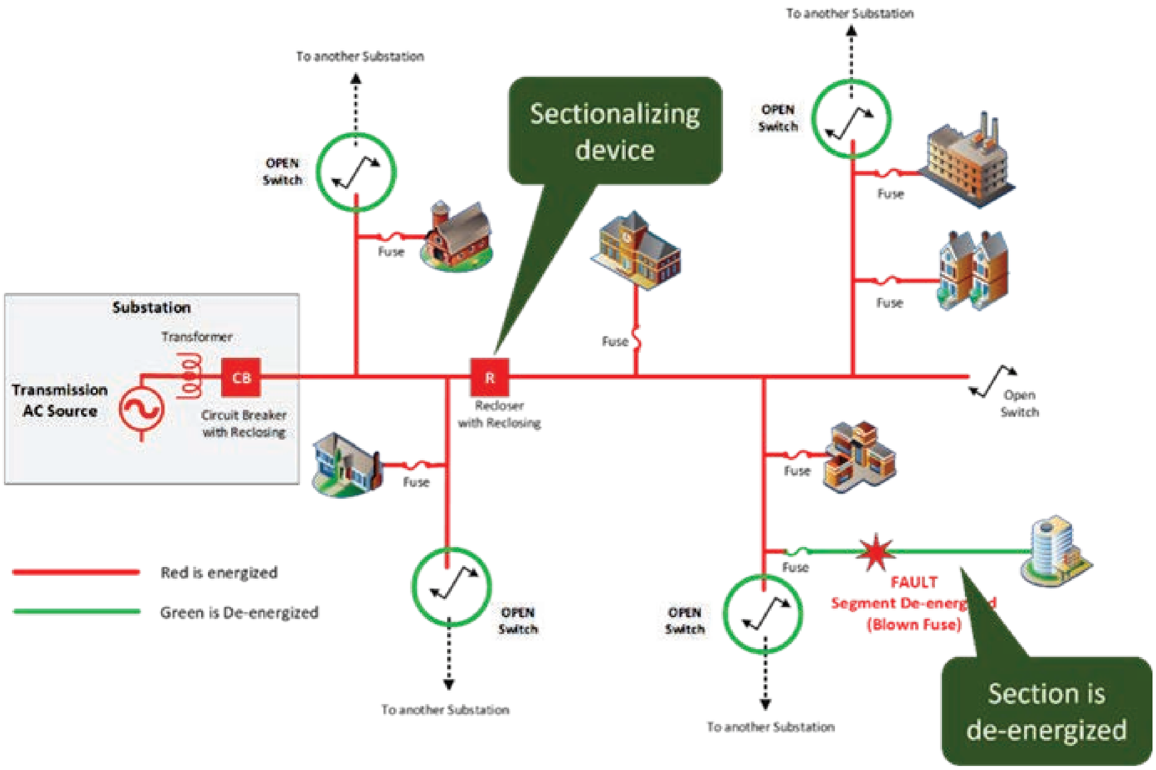


Figure 4-16. Protection settings under non-wildfire risk conditions

Figure 4-17 shows the same circuit configuration but with EFT protection enabled. As described above, EFT schemes can be enabled during times of elevated wildfire risk if appropriate real-time operational risk models and forecasting are in place. The two main differences between non-wildfire risk configurations and EFT are that for EFT:

1. Circuit breakers and reclosers are programmed to trip faster and to trip for lower fault currents (i.e., more sensitive settings)
2. Automatic reclosing is turned off

As shown in Figure 4-17, due to automatic reclosing being disabled, the recloser trips and goes directly to lockout meaning the circuit segment remains de-energized until it is manually re-energized. All customers downstream of the recloser will remain out of service until the line segment is inspected, repairs completed, and manually re-energized. Due to the more sensitive settings, the recloser will act quicker than it otherwise would have and faster than it takes for a fuse to operate in most cases.

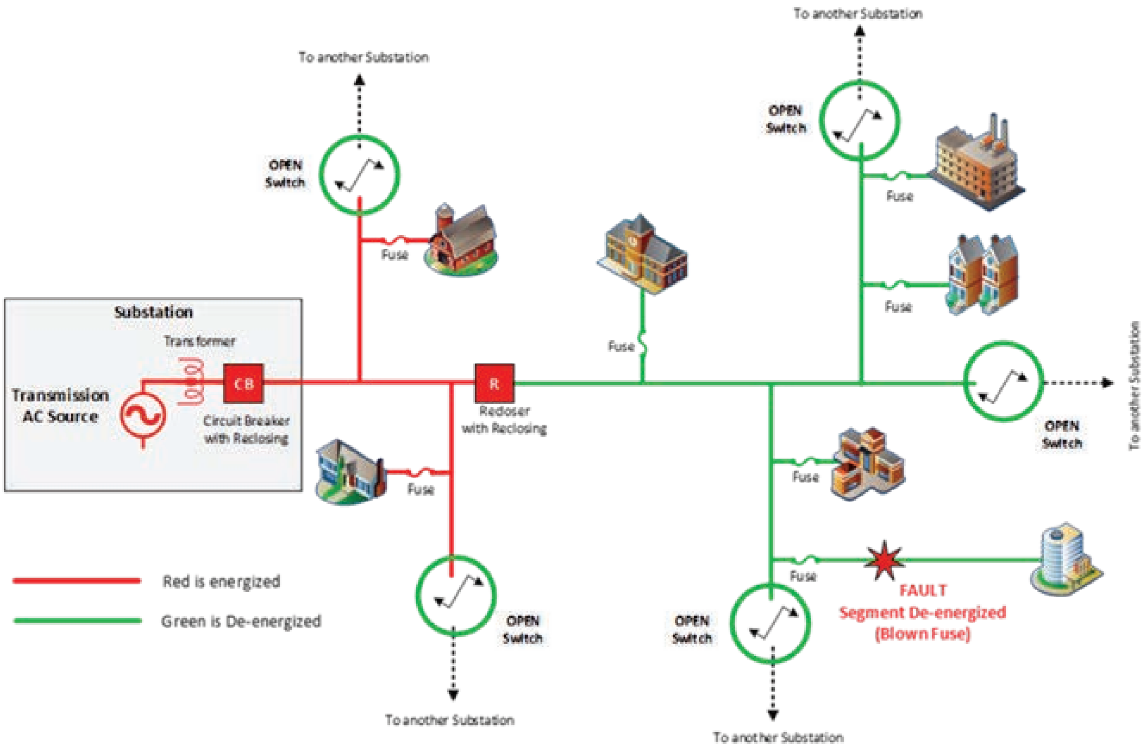


Figure 4-17. Protection settings under wildfire risk conditions.

Due to the faster reaction time to hazard events, there is reduced fault energy that can lead to fire ignitions. As noted in Figure 4-16 and Figure 4-17, EFT enablement and the shift to more sensitive phase and ground settings comes at the cost of more line sections being de-energized, more customers experiencing service interruptions, and resulting outages being of longer duration.

To support decision-making for EFT activation, Hawaiian Electric expects to mature its weather forecasting and situational awareness tools to help forecast wildfire risk based on a variety of data inputs that inform location-specific decisions about enabling and disabling the EFT scheme. The improved forecasting abilities help electric utilities implement EFT more effectively, minimizing the wildfire risk while streamlining the continued operation of critical infrastructure.

4.5.2 Restoration of Customers Following Blocked Reclose and After a Fast Trip

To further reduce ignition risks Hawaiian Electric has implemented procedures for circuit restoration following a fault or circuit trip. While these modified procedures improve public safety, they lengthen the time for restoration to customers.

Hawaiian Electric's current procedures provide that when circuits with EFT and reclose blocking trip open during fire weather and/or high winds, a physical visual inspection of the entire line must be completed before re-energization. During normal conditions, this is required only when the fault cannot be visually located. This reduces the potential for re-energizing into a faulted condition that could cause an ignition. Without EFT enabled, normal coordinated protection operation would allow faults to be cleared by downstream protection devices (e.g., fuses, line reclosers) which are located closer to the fault location, while leaving the remainder of the upstream circuit energized. This reduces the number of customers impacted by the outage and generally reduces the duration of the outage through faster isolation and restoration by field personnel. In addition, without the block reclose applied, normal operation for most circuits would provide for an automatic reclose to allow the circuit to reenergization for transient faults which are typically a high percentage of faults; this is prevented by the block reclose and results in all faults treated as sustained.

With EFT settings enabled, the entire circuit would be de-energized upon a fault. Existing fault current indicators, which are designed to detect and provide a visual indication of the direction of a fault, will not operate fast enough and other protective devices may not operate, which means these visual indications may not be available to assist field personnel in their inspections, lengthening the outage duration. With total circuit miles on circuits ranging from several miles to 30+ miles, FCIs that help field-personnel locate faulted areas are critical for safe and efficient fault location and restoration and reducing risks in the field. Adding new fault detectors can lead to faster patrolling time and power restoration, for example, they may be deployed at the beginning of the circuit and in one-mile sections along the mainline, at switches, riser poles, inaccessible areas, and existing fuses. To aid troubleshooters in isolating fault locations, in 2024, Hawaiian Electric installed over 3,000 overhead fault current indicators that will operate quickly with the EFT setting and plans to install up to approximately 9,800 over the next 3 years as needed to aid in faster fault location.

Restoration procedures during red-flag conditions are more stringent. During more hazardous conditions (such as red flag conditions as determined and issued by NWS), the circuit may remain de-energized until the red flag conditions have been cancelled by NWS. In cases where the risk may be considered lower, such as non-red flag conditions or favorable weather and fuel conditions, depending on system conditions, if a fault cannot be readily identified, Hawaiian Electric may decide to deploy spotters, disable the EFT setting for the circuit temporarily, and re-energize the circuit to find the fault with the existing downstream protection devices enabled.

4.5.3 Summary of EFT Expansion Scope and Cost

Hawaiian Electric began enabling EFT on circuits in 2023 and plans to continue enablement on additional circuits in the WSS based on its wildfire risk analysis. The risk model described in Section 3 identified additional circuits and line sections, primarily in medium risk areas, where EFT should be enabled to further reduce fire ignition risk. To implement this proposed EFT expansion, additional remotely controlled line reclosers are necessary to protect the new circuits and to limit the adverse reliability impacts of EFT to customers outside the fire risk areas. The proposed line reclosers provide additional sectionalizing to refine implementation of EFT as described in Section 4.5 and shown in Figure 4-17.

Table 4-7. Enhanced Fast Trip Expansion Targets

System Design Mitigation Scope	2025–2027 Targets	Estimated Costs
EFT: Enable Circuits with settings only	Complete implementation of EFT on medium risk circuits consistent with risk model. (40 circuits)	n/a
EFT: Upgrade Circuit Breaker Relays to Microprocessor	Install relay upgrades, as needed, to support EFT enablement (approximately 10 upgrades)	$1.5 million
EFT: Install Remote-Control Line Reclosers	Deploy up to 117 reclosers as needed on the distribution system to implement enhanced fast trip or reduce reliability impacts to customers	$11.6 million*
EFT: Add SCADA to substations to remotely enable EFT	Enable SCADA at up to 12 distribution substations to enhance EFT schemes	$0.5 million*
Sectionalizing Switch Installations (Transmission and Sub-transmission)	Deploy up to 43 switches as needed on the sub-transmission system to reduce reliability impacts and increase operational flexibility	$3.2 million*
Non-Communicating Fault Current Indicators	Deploy FCI as needed to improve troubleshooting time (Up to approximately 9,700)	$11.8 million
Smart Fault Current Indicators	Deploy FCI as needed to improve troubleshooting time (Up to approximately 100)	$0.823 million

* Costs denoted with an asterisk will be included in the updated Grid Modernization filing

4.5.4 Public Safety Power Shutoff Program

Hawaiian Electric operates its system emphasizing the safety of its customers, communities, and employees, and periodically assesses and implements technological and procedural improvements to address new or changing risks. One such risk is severe weather during periods when the danger of wildfire is high. During these severe weather events, high winds can cause trees or debris to contact energized powerlines, damage equipment, and cause wildfire ignition. These high winds may accelerate the spread leading to a catastrophic wildfire.

When the danger of wildfire is high, Hawaiian Electric may need to preemptively de-energize powerlines in high-risk areas during severe weather. This is called a Public Safety Power Shutoff, or PSPS. As referenced in this section, Hawaiian Electric's IMT will have responsibility for executing the PSPS Program.

Although PSPS has proven to be an effective means to mitigate the potential for wildfire, it requires significant planning and community education in advance to be successful. The duration of PSPS events can vary significantly – from a few hours to several days in the event of very high sustained winds requiring significant hazard patrols and repairs. Hawaiian Electric is committed to a systematic approach to improving its PSPS program, which was first operationalized in July 2024. Figure 4-18 provides the steps that will be undertaken to progress through a PSPS cycle.

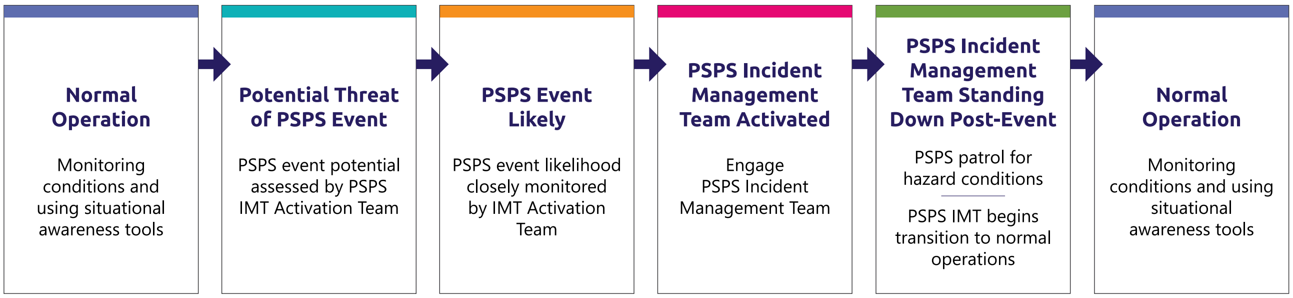


Figure 4-18. Steps of progression – PSPS event

Severe weather can lead to damage throughout a utility's service territory, even outside of areas designated as high-risk and subject to PSPS. Customers served by these circuits may experience an interruption in service, called a "forced outage," until such damage can be safely repaired. Figure 4-19 shows the timeline of PSPS initiation, reenergization of undamaged circuits, and repairs then re-energization of damaged circuits.

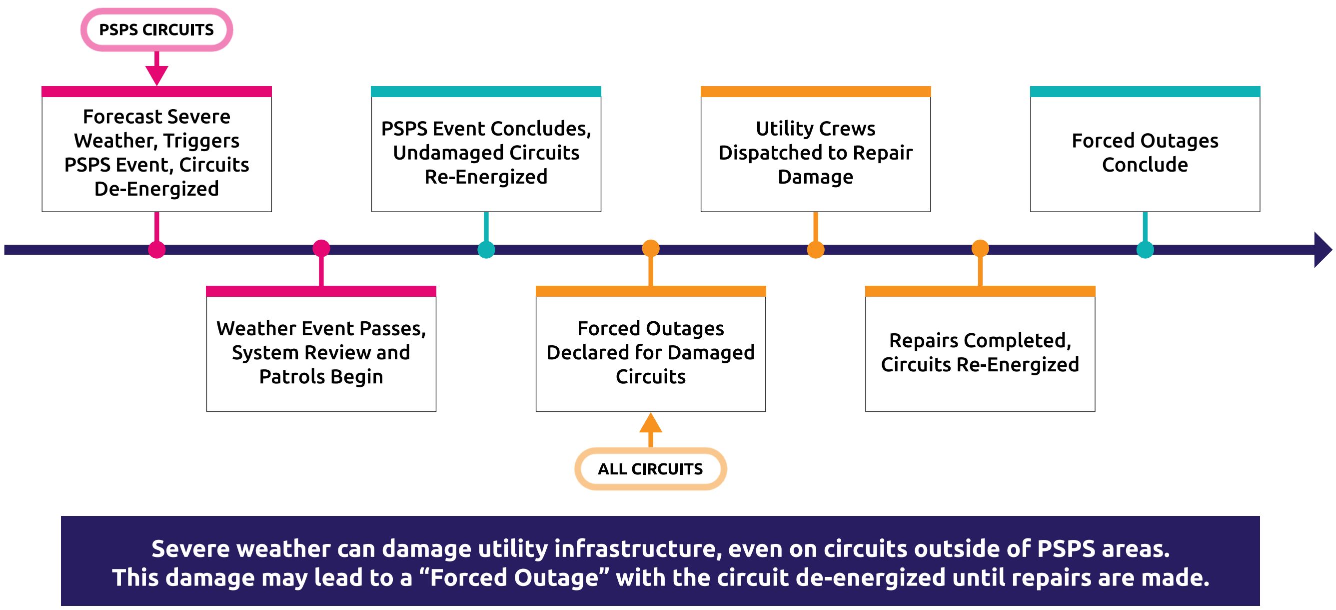


Figure 4-19. PSPS timeline for restoration upon a forced outage

The following sections provide additional information involved in the PSPS planning, execution, organization, resource coordination, public communications, activation, post-event deactivation and the phased expansion of the program.

4.5.4.1 Planning

While PSPS is an effective risk reducing mitigation, its implementation adversely impacts customers because power is shut off during a severe weather event and cannot be restored until Hawaiian Electric personnel have confirmed that the affected feeder(s) are safe and available for re-energization. Any damage to these in-scope feeder(s) requires repairs before power can be restored. The following schematic outlines Hawaiian Electric's PSPS planning process that includes risk assessment of feeders, identification of critical customers, specialized technology deployment and weather forecasting/situational awareness. Also included are organizational actions encompassed within development of the IMT structure, operational procedures/protocols and planning exercises. An overview of the planning steps and activities is included in Figure 4-20.

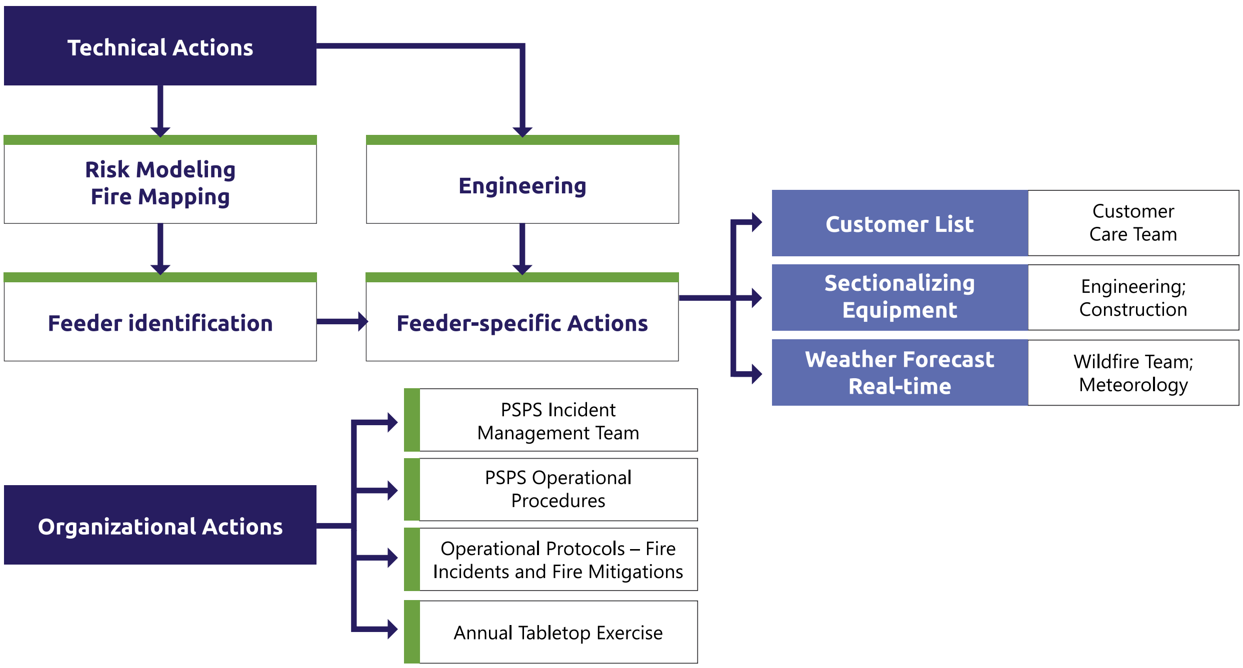


Figure 4-20. Planning in advance of PSPS activation

4.5.4.2 Selection of PSPS In-Scope Areas Based on Fire Map and Risk Assessment

The initial step in planning for PSPS is identifying specific distribution and transmission feeders to be in scope for potential PSPS. Hawaiian Electric used historical weather information, vegetation types, fire history, and locations of communities to develop the latest revisions of its wildfire risk maps (discussed in Section 2), with those determined to be highest risk being evaluated for inclusion in the PSPS program. The current areas that are subject to the PSPS program can be found at hawaiianelectric.com/PSPSmaps, which are subject to change during the current WSS period. The PSPS program may expand in the future to include additional circuits upon further evaluation of available data.

4.5.4.3 Customer Information

Included in the planning phase is the identification of and coordination with critical facility, medical, and public safety customers. These are generally customers and facilities that provide services essential to public safety such as hospitals, police, and fire stations, first responders, communications services, transportation, sewer, and water providers. Some of these critical customers will also be identified as potential public safety partners necessary for inclusion with the coordination of PSPS events. "Public Safety Partners" are entities that may fulfill a critical role in responding to severe weather and providing support to affected customers during PSPS events. They may vary by geographic area, and include emergency responders, police, fire fighting agencies, utilities, and local and state emergency response agencies.

4.5.4.4 Sectionalizing Equipment

Hawaiian Electric's PSPS program is designed to limit impacts to customers by minimizing the geographic area impacted by a power shutoff. This is generally referred to as sectionalizing, which utilizes specialized equipment to isolate feeders during extreme weather events, so that only at-risk portion of the feeder will be de-energized.

In 2024, Hawaiian Electric deployed sectionalizing devices where feasible to reduce customer and reliability impacts of circuits in-scope for the current PSPS program. Hawaiian Electric will seek further opportunities to sectionalize circuits for those with EFT or potential expansion of the PSPS program. These devices are part of the grid modernization program as described in Section 4.6.

4.5.4.5 Weather Forecast and Real-time Monitoring

Another step to the planning phase of PSPS is the integration of weather forecasting and real-time monitoring of weather conditions (described in Section 4). Real-time monitoring is feeder specific, with live weather data received every ten minutes, which is utilized in operational decision making.

4.5.4.6 PSPS Incident Management Team

Hawaiian Electric's PSPS IMT is the organizational structure responsible for deciding when to activate a PSPS event, and for managing the execution of the event, the post event deactivation, and the close-out activities. The PSPS IMT is discussed further in Section 4.5.5.

4.5.4.7 PSPS Operating Procedures

Hawaiian Electric developed procedures for utilization by the IMT, including the following areas:

- Pre-event notification
- PSPS IMT Activation
- Communications and documentation
- Real-time weather monitoring
- Spotters
- PSPS shutoff and restoration decision making
- Executing PSPS shutoff decisions
- Executing PSPS restoration decisions
- Fire weather watch, red flag warning and high wind warning cancellations

4.5.4.8 Annual Tabletop Exercise

Hawaiian Electric will, on an annual basis, plan and execute an exercise to test the effectiveness of the PSPS Tactical Plan. The exercise will include all phases of a PSPS activation with the exception of activating switches and sectionalizers. Customers will not have their power interrupted during such exercises.

4.5.5 PSPS Incident Management Team

Hawaiian Electric's PSPS IMT is the organizational structure responsible for managing a potential PSPS event. More specifically, the PSPS Task Force is tasked with making the recommendation to initiate a PSPS event and once approved by the Executive Incident Commander, the Task Force will manage the execution of the event, the post event deactivation, and the close-out activities. The PSPS IMT structure is represented in

Figure 4-21. The IMT consists of Company employees who are trained and knowledgeable in the specific components of PSPS and structured such that each section functions to ensure consistency across all island service territories. This requires seamless communication and adept decision-making up to, during, and following a PSPS event.

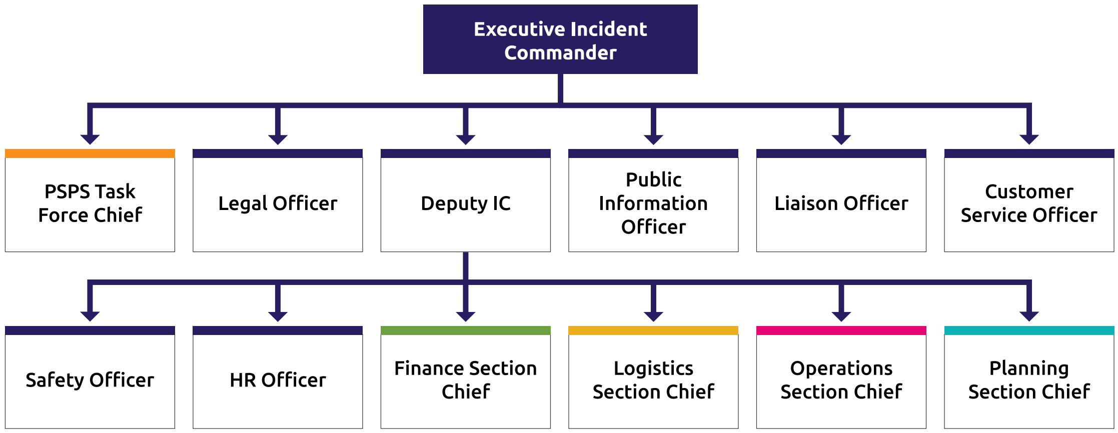


Figure 4-21. PSPS Incident Management Team – Organizational Structure

4.5.5.1 PSPS Command Staff

The organizational structure and the divisional leaders including their areas of responsibility are more fully described in the following sections.

Executive Incident Commander

The PSPS Executive Incident Commander (EIC) serves as the head of the PSPS IMT organization and will be staffed by an officer of the Company. The EIC has overall responsibility for the management and execution of a PSPS event. The EIC has the direct responsibility for making or confirming the shutoff and restoration decisions.

PSPS Task Force Chief

The Task Force Chief is responsible for the coordination of the PSPS Technical Plan and reports directly to the EIC. As the title implies, the Task Force Chief leads a Task Force team responsible for executing the PSPS Technical Plan.

The PSPS Task Force monitors real-time weather for severe fire risk and potential fire hazards to maintain event situational awareness. When threshold conditions are met, the Task Force will utilize the gathered data to make a recommendation to initiate a PSPS event and/or restore a circuit.

Task Force activities include but are not limited to:

1. Real-time monitoring of the weather through Company and third-party weather stations;
2. Communicating PSPS decisions and status to the rest of the IMT organization to cascade communications to external stakeholders;

3. Logging Task Force action and decisions;
4. Updating the PSPS Status Dashboard;
5. Providing real-time, on-island system evaluations for each island/county system;
6. Technical support for information systems tools;
7. Operational Technology and Operations Analytics; and
8. Communicating and coordinating activities with on-island spotters.

Legal Officer

The Legal Officer (LGO) is responsible for ensuring compliance with Company policies and procedures, as well as advising on compliance with relevant laws and regulations.

Public Information Officer

The Public Information Officer (PIO) is responsible for developing and communicating accurate, accessible, and timely information to the press and media. This individual participates in all planning and update meetings and is closely attuned to all activities related to the PSPS event. The PIO works closely with the Executive Incident Commander and obtains their approval before proceeding with any form of information release to the press/media.

The PIO communicates with the press/media through various means deemed most appropriate for the information being conveyed. This may include media briefings, news releases, or interviews. They will also make information about the event available to Company personnel involved in the PSPS event.

Liaison Officer

The Liaison Officer (LNO) function is responsible for serving as the point of contact with federal, state, and local government agencies who are, or may be involved in, the PSPS event. This group will have a ready list of agencies and designated representatives including phone numbers and email addresses.

The LNO participates in all planning and update meetings and is closely attuned to all activities related to the PSPS event. They will monitor and provide updates regarding agency resource utilization and limitations. This function is also responsible for providing guidance to the agencies regarding demobilization at the end of the PSPS event.

The LNO and associated staff will serve as Hawaiian Electric's representative to first responders and incident commanders. The LNO will provide informational updates through briefings and incident status updates to impacted local, county, and state emergency managers on a frequent basis, and assist county emergency managers with obtaining relevant PSPS information.

Customer Service Officer

The Customer Service Officer (CSO) is responsible for keeping customers informed about potential power shut offs related to the Company's PSPS program. The CSO participates in all IMT meetings and is closely attuned to all activities related to the PSPS event.

Deputy Incident Commander

The Deputy Incident Commander (DIC) manages the PSPS IMT sections and resources other than the PSPS Task Force and the PGCG to allow the EIC to focus on the direct PSPS responsibilities. The Safety Officer, Operations, Planning, Logistics and Finance Section Chiefs report to the DIC.

Safety Officer

The Safety Officer (SOFR) is responsible for prioritizing the safety of people, property, and public spaces during a PSPS event. This role involves planning for safety communications, coordinating safety activities, and developing and implementing safety plan specific to such event to ensure the safety of employees as they respond to a PSPS event.

The SOFR will serve as the lead in communicating and collaborating with industry safety peers, public safety partners, emergency support agencies, and state and local emergency managers. The SOFR will provide advance notification of potential PSPS events to Public Safety Partners, key governmental officials, and critical facilities when feasible. Coordination plans with public safety partners will be initiated as the PSPS becomes more likely.

Operations Section Chief

The Operations Chief is responsible for managing all tactical operations. The Operations Chief will be alerted as soon as the potential for activation of PSPS is identified by the IMT. This will allow scheduling and positioning of staffing to be readied in the event PSPS is activated. This will include scheduling and ensuring a full complement of staff familiar with the specific functions of the IMT is available for 24-hour coverage leading up to and during the PSPS event.

The Operations Chief is responsible for executing the specific action plan developed for the PSPS event, as well as revising or approving changes to the plan which may be needed to support the overall goal of the PSPS event. This individual is also responsible for requesting additional resources to support the tactical operations for such tasks as electrical switching, field patrols, and restoration.

Planning Section Chief

The Planning Section Chief (PSC) is responsible for leading the Planning Section. The Planning Section manages the IMT process for PSPS events which includes collecting, analyzing and displaying information; tracking PSPS IMT Section resources; and maintaining incident documentation. If needed, the PSC leads the assessment of damage sustained to the Company's infrastructure to allow for the formulation of an Incident Action Plan. The Planning Section is heavily coordinated with other functional areas, like Operations and Logistics, and considers the specific feeders that may be impacted by the event, availability of local resources, pre-defined plans with Public Safety Partners, and the forecasted severity of the event.

The PSC and associated staff will develop an Incident Action Plan specific to the particular PSPS event, that informs the forward deployment of PSPS IMT Section resources, staff, staffing levels, and shift requirements. If contract resources are likely to be required for recovery and restoration, the needs are communicated through the IMT command structure and arrangements are made accordingly.

Logistics Section Chief

The Logistics Section Chief (LSC) works closely with the PSC to secure labor, resources and services required for specific PSPS events. The Logistics Section considers local resource availability, pre-defined plans with public safety partners, and the forecasted severity of the event. The LSC will assign staff and resources to locations or local storage facilities/yards to prepare for response, recovery, and restoration activities. The LSC will work with Incident Command in the event resources are needed for impacted communities.

Finance Section Chief

The Finance Section Chief manages all financial aspects of the PSPS event including tracking and reporting on associated costs. This will be done through assignment and utilization of special project account numbers for charging materials and labor associated with the PSPS event.

4.5.6 Customer and Stakeholder Communication

The LNO, PIO and CSO are responsible for informing the public and other external stakeholders regarding pre-event notification, PSPS IMT activation, PSPS shutoff and PSPS restoration.

Hawaiian Electric will take steps to keep customers and the community informed of potential PSPS events. This group will drive communication processes that will increase in urgency and frequency as a triggering event becomes more likely.

Between 48 and 72 hours prior, or as early as feasible, Public Safety Partners, critical facilities, and regulatory officials will be informed of a likely PSPS event. Within 24 and 48 hours prior, customers will be warned that a PSPS triggering event may occur. As the event approaches and the likelihood of occurrence increases, customers will be advised to activate emergency plans. Once the PSPS event is triggered, the group will communicate the recovery process and estimated outage duration. Once power is restored, the group will communicate that the threat has passed, and that power has been restored.

This communication process is outlined in Figure 4-22.

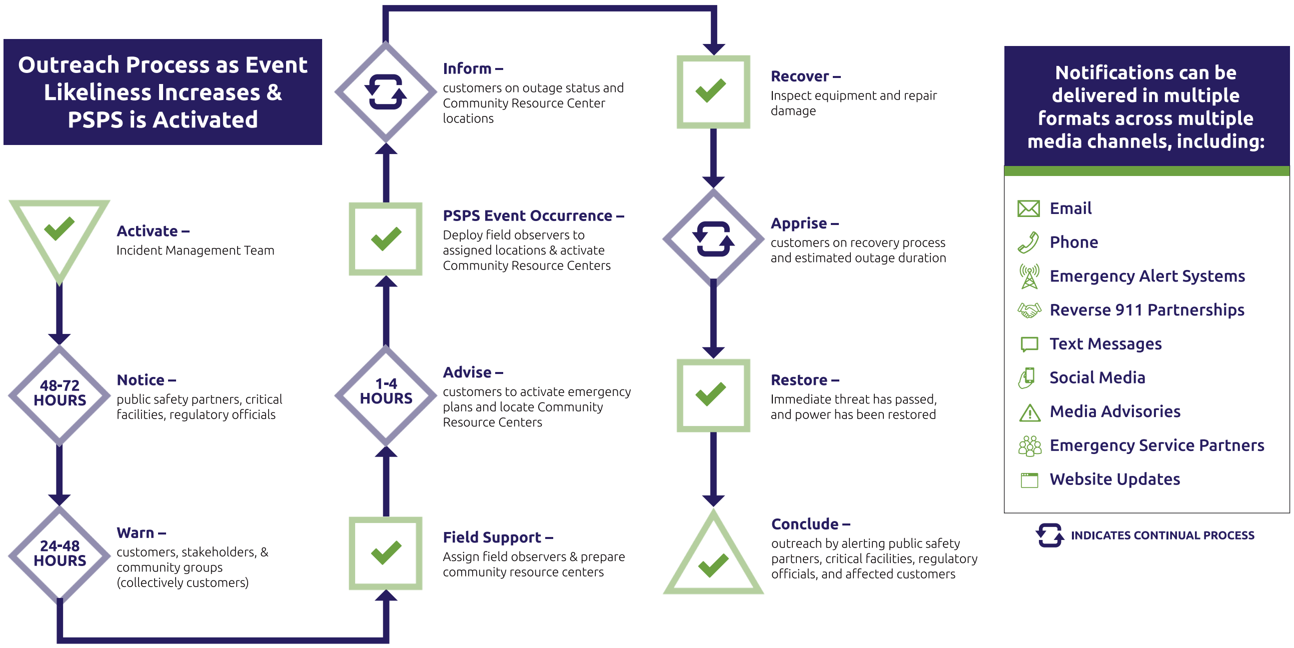


Figure 4-22. PSPS Communication and Outreach Process

As depicted above, PSPS notifications may be delivered electronically, via telephone, and/or through various public outlets. To ensure continuity in communications, shift turnover of the Public Information, Government, & Community Group (PGCG) staff assigned to the PSPS event will conduct meetings at the beginning and end of each shift. Additional team meetings will be conducted as determined necessary by the Executive Incident Commander and the PGCG staff on each shift.

4.5.7 Activation and Deactivation of PSPS

The planning described in Section 4.5.4.1 must be completed in advance, and the organization and community/customer preparedness must be in place prior to activation of the PSPS event. This section describes the key steps involved as part of the activation of a PSPS event.

4.5.7.1 Activation of PSPS Event

As discussed in Section 4.5.5, the PSPS IMT leadership team is responsible for determining when to activate the PSPS IMT. This decision is based on input from advisories and discussions with external weather service resources as well as intelligence from the Company's situational awareness tools in place to monitor the system for potential wildfire risk events. Based on this information, the EIC will make the decision to activate the PSPS event or not.

Upon activation of the IMT, all section heads will be informed to ensure the comprehensive PSPS plan is executed as designed. Figure 4-23 illustrates the key steps and responsible parties involved in the monitoring and decision process. The PSPS IMT will be staffed for 24-hour coverage for the duration of the event.

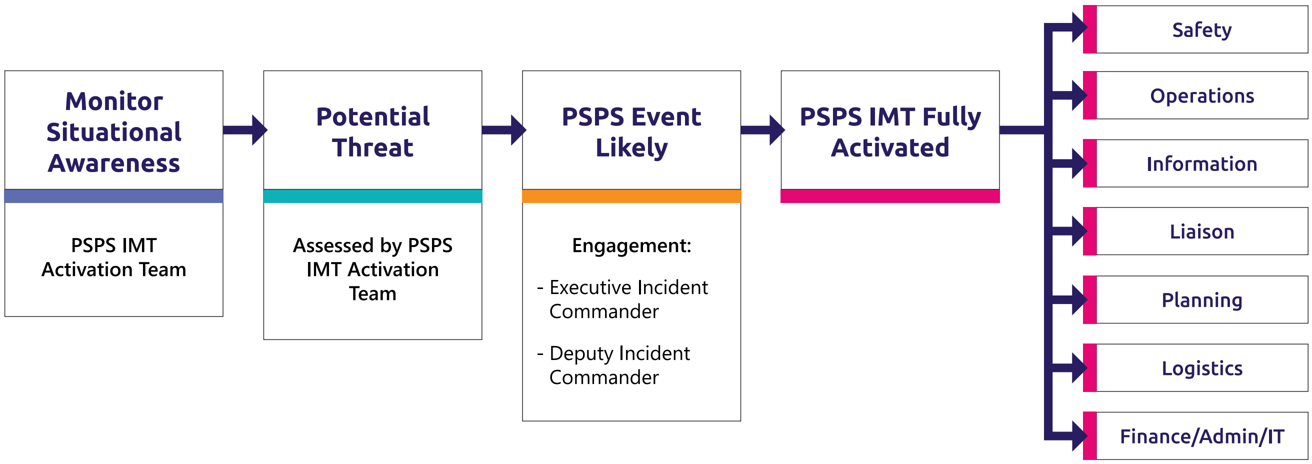


Figure 4-23. Execution prior to and during PSPS activation

4.5.7.2 Deactivation from PSPS Event

When the threat of wildfire has decreased, the EIC will receive confirmation from the DIC, PSPS Task Force Chief, and other members of the IMT. The EIC will make the decision to deactivate the PSPS event. Once that decision is made, the Section Chiefs will communicate the requirement for deactivation to their teams and external contacts, if applicable, and lead the process for patrolling, identification of equipment failure and hazard condition, system repair and safe restoration of the system to normal operating conditions. Each System Chief will inform the DIC when their area(s) of responsibility are complete. The DIC will, in course, inform the EIC, at which time the PSPS event will be deemed complete.

4.5.7.3 PSPS After Action Review Process and Commission Reporting

Following the deactivation of the PSPS event, Emergency Planning and Preparedness (EPP) will execute an after-action review process to incorporate lessons learned and seek to improve PSPS processes moving forward.

In addition, for any PSPS event that results in preemptive de-energization of power to customers, Hawaiian Electric will file a report with the Commission within 60 days of the end of the PSPS event containing the following information:

- Event-specific details
- Circuit(s) affected
- Number of customers who experienced outages
- Total duration of outage
- Information regarding communications sent to customers and stakeholders
- Post-event damage assessment

Over time, based on feedback and experience gained, Hawaiian Electric will refine this reporting process.

4.5.8 Advancing the Public Safety Power Shutoff Program

In 2024, Hawaiian Electric developed the initial PSPS program, including performing drills with stakeholders in advance of fire season. This initiative was based on initial risk assessments, high-level criteria using NWS data, and consideration of customer impacts. While this can aid in risk reduction, the ongoing use of PSPS is recognized as a concern for Hawaiian Electric customers across the State. To enhance public safety while minimizing the impact to customers, Hawaiian Electric anticipates ongoing refinement of the PSPS program based on additional data and further analysis to balance wildfire and outage risks.

The interaction between complex terrain and the influence of the Pacific Ocean creates a variety of micro-climates that cannot be resolved using publicly available weather forecasts. Additionally, there is limited information that connects the relationships between fuel, weather, and fire. Changes in land use by landowners and invasive grasses, prevalent across the islands, are drivers of wildfire activity. Other vegetation, such as brush and timber, also plays a role in wildfires on the islands, but there are no current efforts to measure or predict the moisture levels of these fuels regularly.

Over the next 3 years, Hawaiian Electric plans to improve its capabilities to advance risk modeling, improve execution, enhance fire weather forecasting to minimize risks, better prepare customers, and try to minimize the impacts of and need for PSPS. Programs that support reduce customer impacts are discussed in Section 4.8, such as customer resource centers that can assist customers during these events.

The elements that will support ongoing PSPS program improvement include:

1. **Advancing Risk Modeling:** Developing more advanced risk models to forecast more granular wildfire weather threats will improve operating practices. Refined risk models will enhance visibility to forecasted risks, which will support evaluating emerging wildfire threats while balancing reliability and customer needs. Hawaiian Electric anticipates that these risk models will leverage the use of expanded fire spread modeling and estimated risk and consequence based on simulated conditions, practices that are widely adopted by utilities with mature mitigation programs.
2. **Improving Forecast Accuracy:** Forecasting fire weather threats out to 5 to 7 days in advance, and at more granular levels will support emergency management and customer notifications. These forecasts of weather, fuel moisture, and fire potential will be applied to electric infrastructure in specific locations. Forecasts will require the acquisition of gridded data set of weather and fuel moisture over a historical period, including at least the last 20 years, at an hourly temporal resolution and a spatial resolution of less than 3 kilometers. Fire potential and wind speed forecasts that can be applied to each circuit or circuit segment will increase precision in de-energizations in areas of greatest risk.
3. **Minimizing the Impacts and Need for PSPS:** Minimizing the impacts and need for PSPS involves sectionalization and switch reclosure additions, coupled with additional weather stations, to perform projected de-energizations more surgically. Developing new criteria based on more advanced risk modeling that assess the state of fuel dryness and wind speeds will reflect projected and near real-time fire risks. Expanding the number of weather stations and associated data, and partnering with agencies such as the NWS, will enhance the program. Further ongoing coordination with stakeholders, including emergency management, local first responders, critical infrastructure customers, and community-based organizations (CBOs), will be essential.

It is expected that each of these elements will be developed and implemented at various times during the 2025–2027 period, as described in Section 4.1.2, leveraging the latest technologies and capabilities available. As program improvements are implemented, more educational resources and stakeholder engagement will be conducted each year.

4.6 Grid Modernization

Hawaiian Electric's grid modernization efforts provide the enabling platform for wildfire risk reduction efforts. Solutions such as EFT, PSPS, smart sensors, and sectionalizing equipment are key components of a modernized, resilient grid that can better withstand extreme weather events and changing environmental conditions. Sectionalizing equipment can help to reduce adverse impacts to customers, while SCADA and Advanced Distribution Management System (ADMS) can improve efficiency of grid operations.

Phase 2 grid modernization implementation builds on phase 1 capabilities and is supported by this strategy. The following incremental investments are discussed throughout this WSS as critical to improve operational efficiencies in operating the grid during elevated wildfire conditions and to minimize the reliability impacts of operational practices that reduce wildfire risks:

- An advanced distribution management system to enable grid operators to, in a coordinated fashion, effectively monitor, visualize, control, and predict conditions on the distribution grid and better implement new wildfire operational procedures.
- Integrated and coordinated Field Devices to enhance circuit capability (wildfire PSPS segmentation, hosting capacity, reliability, etc.) to increase the reliability and resilience of high-risk circuits, many of which are in disadvantaged communities.
- SCADA functionality into legacy distribution substations, increasing the efficiency and security of electric grids.
- Expand the Private LTE (long-term evolution) or PLTE, telecom network by installing radio access network (RAN) sites, modular communication devices, field antenna boxes, and microwave backhauls to increase day-to-day functionality, as well as improve the resiliency of Hawaiian Electric's telecommunications networks during emergency response situations.
- Improve infrastructure cybersecurity resiliency through implementing additional operational technology (OT) cybersecurity to protect, detect, and response capabilities.

These incremental grid modernization investments have direct benefits to the efficacy of wildfire prevention and are considered foundational to the WSS. Should Extraordinary Project Recovery Mechanism (EPRM) funding for the Grid Modernization Phase 2 program under Docket No. 2019-0327 not be approved by the PUC, the Grid Modernization Phase 2 program would need to be incorporated as part of the WSS.

The Advanced Distribution Management System (ADMS) will incorporate data from communications-enabled field devices providing situational awareness to operators on conductor loading, Advanced Metering Infrastructure (AMI) fault events, and various circuit-health indicators. This functionality would be supportive of identifying issues on the distribution system and would provide more data to operators to make decisions for restoration and reducing outage durations to customers.

Among the various field devices included in the Grid Modernization Phase 2 program, smart reclosers and 69-kV motor-operated switches were included. These devices support segmentation of faults and outages, and aid in reducing restoration of customers. From the Grid Modernization Phase 2 program, the WSS is currently targeting up to 117 smart reclosers and 43 sub-transmission motor-operated switches to reduce wildfire risk and improve restoration in MWRA and HWRA.

The Grid Modernization Phase 2 program also includes the implementation of SCADA functionality to legacy distribution substations. The WSS identified 12 substations that require communications to remotely enable/disable EFT settings.

Grid Modernization Phase 2 will also expand the PLTE network to enable a secure and dedicated wireless telecommunications network for operational visibility, data acquisition and control of the grid, particularly during emergency events. The PLTE expansion will strategically deploy RAN sites to ensure comprehensive coverage of WSS-identified substations and field devices in areas critical for wildfire mitigation, while also enhancing grid reliability and resilience.

Given the widespread deployment of Grid Modernization Phase 2 and WSS field devices, the OT cybersecurity monitoring capabilities needed to manage the increase in incoming data must be built in parallel to deployment rather than after the fact. These capabilities will be provided by deploying a suite of cybersecurity solutions that provide packet capture and storage, network segmentation, and threat detection capabilities, which will ultimately improve Hawaiian Electric's cybersecurity.

4.6.1 Summary of Grid Modernization Scope and Cost

Table 4-8, summarizes the cost and scope of the grid modernization investments that support implementation of the WSS, through operational efficiencies, and reduced impacts to EFT and PSPS programs. Note grid modernization costs extend beyond 2027 but for the purposes of WSS the 2025-2027 costs are shown below.

Table 4-8. Grid Modernization Scope with Estimated Costs

Projected Scope	Current 2025–2027 Target	2025-2027 Estimated Costs
ADMS	Implement ADMS Release 1 for Oahu	$39.5M
Sectionalizing Field Devices	Deploy up to 117 smart reclosers and 43 sub-transmission motor-operated switches	$29.7M
SCADA to Substations	Enable SCADA at up to 12 distribution substations	$1.2M
PLTE Expansion	Deploy RAN sites necessary to provide PLTE coverage for WSS sectionalizing field devices	$14.2M
OT Cybersecurity Monitoring	Deploy data sensors, integrate into the Network Operations and Security Center (NOSC), and complete testing	$4.5M

4.7 New Technology Pilots

In addition to the risk reductions provided by grid hardening and operational improvements, the use of new and emerging technology supports long term sustainability of risk reductions, especially with the changing climate and the associated changes in wildfire risk. Hawaiian Electric is evaluating pilot projects for three emerging technologies to enhance its wildfire risk management, electric infrastructure public safety and reliability of service to customers. The pilot projects are separate projects but will be structured in a coordinated fashion to address a wide range of priority capabilities ranging from advancing the detection of conditions that may lead to power line caused ignitions, enhancing safety systems to incorporate new wildfire components such as covered conductors, and continuing to reduce adverse customer reliability impacts of wildfire mitigation programs.

4.7.1 Distribution System Enhanced Fault Detection Pilot

This technology uses various types of sensors and data analysis techniques on power lines to detect evidence of damage and emerging problems to support proactive action to avoid an outage or potential fire ignition. The technology also supports locating damage that may not result in an outage but represents a risk to public safety to address risks, reduce response times and improve customer reliability. An array of sensors and analytic technologies will be considered for the pilot including vibration detection, electric and magnetic field monitoring, voltage and current monitoring and cameras to collect data for analysis. The technology to be considered also uses waveform analytics to detect anomalies in electrical current, such as low current arcing faults or equipment deterioration, that traditional systems may overlook. When the system detects changes in conductor or equipment condition, it sends notifications for operators and first responders to locate the issue. Other mainland utilities report success in the identification of a variety of conditions, including trees contacting the conductors, pole failures, fallen energized conductors and fuse operations among others.

Hawaiian Electric is planning to pilot this technology on at least two distribution circuits and up to one per County. Circuits with a history of multiple outages will be considered as candidates for the pilot technology deployments.

4.7.2 Distribution System Downed Conductor Detection Pilot

Conductor breaks can occur due to trees, equipment failure and weather events. The technology to be considered in this pilot uses synchrophasor voltage measurements and other approaches from substation circuit breakers and other devices such as line reclosers or switches to detect a break in the conductor. This technology can trip the protection devices and isolate the broken section of the circuit before the conductor reaches the ground, thus reducing the risk of arcing and wildfire ignition.

Hawaiian Electric is planning to pilot this technology on at least two distribution circuits and up to one per County. Circuits with a history of multiple outages will be considered as candidates for the pilot technology deployments.

4.7.3 Transmission Traveling Wave Downed Conductor Detection Pilot

Traveling wave is a time-domain identification technology that analyzes travelling waves of voltages and currents after disturbances on the grid. Traveling waves contain high-frequency components that can be sensed with travelling-wave relays. These relays use signal processing to detect faults faster than traditional protection devices. The trip signals that these devices send to the circuit breakers allow the fault to be cleared with lower energy levels, thus reducing the risk of ignitions. In addition, traveling wave aids in locating faults on the line, which can support restoration efforts following a fault. The technology can detect downed conductors, vegetation contact or insulator failures among other conditions.

Hawaiian Electric has deployed relays capable of adding traveling-wave functionality on some transmission lines in O'ahu, Maui and Hawai'i Island. Hawaiian Electric is planning to pilot this technology on one transmission circuit on O'ahu, Maui, and Hawai'i Island.[32] The costs related to this technology are associated with settings development and tuning the existing relays, implementation of modeling and analysis tools and troubleshooting detected events.

4.7.4 Summary of New Technology Pilots Scope and Cost

The pilots under review are listed below with estimated cost for each. These projects will be implemented as pilots so Hawaiian Electric can evaluate their efficacy and implementation into the operational domain. Should any of these pilots be found to be highly effective in mitigating risk, they would be considered for wider-scale deployment on more circuits in a future iteration of the WSS.

Hawaiian Electric is currently targeting to implement between one and three of the pilots listed in Table 4-9 by the end of 2027.

Table 4-9. New Technology Pilot Scope with Estimated Costs

Projected Scope	Current 2025–2027 Target	2025-2027 Estimated Costs
Add Enhanced Fault Detection (EFD)	Implement on one circuit in each county (O'ahu, Maui County, Hawai'i Island) by 2027.	$1.6 million
Add Distribution Downed Conductor Detection	Implement on one circuit in each county (O'ahu, Maui County, Hawai'i Island) by 2027.	$8 million
Add Transmission Traveling Wave Downed Conductor Detection	Implement on one circuit in each county (O'ahu, Maui County, Hawai'i Island) by 2027.	$0.2 million

[32] Moloka'i and Lāna'i do not have a transmission system and thus are not eligible for implementing this pilot.

4.8 Stakeholder and Community Partnerships

This section provides an overview of Hawaiian Electric's strategies to engage community members and other stakeholders in wildfire safety planning on each island within its service territory. It also describes themes from what the company heard from community members and how community input has shaped the WSS. Additionally, this section details Hawaiian Electric's efforts to build and sustain partnerships with fellow utilities, emergency responders, government agencies, researchers and community-based organizations through its Wildfire Safety Symposium and subsequent series of Wildfire Safety Working Group meetings.

A full record of Hawaiian Electric's community engagement activities on each island can be found in Appendix A-1. Appendices A-2 to A-4 are also referenced throughout this section, as they contain copies of public outreach materials, Wildfire Safety Symposium summaries and Working Group meeting notes.

4.8.1 Overview of the Community Outreach and Engagement Approach

An informed, engaged and prepared public is of paramount importance to wildfire safety. Led by a commitment to "meet people where they are," Hawaiian Electric implemented a wide range of outreach strategies tailored to individual islands to connect with community members, listen to concerns, gather input, collect emergency contact information and share wildfire safety information and resources.

From January through October 2024, Hawaiian Electric participated in more than 100 in-person and virtual public outreach events on Maui, Molokaʻi, Oʻahu and Hawaiʻi Island—from visiting residents door-to-door and attending neighborhood fairs, to hosting public open houses and community meetings. Hawaiian Electric also shared information and invited residents to community events through emails and printed mail, on social media and online at *hawaiianelectric.com/wildfiresafety*. Hawaiian Electric also conducted a targeted advertising campaign in community publications and on social media by zip code. In all its outreach efforts, Hawaiian Electric worked to broaden the accessibility of its events and materials, providing information in multiple formats and languages.

Among the Company's top priorities is helping the public understand and plan for PSPS. Since the PSPS program was announced in late May 2024 and was ready to be implemented on July 1, 2024, as needed, Hawaiian Electric's aim has been to expand public awareness of PSPS, help communities identified as potentially impacted by PSPS prepare, listen to individuals' concerns, answer questions and demystify the process of initiating a shutoff and restoring power. (Currently, Lānaʻi does not have any identified PSPS communities, so was not prioritized for PSPS outreach.) See Section 4.8.2 for a summary of community engagement strategies on each island, including PSPS outreach.

In all its outreach efforts, Hawaiian Electric emphasized everyone's collective responsibility for reducing wildfire risk and the many, interconnected actions that can improve wildfire safety. The Company partnered with a diverse array of local organizations, emergency management agencies and first responder public agencies to reach more communities, provide greater resources and demonstrate the collaborative, cross-sector approach crucial to improving wildfire safety. Hawaiian Electric found that collaboration and partnerships at the public, private and community-based level are critical to implementing near-, mid- and longer-term actions to meaningfully reduce wildfire risk.

In April 2024, Hawaiian Electric hosted a Wildfire Safety Symposium in Hilo focused on collective actions to reduce Hawai'i's wildfire risk. This two-day technical symposium brought together wildfire safety experts from utilities, agencies, research institutes and the state to learn and share insights about wildfire risk areas, near-term mitigation actions, operational and emergency response needs and long-term strategies for safety and grid resilience. See section 4.8.3 for a summary of the Wildfire Safety Symposium.

Hawaiian Electric channeled the collective momentum from the symposium into a series of Wildfire Safety Working Group meetings, where experts convened to review Hawaiian Electric's wildfire safety strategies and share input on technical topics. See section 4.8.4 for a summary of the Working Group meetings.

4.8.2 Island-Specific Outreach

Hawaiian Electric tailored its community outreach strategies to the unique needs of each island within its service territory. The following subsections summarize these strategies, feedback from community members and Hawaiian Electric's ongoing and future efforts to continue engaging the public and its partners around wildfire safety.

4.8.2.1 Maui County (Maui and Moloka'i)

Outreach strategies:

Hawaiian Electric held both in-person and virtual events in each of the identified PSPS communities on Maui and Moloka'i, which are considered areas with high risk of wildfire. The events included participating in and staffing tables at events led by other organizations, hosting the company's own open house forums and presenting at community meetings. The Hawaiian Electric community relations team tailored their outreach strategies to different areas, as they found that certain formats were more effective depending on the areas. For example, the company hosted in-person open houses during the morning to mid-afternoon hours on weekends that were well-attended in certain areas, whereas for other communities, they reached out to people more effectively online through regularly scheduled community association group meetings or in-person regular meetings with community senior citizen organizations. Hawaiian Electric tailored its outreach approach based on local staff's knowledge and community relations experiences with and past feedback from each community. In some areas, staff consulted with community leaders to determine the best approach to inform and engage with their communities.

Hawaiian Electric hosted or participated in 16 PSPS-related community events in Maui County from May through October 2024. This outreach is ongoing and continued through the remainder of 2024. See Appendix A-1 for a record of all community outreach activities Hawaiian Electric hosted or participated in on Maui or Moloka'i. This record displays the purpose and location of community events, partners involved and number of community members engaged (if the data is available). Appendix A-2 contains copies of materials presented and distributed at these events.

In addition to this ongoing PSPS engagement, since fall 2023, the Maui County community relations team has engaged and continues to engage in communicating and sharing the company's immediate and ongoing restoration and rebuilding efforts on Maui.

Partnerships

Hawaiian Electric partnered with several organizations to reach more communities in Maui County and to show continued collaboration and partnerships. For example, at its open house events, the company partnered with various County of Maui departments, including Maui Emergency Management Agency and Maui Fire Department; state departments, including the Hawaiʻi State Emergency Management Agency, Hawaiʻi Wildfire Management Organization, State Department of Health Behavioral Health Services; and community organizations, including the Boys and Girls Club of Maui.

Figure 4-24 shows Hawaiian Electric staff and partners at community events on Maui and Molokaʻi.

Figure 4-24. Hawaiian Electric staff and partners at community events in Maui County

Left to right from the top left corner: Molokaʻi Resource Fair emergency preparedness PSPS table, May 18, 2024; Upcountry Emergency Preparedness Open House, June 22, 2024; Maui County PSPS External Stakeholders Workshop, July 16, 2024

West Maui Emergency Preparedness PSPS Open House, July 13, 2024; Maui Emergency Management Disaster Preparedness Expo PSPS table, July 13, 2024; Boys and Girls Club of Maui Lahaina Family Night emergency preparedness PSPS table, June 1, 2024.

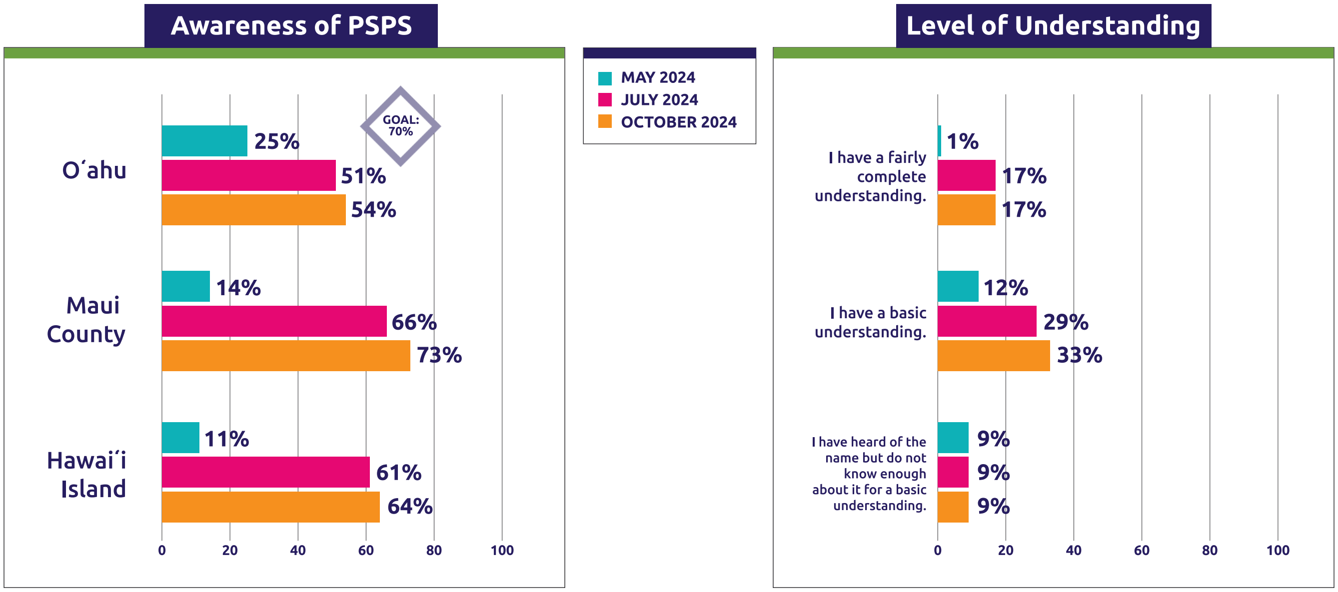
Themes and feedback from community members:

Hawaiian Electric heard the following recurring questions, themes or concerns from community members regarding wildfire safety on Maui and Molokaʻi:

- Many residents expressed appreciation for Hawaiian Electric's efforts to share their Wildfire Safety Strategy and PSPS information with their community. Some said they received Hawaiian Electric's emails but appreciated that the team also shared more information with them directly.
- Some residents shared concerns of not being prepared for emergency situations in general, including for hurricanes. These residents indicated they are not used to having outages in their area.
- Some shared that they did not see the need to preemptively shut off the power in their area, while others understood why Hawaiian Electric has the plan to turn off the power if needed. Some asked why their neighborhood is not identified as a PSPS area.
- Hawaiian Electric's Maui County community relations team received and shared feedback during one of its engagement events that materials should be made available in multiple languages, including for individuals who are deaf or hard of hearing. The communications team responded to this request by creating materials in eight other languages identified by respective communities, such as Spanish, Tagalog and Ilocano and Hawaiian. This also includes a PSPS informational video that was created that featured American Sign Language posted online (https://youtu.be/ouWjjkF8-0A). Attendees could access these materials through QR codes posted at in-person events.

Outcomes and next steps:

Community outreach efforts on Maui and Molokaʻi substantially improved public awareness of PSPS. In May 2024, surveys showed that Maui and Molokaʻi residents had a 14% level of awareness of PSPS. This awareness level increased to 73% in October 2024, during the timeframe of Hawaiian Electric's direct outreach on Maui and Molokaʻi. Figure 4-25 shows the change in public awareness of PSPS before and during community outreach.



Sources: May 2024 baseline – Hawaiian Electric's Energy Panel Hawai'i (n=942) July 2024 tracking – Escalent's Residential Benchmark (n=585) October 1-14, 2024 tracking – Escalent's Residential Benchmark preliminary (n=274)

Figure 4-25. Public awareness of PSPS per island, May, July and October 2024

Hawaiian Electric is continuing community engagement efforts in Maui County, focusing on the kupuna or senior citizens on Maui with in-person presentations.

Moving forward, Hawaiian Electric's community relations team on Maui aims to continue ongoing collaboration with the community affairs and communications teams across its service territories to start annual internal and external PSPS outreach ahead of the hurricane and wildfire season. The goal is to start PSPS outreach in April every year.

4.8.2.2 O'ahu

Outreach strategies:

Hawaiian Electric's outreach strategies on O'ahu included in-person and virtual events and print and digital communications. Hawaiian Electric hosted or participated in 45 community events on O'ahu from April through October 2024 to share information about its wildfire safety measures in the community and to engage in dialogue to collect input. These meetings focused on wildfire mitigation actions that were underway or planned, in addition to longer term action plans. Prior to this, outreach was focused on immediate enhanced safety procedures involving operational settings, equipment inspections and the use of field observers at strategic locations during certain weather events, including red flag warnings by the weather service.

See Appendix A-1 for a record of all community outreach activities about wildfire safety and emergency preparedness that Hawaiian Electric hosted or participated in on O'ahu. This record displays the purpose and location of community events, partners involved and the number of community members engaged (if the data is available). Appendix A-2 contains copies of materials presented and distributed at these events.

Hawaiian Electric tailored its outreach approach on O‘ahu based on information gathered from community leaders, elected officials, area schools and non-profit organizations, as well as local staff’s knowledge and experiences engaging with Leeward Coast communities. The O‘ahu communications team found that the most effective methods to reach and engage community members were:

- Participating in community-hosted events proven to draw in families—in other words, meeting community members “where they’re at”
- Visiting door-to-door to provide information and to verify understanding of PSPS, improve preparedness and gather contact information
- Working with and alongside partners who are known and trusted within the community
- Listening to families impacted by wildfires in the community and showing empathy by acknowledging their concerns, including opposition to PSPS, answering questions and noting their feedback for follow-up
- Keeping legislators informed about wildfire mitigation efforts that are implemented throughout the year, including AI cameras, weather stations, searchable online PSPS map and use of drones. Hawaiian Electric found that government relations outreach efforts are most effective when legislators share information in their e-newsletters and on their social media platforms. Hawaiian Electric’s communications materials can help reach legislators’ constituencies, especially when it’s easy to repurpose or repost those materials for their communities.

Hawaiian Electric’s O‘ahu outreach efforts included:

- Providing in-person presentations at City and County of Honolulu Neighborhood Board meetings in the Nānākuli-Mā‘ili and Wai‘anae Coast districts, in addition to the Nānākuli Hawaiian Homestead Community Association
- Mailing and emailing communications to all customers in impacted neighborhoods with an invitation to attend an in-person community meeting with livestream option. The meeting was recorded and posted publicly on Hawaiian Electric’s website.
- Participating in multiple community-led emergency preparedness fairs with an educational booth using an engaging Wildfire Safety Measures illustration to draw people in
- Visiting communities in the PSPS zones via door-to-door canvassing and meet-ups at the properties’ community centers, in partnership with emergency management partner agencies.

Figure 4-26 shows Hawaiian Electric staff and partners at community events on O‘ahu.

Figure 4-26. Hawaiian Electric staff and partners at community events on Oʻahu

Left to right from the top left corner: East Oʻahu Emergency Preparedness Fair, July 24, 2024; Lanikai Emergency Preparedness Fair, April 14, 2024; PSPS canvassing on the Leeward Coast, August 2024 (photos 3-6); Windward Coast Emergency Preparedness Fair May 11, 2024 (photos 7-8).

Partnerships:

Hawaiian Electric partnered with community-based organizations and government (emergency management and first responders) for alignment and coordination in information distribution. See Appendix A-1 for a full list of partners at each community event.

One example of partnership was Hawaiian Electric's community meeting on wildfire safety measures in June 2024. Partners at this event included:

- Mālama Learning Center
- Ka'ala Farm
- Hawai'i Wildfire Management Organization
- Wai'anae Watershed Management Partnership
- Hawai'i Emergency Management Agency
- Hawai'i State Department of Health
- Honolulu Police Department
- Honolulu Fire Department
- American Red Cross of Hawai'i

Community-based organizations and government partners collaboratively shared information about heightened wildfire risk on the Leeward Coast of O'ahu, along with their respective roles in wildfire mitigation and/or response, with the common theme that addressing the increasing threat of wildfires and climate change requires the collective effort of all entities involved.

Another example of partnership was during PSPS canvassing events in the Leeward Coast in August and September 2024. Partners included:

- City and County Department of Community Services Elderly Affairs Division
- Department of Emergency Management
- Board of Water Supply
- Hawai'i Public Health Nurses

All partners at these canvassing events worked together as one unit. Hawaiian Electric explained its wildfire safety strategy and the importance of preparing for PSPS just like other emergencies. The Board of Water followed up with the water issues occurring during a PSPS and provided water bags. The State of Hawai'i Department of Health, Public Health Nurses discussed the need to remain cool and hydrated when temperatures were hot (or when there was no air conditioning) and how to identify issues like heat stroke. The Department of Emergency Management shared tips on what to do in different emergencies, especially with those communities in tsunami zones. The Department of Community Services, Elderly Affairs Division conducted a survey of the elderly and non-English speaking residents in the community and provided interpreters.

Hawaiian Electric also partnered with others to present PSPS information to more audiences. For example, in July 2024, the Honolulu City Council's Committee on Public Safety invited Hawaiian Electric to present on its

PSPS program. The session was livestreamed, and the video was posted to the City Council's website. The presentation provided insight on the PSPS program rollout and informed the public about the program's impact.

Another form of partnership on Oʻahu is through Hawaiian Electric's community-driven resilience program. Through a federal grant from the U.S. Department of Energy, Hawaiian Electric is working with community partners in areas of high wildfire risk that are also impacted by infrastructure upgrades to implement resilience projects and enter Community Benefits Agreements (CBA). The CBAs will be centered around actions that will benefit the most people in the region, serve to protect human life and safety, address a specific community resilience concern (e.g., community-planned firebreaks, hazard tree removal, native plant reforestation) or past incident, and must be realistic and feasible.

For example, Hawaiian Electric is collaborating with Mālama Learning Center, Kaʻala Farm, the Hawaiʻi Wildfire Management Organization and the Hawaiʻi State Department of Education to reduce wildfire risk around public schools in the West Oʻahu region, which includes multiple disadvantaged communities. Through a CBA, Hawaiian Electric and its partners are working to clear vegetation in areas prioritized by the community and to also support a native plant nursery to be managed by the students, their parents and school faculty to keep invasive vegetation down and involve them as part of a longer-term solution. (This Hawaiian Electric video explores the pilot project.) This will be paired with a wildfire safety educational campaign in the schools and community where projects are implemented. The community group is also exploring a local "mob grazing" operation using sheep from a local farm to further support keeping invasive vegetation down. Hawaiian Electric hopes to replicate this partnership model on other islands.

Themes and feedback from community members:

Hawaiian Electric heard the following recurring questions, themes or concerns from community members regarding wildfire safety on Oʻahu:

- Community members expressed displeasure with PSPS, noting that system hardening and maintenance should be done instead
- Community members expressed equity concerns, noting that areas at high risk of PSPS are in West Oʻahu communities where there are already energy burdens present
- Community members suggested that Hawaiian Electric should clear all vegetation, everywhere—that it's Hawaiian Electric's responsibility
- Community members frequently asked how long the power will be out during PSPS. They also asked what to do if they have electric medical equipment, if the community will receive adequate notification before a shutoff occurs, how they will know which areas are affected, and if they will be able to know when it is a regular outage versus a PSPS.
- Community members suggested that Hawaiian Electric should provide generators and batteries for homes impacted by PSPS
- Generally, residents who spoke with Hawaiian Electric staff through door-to-door and meet-and-greet outreach efforts expressed gratitude for the information and effort to get the word out about PSPS

Outcomes and next steps:

Community outreach helped increase public awareness of Hawaiian Electric's wildfire safety strategies, including PSPS. In May 2024, surveys showed that O'ahu residents had a 25% level of awareness of PSPS. This awareness level increased to 54% in October 2024, during the timeframe of Hawaiian Electric's direct outreach on O'ahu. See Figure 4-25 (in the discussion of Maui County outreach, above) for a graph displaying the change in public awareness about PSPS before and during community outreach.

From its outreach efforts, Hawaiian Electric received 230 completed PSPS communication forms, which included 34 special medical needs forms. The community outreach also dispelled misinformation by explaining that families should prepare for PSPS like they would for hurricanes or other natural disasters, and that the PSPS helps prevent wildfires, not just to shut off power if there is a fire.

Hawaiian Electric found that collaboration and partnerships at the public, private and community-based level are critical to implementing near-, mid- and longer-term actions to meaningfully reduce wildfire risk. For future outreach, Hawaiian Electric recognizes that more time is always helpful in planning for coordinated response processes. The company is continuing to refine its community engagement plans and actions as it moves forward. In the coming months, community members can expect Hawaiian Electric to continue collaboration with community leaders and partner organizations to make meaningful impact through engagements and projects. This includes utilizing the U.S. Department of Energy's Grid Resilience Innovation Partnerships funds to empower organizations to continue their wildfire mitigation work and/or identify projects within the community to advance wildfire efforts.

4.8.2.3 Hawai'i Island

Outreach strategies:

Community engagement efforts around wildfire safety began on Hawai'i Island in November 2023 when the Company announced actions it was taking as part of its WSS. From January through early November 2024, Hawaiian Electric hosted or participated in 46 community events on Hawai'i Island. See Appendix A-1 for a record of all community outreach activities about wildfire safety and emergency preparedness that Hawaiian Electric hosted or participated in on Hawai'i Island. This record displays the purpose and location of community events, partners involved, and the number of community members engaged (if the data is available).

Hawaiian Electric's outreach efforts spanned the entire island and started with key stakeholders in government, business and the community. Since the PSPS program was announced in late May 2024, outreach efforts have been focused on communities that would be most impacted by PSPS. Approximately 15,000 customers, primarily on the northern and western sides of the island, live in a community identified for the PSPS program. These communities include both locals and non-locals of various income levels. Hawaiian Electric's community outreach strategy is focused on meeting people where they are and tailoring its approach to meet the needs of diverse audiences.

Most engagement occurred through face-to-face interactions at public events, as well as small group meetings with businesses, organizations and community associations. Hawaiian Electric staff also spoke or met privately with individuals whose questions or concerns required a longer conversation. Hawaiian Electric found this approach to be the most impactful because it is more personal, builds trust and encourages meaningful conversations. People feel seen and heard when staff make the effort to "talk story" with them, especially if they live in a distant, rural community.

To broaden its reach, Hawaiian Electric participated in events and meetings led by other organizations. Community events included disaster preparedness fairs, resilience fairs, family-oriented festivals, and charity walks. Staff met with County of Hawaiʻi leadership, emergency response agencies, business and industry organizations, community associations, nonprofit organizations and low-to-moderate income groups. Hawaiian Electric also hosted a 2-day Wildfire Safety Symposium in Hilo and a Community Resilience Fair in Kohala and Kona. (See section 4.7.3 for a summary of the Wildfire Safety Symposium.)

Figure 4-25 shows Hawaiian Electric staff and partners at community events on Hawaiʻi Island.

Figure 4-27. Hawaiian Electric staff and partners at community events on Hawaiʻi Island

Hawaiian Electric tailored its outreach approach based on local staff's knowledge and experiences with each community. In some areas, staff consulted with community leaders to determine the best approach to inform and engage with their community. The notifications, presentations, displays and collateral materials were customized for the audience and venue. For example, at some events, Hawaiian Electric distributed printed handouts instead of projecting the presentation on a screen.

Hawaiian Electric found that events with an open house are very effective, because it provides attendees the opportunity to get information and resources as well as speak with the partners. This helps address questions and concerns and empowers the community to take action. Presentations, displays, activities and collateral materials were helpful at the various events and meetings. Additionally, customer letters (direct mail and email), advertising, news releases, social media and the Hawaiian Electric website helped inform communities about PSPS and upcoming public meetings. Figure 4-28 displays examples of PSPS outreach materials. See Appendix A-2 for copies of all materials presented and distributed at community events.

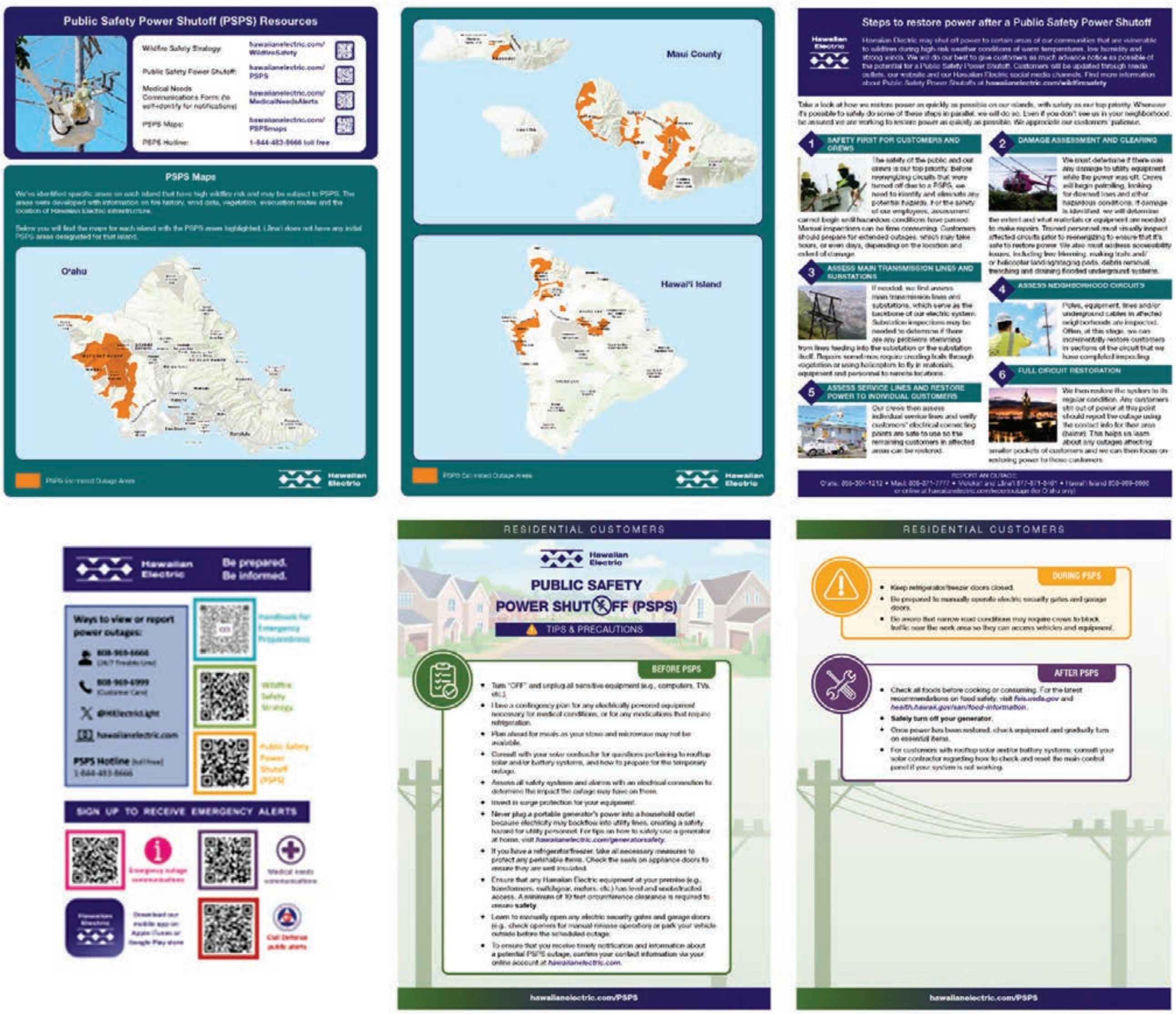


Figure 4-28. Examples of materials that Hawaiian Electric shared online and in person to help communities understand and prepare for PSPS

Partnerships

Strong partnerships with many key organizations and agencies were essential for effective community engagement. The County of Hawai'i is a critical partner and collaborator, and included the following agencies or departments:

- Mayor's Office
- Civil Defense Agency
- Community Emergency Response Team
- Department of Water Supply
- Hawai'i Fire Department
- Hawai'i Police Department
- Office of Aging (Aging and Disability Resource Center)
- Business and community partners included:
- Citizens' Climate Lobby
- Hawai'i Energy
- Hawai'i Red Cross
- Hawai'i Wildfire Management Organization / Firewise
- Sustainable Energy Hawai'i
- Vibrant Hawai'i

Conducting outreach on a 4,028-square-mile island is a challenge. Many rural communities have limited or no access to modern communication technologies like internet or WiFi. Some communities depend on word-of-mouth or the "Coconut Wireless" for information. The most effective method for reaching and engaging communities is attending or participating in meetings or events organized by others.

In addition, participating in events with key partners shows how Hawaiian Electric is working together with others to keep communities safe in terms of wildfire risk and reinforced the message that everyone must do what they can to prepare for emergencies. The Community Resilience Fair is an example of collaboration and partnership. Each fair included an open house and community meeting. Hawaiian Electric and its partners engaged directly with community members and shared information on what they are doing for public safety and what individuals can do to stay safe. The August 19, 2024, fair also included a panel discussion that was recorded and is posted on the company's website and on Na Leo TV for those who could not attend the meeting in person.

Hawaiian Electric's partners also helped disseminate information and promoted events through flier distribution, website announcements, and social media posts. For example, the County of Hawai'i Office of Aging (Aging and Disability Resource Center) mailed 325 medical needs forms to customers in PSPS areas.

Early engagement with key stakeholders was critical to gain their understanding of and support for the WSS, especially PSPS. Hawaiian Electric also keeps legislators and county officials informed on a regular basis and provides timely responses to questions or concerns they receive from constituents.

Themes and feedback from community members:

Hawaiian Electric heard recurring questions, themes and concerns about PSPS and its impact on customers with medical needs, public notifications, and continuity of critical services (e.g., hospitals, emergency responders, water and communication providers). Initially, Hawaiian Electric shared high-level information about the PSPS program, and the community asked for more transparency. As the program evolved and more information became available, Hawaiian Electric staff have been able to share more details.

In conversations with community members on all islands, Hawaiian Electric staff commonly heard the following categories of questions about PSPS:

- Emergency services and partnerships with first responders
- Support for customers with medical needs
- Operations and protocols, including public notifications
- Reasons and data behind defining PSPS areas
- Customer bills and financial support

Hawaiian Electric staff answered these questions as they received them and shared information through slides, handouts and online resources, including the PSPS homepage. See Appendix A-2 for more examples of informational materials Hawaiian Electric shared at community events.

Staff also frequently heard the following suggestions and concerns from community members:

- Hawaiian Electric should seek other options instead of PSPS, like undergrounding lines
- Hawaiian Electric should be responsible for clearing brush and trimming or removing trees
- Hawaiian Electric implemented PSPS too quickly and gave customers short notice to prepare

Many of these questions and concerns show that communities want reassurance that Hawaiian Electric is doing everything it can to prevent wildfires and keep the lights on. In general, customers residing outside of PSPS areas appear to be more supportive and less concerned than those who live within a PSPS area. Customers who relocated from the mainland and experienced PSPS events also appear supportive and less concerned.

After community events or outreach, Hawaiian Electric staff have found that people generally have a better understanding of the WSS. While they still may have concerns about the impacts of a PSPS, they also appear less anxious knowing that Hawaiian Electric is working together with them and there are many resources to help them prepare.

Some attendees requested presentations for their organization or extra handouts to share with friends or family members who live in a PSPS area. Others invited Hawaiian Electric staff to participate in their community event or organization meeting. Hawaiian Electric received this comment from a community member who attended the Community Resilience Fair on August 19, 2024:

> "I'd like to express my warmest mahalo to the entire team who coordinated the PSPS meeting at Kealakehe High School. With my many years in the health and safety environmental field, I was very impressed with the overall event. My wife and I felt a sense of aloha throughout the meeting. We were particularly pleased with the panel and appreciated all of the great information shared about emergency preparedness."

Another attendee said he attended many PSPS community meetings in California, and the Kona meeting was by far the best.

Outcomes and next steps:

Overall, community outreach on Hawaiʻi Island led to the following outcomes:

- Communities are taking action to plan and prepare for emergencies
- Communities support the WSS and understand that PSPS is the last line of defense
- Communities believe that Hawaiian Electric is working together with partners to keep them safe
- The Wildfire Safety Symposium and Community Resilience Fairs were successful and demonstrated the power of partnerships and face-to-face conversations
- Hawaiian Electric strengthened relationships with its key partners
- Hawaiian Electric identified new partners and is building a relationship with them

In May 2024, surveys showed that Hawaiʻi Island residents had an 11% level of awareness of PSPS. This awareness level increased to 64% in October 2024, during the timeframe of Hawaiian Electric's direct outreach on Hawaiʻi Island. See Figure 4-25 (in the discussion of Maui County outreach, above) for a graph displaying the change in public awareness about PSPS before and during community outreach.

Wildfire safety outreach gave Hawaiian Electric an opportunity to listen and gain valuable insights on what matters most to its communities. Input has helped improve the ways Hawaiian Electric communicates. For example:

- Online and print forms: Hawaiian Electric provided a medical needs communications form and an emergency outage communications form that customers could submit online. Printable versions were created for distribution at community events as an option for those who are unable to submit the forms online.
- Generator safety: Hawaiian Electric created a handout to distribute to those who asked for information about using a generator during power outages.
- Online community events list: A comprehensive list of PSPS community events was added to the Hawaiian Electric website to address inquiries about upcoming events.
- Email: An email account was created for Hawaiʻi Island customers to contact Hawaiian Electric with requests or questions (CommunityRelations.HawaiiIsland@hawaiianelectric.com).

Other takeaways from community outreach on Hawaiʻi Island included:

- Meeting people where they are and tailoring the outreach approach to meet the needs of diverse audiences were very effective
- Participating in events and meetings that are organized by others was also very effective
- Collaborating with key partners on outreach efforts was critical and demonstrated how Hawaiian Electric and partners are working together to keep communities safe and prepared for emergencies
- Communities are likely to support or accept initiatives like the WSS and PSPS when they understand the need and benefits and believe their concerns are heard and addressed
- Helping communities understand the WSS and its safety measures can take time and require multiple conversations and follow-up with those who would like to better understand the subject

- Customer letters about the PSPS program, community events and local resources should be tailored to each island or community
- The comprehensive list of PSPS community events on the Hawaiian Electric website was helpful because it provided the community with a variety of opportunities to connect with us in person
- Printable versions of the Medical Needs Communications Form and the Emergency Outage Communications Form that were distributed at outreach events helped reach customers who cannot complete the forms online
- Outreach materials should include a simple explanation or infographic of how an electric grid works. Hawaiian Electric added a slide with a graphic like this to its presentation, and this helped the audience understand how electricity is delivered and safety measures like EFT and block reclose
- Handouts could be condensed and simplified, so the information is easier to read and absorb. With more graphics and fewer words (for example, designing handouts like infographics), people would be more likely to read the handouts. Figure 4-29 is an example of an infographic shared at community events to illustrate the many, interconnected wildfire safety measures.
- Displays could benefit by incorporating a laptop or iPad to show attendees how to access the PSPS resources, videos and tools available on Hawaiian Electric's website as well as the AI cameras on the AlertWest website

Venues can impact event attendance. It's important to identify and select venues that are more visible and have easy access, ample parking, comfortable room temperature and adequate facilities like tables, chairs, AV equipment and restrooms

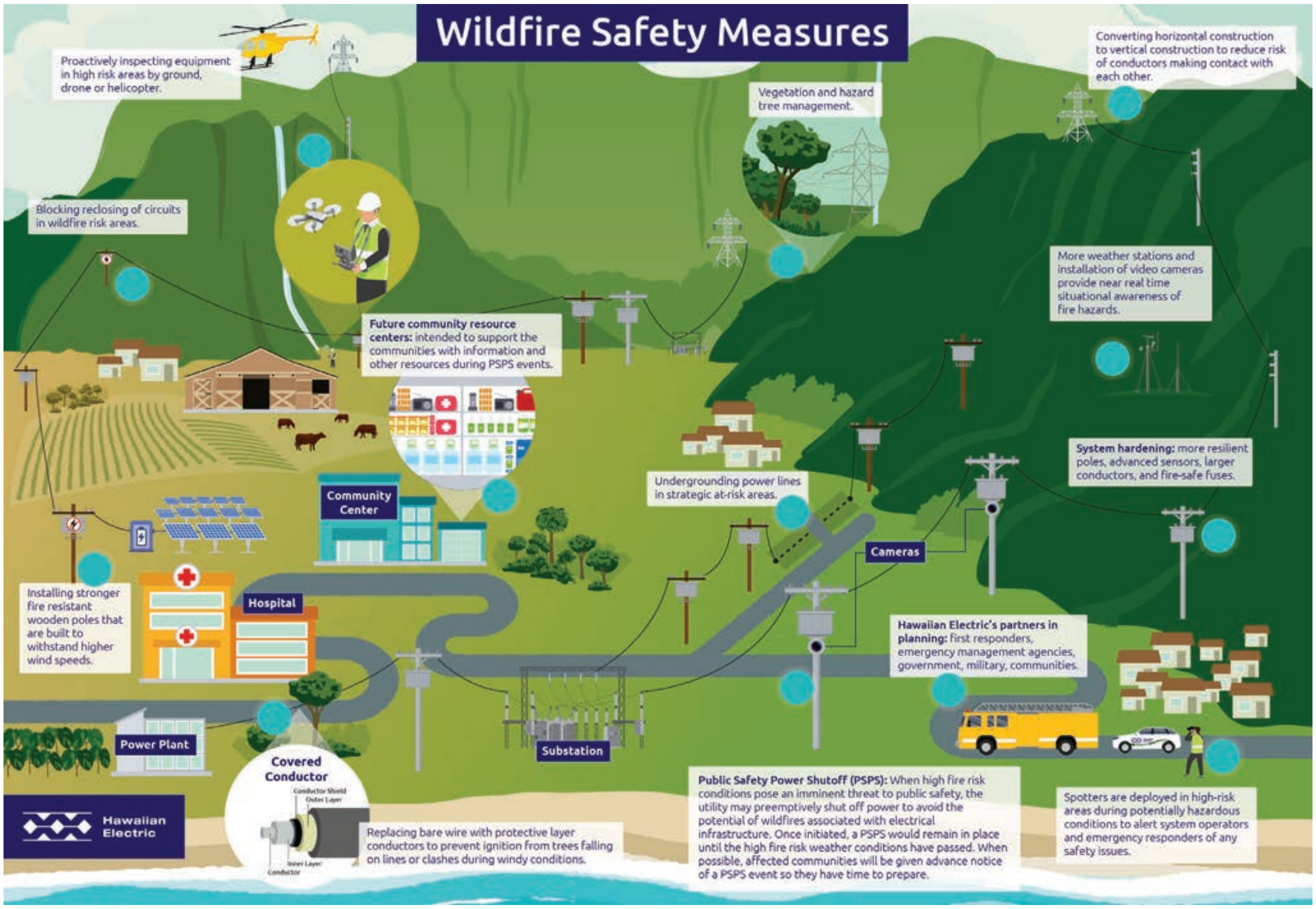


Figure 4-29. Example of a handout provided at community events

This infographic displays the many interconnected wildfire safety measures. See Appendix A-2 for copies of public materials.

The Hawaiian Electric team is continuing to engage communities. Staff are participating in three events through December 2024, which include two community fairs or festivals and one conference presentation. The team will continue to implement the engagement strategies that have been most successful and refine methods through the lessons learned mentioned above. These ongoing efforts include:

- Developing innovative ways to reach those who are unable to attend community events or meetings
- Continuing to strengthen relationships with key partners and join them at events and meetings
- Expanding its network of partners who can advise and collaborate with Hawaiian Electric to keep communities safe
- Continuing to emphasize the importance of emergency preparedness throughout the year

Community members can expect to see Hawaiian Electric staff at events. They also can request a presentation or invite Hawaiian Electric to participate in their event or meeting by emailing CommunityRelations.HawaiiIsland@hawaiianelectric.com.

4.8.3 Wildfire Safety Symposium

In April 2024, Hawaiian Electric invited wildfire safety experts from utilities, agencies, research institutes and the state to a two-day technical symposium focused on reducing Hawaii's wildfire risk. The objective of the symposium—hosted on April 10 and 11 at ʻImiloa Astronomy Center on Hawaiʻi Island—was to bring diverse organizations together to collaboratively address continuing and emerging threats posed by increasingly extreme weather and climate change. Over 88 organizations were represented at the symposium, with more than 100 in-person participants. Figure 4-30 is a photo from the first day of the symposium, as ʻImiloa Executive Director Kaʻiu Kimura gives opening remarks to all participants.

Hawaiian Electric provided updates on its actions taken to date to reduce wildfire risk, as well as gathered input from participants to improve and inform its long-term plans. Participants learned and shared insights about collective actions to keep communities safe, discussed Hawaii's wildfire risk areas, near-term mitigation actions, operational and emergency response needs and proposed long-term strategies for safety and grid resilience.

Copies of the symposium agenda, slides, lists of speakers and panelists and recordings of presentations are available online at hawaiianelectric.com/wildfiresafetysymposium.

Appendix A-3 contains additional symposium records, including an executive summary and summaries of participants' input in breakout group discussions.

Figure 4-30. ʻImiloa Executive Director Kaʻiu Kimura gives opening remarks at the Wildfire Safety Symposium

4.8.3.1 Panels

The symposium included four panels with experts from around the globe. Each panel focused on a different aspect of wildfire safety, including:

- Introduction to Climate Risks and Resilience
- Wildfire Mitigation: Industry Practices and Lessons Learned
- Hawaiian Electric's WSS
- Planning for PSPS

See Appendix A-3 for summaries of panel discussions.

4.8.3.2 Breakout Group Discussions

The symposium included three breakout discussions that each involved all participants and focused on risk maps, considerations for PSPS and opportunities to take collective action, such as building partnerships and engaging communities around wildfire safety. Participants provided input on handouts and maps. Figure 4-31 depicts one breakout group adding comments to a worksheet about collective actions for wildfire safety.

See Appendix A-3 for summaries from each breakout group session drawn from participants' completed handouts, including island risk maps with comments from participants.

Figure 4-31. A breakout group discusses collective actions for wildfire safety during day 2 of the symposium

4.8.3.3 Outcomes

The Wildfire Safety Symposium was a critical step in facilitating collective conversations between many organizations engaged in wildfire safety across the islands. The symposium reinforced the immediate actions Hawaiian Electric undertook in 2024 and informed many elements of the WSS. For example, situational awareness and data collection was discussed across multiple panel sessions. Hawaiian Electric invested resources in accelerating deployment of cameras and weather stations. The symposium also discussed operational measures such as PSPS and EFT, which Hawaiian Electric deployed in 2024 and will continue to do so as part of the WSS. As extensively discussed, Hawaiian Electric put a large emphasis on public and community outreach as it deployed the PSPS and EFT programs.

As the risk maps in Section 2 describe, the breakout session to gather different perspectives where risks exist on each island were taken into account as the tiered risk maps were developed. This local knowledge was helpful in validating the data-based process used to develop the risk maps.

Following the symposium, Hawaiian Electric channeled the collective momentum into a new Wildfire Safety Working Group with representatives from a diverse array of organizations and sectors. (See the following section for an overview of the Wildfire Safety Working Group meetings.)

4.8.4 Wildfire Safety Working Group Meetings

Hawaiian Electric hosted seven Wildfire Safety Working Group meetings from July through November 2024 to inform the technical development of the WSS. The objectives of the Working Group were to support the development of the WSS, inform and engage stakeholders on various aspects of Hawaiian Electric's strategy and afford stakeholders and partners opportunities to provide their knowledge, feedback and input.

Roles and responsibilities of members of the Working Group were to:

- Gain a sufficient level of understanding of Hawaiian Electric's plans and operations
- Bring forward industry practices or ideas to reduce wildfire risk for consideration to incorporate into the WSS
- Provide local, area-specific information and issues as input into the WSS
- Identify gaps and priorities in wildfire risk on the grid and customer capabilities
- Collaborate with all members of the Working Group

The Working Group was comprised of representatives from the following organizations and sectors:

- Public Utilities Commission
- Division of Consumer Advocacy
- Hawai'i State Energy Office
- Emergency and First Responders
- Non-Profits
- Community Based Organizations
- Academia
- Defense
- Other Federal, State and County Agencies
- Landowners
- Other Public and Private Utilities

Each meeting was focused on a different aspect of the WSS, including risk maps, mitigation strategies, future operational strategies and enhancements, metrics and performance measurement and risk modeling. The meetings were held virtually through Microsoft Teams on the following dates:

- **Risk Maps,** July 31, 2024
- **Mitigation Strategies and Priorities,** August 14, 2024
- **Future Operational Strategies and Enhancements,** August 21, 2024
- **Metrics and Performance Measurement,** September 5, 2024
- **Risk Modeling Part 1,** September 26, 2024
- **Risk Modeling Part 2,** November 6, 2024
- **WSS Summary,** December 12, 2024

Following several Working Group meetings, Hawaiian Electric sent a survey to all members to continue the conversation and provide additional opportunity to share input and help shape the WSS. See Appendix A-4 for copies of the Working Group meeting materials, including presentation slides.

4.8.4.1 Outcomes

The Wildfire Safety Working Group supported Hawaiian Electric in developing its WSS through the sharing of information with stakeholders and collecting feedback. Hawaiian Electric also distributed post-meeting surveys to collect additional feedback. In general, stakeholders were appreciative of the working group meetings and found them to be a good use of time. Critical infrastructure providers focused on clarity in communications for PSPS events. (Hawaiian Electric addresses that in Section 4.5.4 and 4.5.5.) Another stakeholder commented that Hawaiian Electric should consider incorporating ignition potential, utility thereat index, fire threat index and annual fire probability. These factors were incorporated in the wildfire risk model as discussed in Section 3. Stakeholders were also keen on vegetation management strategies. Although Hawaiian Electric did not cover that topic in detail in the working group meetings, Section 4.2 extensively discusses its vegetation management plans over the next three years. As part of the risk model deep dive meetings, a stakeholder suggested including critical habitat as a qualitative factor in the risk assessment process. Hawaiian Electric included that attribute as described in Section 3.6.2.

4.8.5 Engagement and support for access and functional needs customers, and strategic community partners

In the event of a PSPS, the Customer Service Officer function and Liaison function of the Hawaiian Electric IMT will evaluate establishing a CRC in an area(s) impacted by a prolonged PSPS outage or electrical related incident. The intent of an activated CRC is to provide support and resources to impacted residents in the form of charging stations, ice, light refreshments, information about power restoration (to the extent possible), and to provide the IMT with information and feedback about field conditions and impact on customers. If possible, the Customer Service and Liaison Team will evaluate a staging area(s) in coordination with emergency management and first responder partners in the affected community. Company representatives will be on hand to answer questions from the public and provide the status of repairing the damage caused by the severe weather/high wind incident. Charging stations will be available at the center for customers to recharge their mobile devices. The center will remain open daily as the restoration process continues.

4.8.5.1 Guidelines for Establishing CRC

- Confirmation of prolonged PSPS outage – IMT has confirmed that an area(s) of the island will be without power for more than 2 days.
- Customer access to Information – Customers do not have access to power restoration information as a result of the prolonged outage (lack of signal for radio, television, computer, phone – ran out of batteries, ability to recharge devices, etc.)
- Restoration prioritization – In the event of a widespread power outage, CRC locations will be prioritized in areas forecasted to be without power for the longest duration.

4.8.5.2 Considerations for CRC Site Selection

- Safety of facility
- Proximity to impacted customers
- Size of facility, open floor plan
- Proximity to other disaster support resources, but clear visual or physical separation to distinguish Hawaiian Electric CRC establishment for customers
- Familiarity of site to the customers
- Restroom facilities (if functional)
- Ability to secure facility
- Availability of small private area or room where CRC team members can rest/eat, have discussions, and make calls out of customer sight (if possible)
- Parking and traffic flow (for customers and CRC staff)

4.8.6 Customer Programs that Support Community Safety for Wildfire and PSPS Safety

To further support customers that are affected by PSPS events, Hawaiian Electric is pursuing a loan from the U.S. Department of Energy Loan Program Office to fund the next evolutions of virtual power plant concepts.

As part of its Virtual Power Plants (VPPs) strategy, Hawaiian Electric is developing potential program options based on the following:

1. Support distributed energy resources (DERs) ability to meet grid requirements.
2. Improve the extent to which DERs are equitably distributed to disadvantaged communities.
3. Improve the reliability and resilience of the grid in areas at greater risk of wildfires.
4. Enhance the integration of renewables and demand flexibility.
5. Improve the affordability of power for utility customers.

The technology, connected aggregations of DER technologies, enhances the integration of renewables and demand flexibility, results in cleaner and more affordable power for utility customers.

The current project will build on Hawaiian Electric's past success in utilizing these VPP components, expanding the program to reach more customers, especially those with low and moderate income. These new VPP pilot programs will be the start of a new market model that will leverage customer support to accelerate Hawaiian Electric's shift from fossil fuels to renewables and decarbonization. Following an initial pilot and contingent on commission approval, Hawaiian Electric will equitably expand this offering to all its customers.

Leveraging loan program office funds, Hawaiian Electric plans to build the next generation of VPP programs, improving resilience and reliability on all five islands in Hawaiian Electric's service area and increasing DER participation by more than 300 megawatts (MW). Hawaiian Electric will use these funds to provide battery systems for a series of VPP programs. Collectively, the strategies are intended to create choices for segments of customers. The proposal has opportunities for customers who currently have PV systems but do not have batteries, customers without electric vehicles (EVs) or batteries, and customers looking to use their EVs to power their homes during emergencies. These strategies will also benefit Hawaiian Electric's PSPS program, where Hawaiian Electric implements proactive power shutoffs to prevent wildfires when certain conditions exist, such as hot, windy weather in areas where dry vegetation surrounds electrical equipment. These conditions may lead to damaged powerlines or debris flying onto powerlines, which increases the risk of a fire starting.

4.8.7 Summary of Stakeholder and Community Outreach Scope and Cost

The following table provides the estimated scope and cost needed for stakeholder, community and customer outreach. Hawaiian Electric understands the importance of this area – to prepare customers for potential events, keeping customers and residents informed on utility operations during hazardous conditions, and implementing programs and initiatives to reduce the impacts of programs like PSPS and EFT.

Table 4-10. Stakeholder and Community Outreach Scope with Estimated Costs

Projected Scope/Initiative	Current 2025–2027 Goal	2025-2027 Estimated Costs
Public Outreach and Communications	Customer Communication Tools	$2.7 million
Community and Stakeholder Planning	Additional support for various initiatives to strengthen stakeholder and community partnerships	$1.3 million
Customer Resource Centers	Establish CRC when appropriate for multi-day outages due to PSPS	$0.100 million

5 WSS MANAGEMENT, ORGANIZATION AND GOVERNANCE

This section of the report outlines Hawaiian Electric's approach to wildfire safety strategy management, organization and governance, which includes the overall management of the WSS, performance metrics, data collection, monitoring, audit and reporting, which will evolve over time. Metrics serve as the primary means in which Hawaiian Electric will manage and govern the implementation of the WSS. The purpose of these metrics is twofold: to track the implementation of planned wildfire risk mitigation activities against annual targets (progress metrics) and to measure the effectiveness of these strategies by assessing reductions in wildfire risk events and customer impact in high-fire-risk areas. Wildfire mitigation measures also aim to reduce the reliability impacts of EFT and PSPS events.

Throughout the WSS program, Hawaiian Electric systematically incorporates lessons learned from past events, technological advancements, and stakeholder feedback to improve its wildfire mitigation practices continuously. Hawaiian Electric is dedicated to refining its wildfire safety strategy as it learns and adjusts to effectively manage and mitigate wildfire risks.

5.1 Key Performance Indicators

The following section introduces Hawaiian Electric's performance metrics, designed to measure progress toward wildfire risk reduction and overall program effectiveness. These metrics focus on achieving wildfire safety goals, such as reducing wire-down events and reportable ignition events. By tracking critical data points, Hawaiian Electric can evaluate the success of its wildfire safety strategy and make informed decisions to enhance mitigation efforts over time.

5.1.1 Performance Metrics

Performance metrics are outcome-based measures that assess the overall effectiveness of Hawaiian Electric's WSS program in reducing wildfire risk, rather than focusing on individual initiatives. These metrics are concentrated on designated elevated wildfire risk areas and factor in the impacts on customers from EFT and PSPS programs. By measuring outcomes, Hawaiian Electric can gauge progress toward wildfire safety goals, including reducing the frequency, duration, and scope of PSPS events. Performance metrics also enable data-driven insights that inform future adjustments and enhancements of wildfire mitigation strategies. Though the WSS program encompasses a broad range of activities, only the most critical metrics will be reported to reflect progress toward reducing wildfire risks associated with Hawaiian Electric's assets.

Key efficiency performance indicators include:

Risk Reduction Indicators – Hawaiian Electric defines risk reduction as minimizing the potential of ignitions associated with the electric grid infrastructure, including the likelihood of ignitions spreading into wildfires and the associated impacts. Hawaiian Electric will monitor and report metrics associated with system performance in reducing ignitions, unplanned overhead outages, and wire-down events. These metrics serve as proxy indicators of risk reduction and reflect the effectiveness of wildfire mitigation measures in reducing ignition risks within elevated wildfire risk areas.

Customer Impact from PSPS – Metrics will include the total number of customers subject to PSPS and impacted by PSPS, the success rate of notifications issued 24-48 hours before PSPS events, and duration of customers impacted by PSPS. Hawaiian Electric's goal is to send at least one notification to affected customers prior to a PSPS event. Furthermore, Hawaiian Electric aims to minimize the impact of and need for PSPS events by engaging in system hardening and other mitigation measures as described in this WSS.

Performance metrics will focus on designated high and medium risk areas as shown in Table 5-1. Metrics may not immediately reflect mitigations implemented because it will take some time (e.g., 1–2 years) to establish baseline targets. Because these metrics may vary with changes in weather and PSPS areas, year-over-year comparisons should be normalized for weather and risk area changes. For areas with limited data on mitigation effectiveness, subject matter experts will evaluate program success.

Table 5-1. Performance Metrics Attributes

Performance Metric	Meaning
Number of Ignitions	Tracks ignitions involving electrical equipment or infrastructure, to assist in tracking the effectiveness of preventive measures.
Number of Wire-down Events	Refers to incidents where power lines contact the ground or other structures; may indicate equipment vulnerability and maintenance needs, and reductions imply reduced ignition potential.
Number of Unplanned Outages	Tracks unscheduled power disruptions caused by disruptions on the system; reductions indicate improved system reliability and imply reduced ignition potential.
Frequency of PSPS Events	Counts PSPS events, which are proactive shutdowns during extreme weather to reduce wildfire risk; this metric will largely be dictated by weather, provides data on customer impact and high frequency may signal infrastructure needs.
Duration of PSPS Events and Restoration Time	Measures PSPS impact in customer minutes, reflecting the cumulative duration of PSPS outages and restoration activities (after all clear) across affected customers. This metric will largely be dictated by weather and the extent of damage following "all-clear" of a PSPS event, provides data on customer impact.
Number of Circuits De-energized	Reflects the scope of PSPS events by counting circuits proactively de-energized, showing potential network vulnerability and event impact.
Total Customers Impacted by PSPS	Measures the extent of the population subject to potential PSPS events and affected by an actual PSPS event. This metric will largely be dictated by weather and the timing of grid hardening mitigations deployed, and provides data on customer impact.

Performance Metric	Meaning
Notification Success Rate (24-48 hours)	Measures the effectiveness of advance notifications before PSPS events, supporting customer preparedness and response efforts.

5.1.2 Progress Metrics

Progress metrics track Hawaiian Electric's annual wildfire risk mitigation targets within its wildfire safety strategy. These targets, shown in Table 5-2, represent Hawaiian Electric's current goals for each year but are not binding commitments. A threshold, target and max are provided based on a reasonable assessment of work that can be accomplished in the 2025-2027 period. Accomplishments, reported annually, may vary due to various influencing factors.[34] In addition to its progress, as part of the annual updates of the WSS starting in December 2025, Hawaiian Electric will provide updates to the table below, to the extent necessary.

Table 5-2. Major WSS Activities 2025-2027

WSS Initiative	Wildfire Mitigation	Current Threshold (By end of 2027 unless otherwise noted)	Current Target (By end of 2027 unless otherwise noted)	Current Max (By end of 2027 unless otherwise noted)
Grid hardening	Covered Conductor	15 miles in HWRA	56 miles in HWRA	70 miles in HWRA
Grid hardening	Initial Targeted Undergrounding	1 mile and, to-be-determined number of circuit miles, pending feasibility studies.	2 miles and, to-be-determined number of circuit miles, pending feasibility studies.	3 miles and, to-be-determined number of circuit miles, pending feasibility studies.
Grid hardening	Expulsion Fuse Replacement	100% in HWRA; 90% in MWRA	Complete replacements in 100% of HWRA and MWRA	By end of 2026: 100% in HWRA and MWRA
Grid hardening	Lightning Arrester Replacement	100% in HWRA; 90% in MWRA	Complete replacements in 100% of HWRA and MWRA	By end of 2026: 100% in HWRA and MWRA
Grid hardening	Cellon & Poly-fill Pole Replacements	On track to complete pole replacements in 13 years	On track to complete replacement of cellon poles in 11 years	On track to complete pole replacements in 9 years
Grid hardening	Transmission Circuit Hardening	Harden 14 miles	Harden 19 miles on high risk transmission circuits	Harden 23 miles
Grid hardening	Single Strand Copper Replacement	Complete 17 miles	Complete 21 miles of single strand copper replacement	Complete 25 miles
Grid hardening	KPF Switch Replacement	Replace 45 switches	Complete replacement of 64 switches	Replace 83 switches

[34] All targets in Table 5-2 assume reasonable circumstances but may be affected by new data and experiences gained by the Company during deployment, and internal and external factors impacting execution, including, but not limited to, physical conditions, the need for detailed field inspections and assessments, budget prioritization, environmental delays, customer refusal, permitting delays or restrictions, weather conditions, active wildfires, exemptions to regulatory or statutory requirements, or other safety considerations.

WSS Initiative	Wildfire Mitigation	Current Threshold (By end of 2027 unless otherwise noted)	Current Target (By end of 2027 unless otherwise noted)	Current Max (By end of 2027 unless otherwise noted)
Operational practices	Wildfire Risk Model for Operations and Forecasting	Acquire by end of 2027	Prior to first Red Flag Warning 2026 or June 1, 2026, whichever is later: Acquire operational risk model capability including, localized fire weather forecasts and establish watch office	Prior to first Red Flag Warning of 2025 or June 1, 2025, whichever is later
Operational practices	Enable Enhanced Fast Trip	Complete by end of 2027	By end of 2026: Complete implementation of EFT on MWRA circuits consistent with risk model; including installation of distribution relay upgrades as needed.	Complete by end of 2025
Vegetation management	Vegetation management	85% compliance	90% compliance: (1) 12-18 month routine for HWRA, MWRA as prioritized, (2) Mid-cycle on as-needed basis for hazard tree and radial clearance for specified areas, (3) Facility clearance substation and poles	100% compliance
Vegetation management	Vegetation Management QA/QC	85% compliance	90% compliance of QA/QC of 25-30% of all work performed in HWRA and MWRA including Level 1 inspections, Radial Clearance and Hazard Tree Removal and consistently document all findings.	100% compliance
Asset inspections	Detailed Inspections - Distribution	90% compliance	95% compliance: Complete annual HWRA inspections, 3-year cycle for MWRA, 5-year for LWRA Test & treat on 10-year cycle Post Inspection & Repair QA/QC within 90 days	100% compliance prior to first RFW each year
Asset inspections	Detailed Inspections - Transmission	90% compliance	95% compliance: Complete annual tier 3 inspections, 3-year cycle for tier 2, 5-year for tier 1 Test & treat 10-year, IR as needed. Post Inspection & Repair QA/QC within 90 days	100% compliance prior to first RFW each year
Asset inspections	Inspection QA/QC	3% of poles	5% of poles	10% of poles
Asset inspections	Inspection Remediation	HWRA: 85% compliance with Hot B; 80% compliance with B MWRA: 55% compliance with Hot B; 50% compliance with B	HWRA: 95% compliance with Hot B 90% compliance with B MWRA: 65% compliance with Hot B; 60% compliance with B	HWRA: 100% compliance with Hot B and B MWRA 70% compliance with Hot B and B
Operational practices	New Technology Pilots	Implement 1 pilot	Implement 2 pilots	Implement 3 pilots
Operational practices	FCI or Smart FCI	N/A	Deploy FCI as needed to improve troubleshooting time	N/A
Situational awareness	Weather Stations	N/A	Deploy additional weather stations as necessary (locations to be informed by wildfire risk modeling) to support PSPS program evolution	N/A
Situational awareness	Video Cameras	N/A	Install additional standard camera stations and mini cameras to achieve desired viewshed of HWRA and MWRA	N/A

WSS Initiative	Wildfire Mitigation	Current Threshold (By end of 2027 unless otherwise noted)	Current Target (By end of 2027 unless otherwise noted)	Current Max (By end of 2027 unless otherwise noted)
Grid modernization	Smart Recloser	N/A	Deploy up to 117 reclosers as needed on the distribution system to implement EFT or reduce reliability impacts to customers	N/A
Grid modernization	Motor Operated Switch	N/A	Deploy up to 43 switches as needed on the sub-transmission system to reduce reliability impacts and increase operational flexibility	N/A
Grid modernization	SCADA	N/A	Enable SCADA at up to 12 distribution substations to enhance EFT schemes	N/A
Grid modernization	ADMS	N/A	Implement ADMS Release 1 for Oahu	N/A
Grid modernization	OT Cybersecurity Monitoring	N/A	Deploy data sensors, integrate into the Network Operations and Security Center (NOSC), and complete testing	N/A
Grid modernization	PLTE Expansion	N/A	Deploy RAN sites necessary to provide PLTE coverage for WSS sectionalizing field devices	N/A

5.1.3 Summary of Additional WSS actions

Table 5-3 provides additional initiatives identified in this WSS as part of the 2025-2027 action plan. Hawaiian Electric will provide updates on these actions as part of its annual updates.

Table 5-3. Additional WSS actions as described in this WSS

WSS Initiative	Wildfire Initiative	Action
Grid hardening	Continuous Improvement Streams	Complete underground feasibility study of scope and construction options with more accurate cost estimates
Grid hardening	Continuous Improvement Streams	Overhead transmission and distribution line structural design policy and practices. Develop more formal guidelines for overhead T&D structural material selection by evaluating the relative benefits, drawbacks, and total lifecycle costs of various pole material types. Separately, evaluate if any modifications should be made to structural wind design policy.
Grid hardening	Continuous Improvement Streams	Develop Covered conductor material and construction standards, including for above 15kV
Grid hardening	Continuous Improvement Streams	Updated evaluation on ingress and egress risks, incorporating studies and other work being performed by various government emergency agencies.
Grid hardening	Continuous Improvement Streams	Hawaiian Electric plans to evaluate its broader planning standards and design criteria in wildfire risk areas to determine where system hardening-type designs should be applied when constructing new lines, Rule 13 line extensions, or reconstructing existing lines
Strengthen stakeholder and community partnerships	Customer Resource Centers	Establish CRC when appropriate for multi-day outages due to PSPS
Strengthen stakeholder and community partnerships	Potential VPP for resilience	Pursue DOE Loan Programs Office grant to establish customer resilience battery programs
Strengthen stakeholder and community partnerships	Continue Wildfire Safety Working Group	Continue to hold Wildfire Safety Working Group meetings as needed on the implementation of the WSS
Strengthen stakeholder and community partnerships	Establish community group for Lahaina Undergrounding	Establish working group to consult on Lahaina Undergrounding
Risk Analytics	Continuous Improvement Streams	Collect sub-circuit data, incorporate transmission circuits into planning risk model
Governance	Establish monitor and audit Program	Complete first round of audit by end of 2026 but no later than 2027. First monitoring report on metrics and performance by end of 2025.

WSS Initiative	Wildfire Initiative	Action
Governance	Establish Ignition Management Program	Track ignitions involving utility equipment. Data will be reported as part of performance metrics

5.2 Data Collection of Metrics

Data on wildfire risk mitigation is sourced primarily from outage management and work management systems, supplemented by situational awareness data from weather stations, video cameras, drone inspections, and field inspections. This real-time data will help Hawaiian Electric make informed operational decisions during hazardous conditions. Hawaiian Electric will also gather data from vegetation management records, maintenance logs, and emergency response reports, providing a comprehensive view of potential wildfire risks.

To support data accuracy, Hawaiian Electric has adopted calibration and maintenance schedules for equipment that will inform wildfire decision making, such as weather stations and protection relays for EFT. Where possible, inspection data will be verified with photographs and reviewed by trained personnel, enhancing the reliability of outage records.

Additional data for wildfire risk mitigation will be gathered through the newly developed Ignition Management Program (IMP). As part of the IMP, Hawaiian Electric employees and contractors will identify and report ignitions taking place on or near utility assets, respond to and assess all such ignitions, and collect data or document assessment findings related to such ignitions. The IMP will improve Hawaiian Electric’s understanding of ignitions and potential wildfire risk, and mitigate future ignitions caused by utility infrastructure.

The IMP process begins with a system where ignitions are reported to System Operations. System Operations then contacts the Ignition Manger, who oversees Hawaiian Electric staff as they gather initial data on the ignition, determine the appropriate workflow for assessing the ignition, then conduct the actual ignition assessment. As a final step, reports and data are shared with the Hawaiian Electric groups who use the data including wildfire mitigation teams and capital planning.

The data developed through the IMP will inform future wildfire risk modeling, fire spread modeling, and mitigation program development. A component of the IMP is the production of data which can be used in future modeling efforts. Hawaiian Electric anticipates that the data produced through the IMP will be incorporated into the wildfire risk modeling. to help refine the evaluation of risk and mitigation effectiveness over time.

5.3 Management and Governance

Hawaiian Electric prioritizes a robust safety culture in which, all major decisions are fully understood and vetted through senior leadership. This encompasses:

- **Risk Management:** Comprehensive oversight of risk management processes
- **Wildfire Safety Strategy:** Development and progress monitoring of wildfire safety strategies.
- **Stakeholder Engagement:** Ensuring proper engagement with all stakeholders.

- **Financial and Regulatory Considerations:** Overseeing financial and regulatory aspects to balance wildfire mitigation decisions between risks, costs, and stakeholder interests.

Governance will be established for wildfire-related work to provide regular reporting of implementation progress, document execution relative to performance and progress metrics, identify any potential changes or adjustments that might be needed, and to facilitate a structured decision-making process to document and communicate any changes to implementation of the WSS.

In addition, wildfire governance responsibilities will also set the overall direction for the wildfire mitigation strategy and updates to ensure that goals are properly established. Oversight includes performance and analysis, including risk modeling, managing compliance and data integrity.

5.3.1 Responsibilities

Table 5-4 identifies each Hawaiian Electric director responsible and accountable executive for various aspects of the WSS and the general scope of each person's responsibilities as described in this WSS.

Table 5-4. Responsible person(s) for executing the WSS

Scope Description	Responsible Director (Executive)
Wildfire Risk Map	Wildfire Planning (Planning & Technology)
Risk Modeling and Assessment	Wildfire Planning (Planning & Technology)
Situational Awareness	Regional System Operations (Operations)
Vegetation Management	Operations Planning & Construction Management (Energy Delivery)
Asset Inspections	Operations Planning & Construction Management (Energy Delivery)
System Hardening	T&D Resiliency Program Director (Energy Delivery)
Operational Practices	Regional System Operations (Operations)
Grid Modernization	Operations Planning & Construction Management (Energy Delivery)
New Technology Pilots	Transmission & Distribution Planning (Planning & Technology)
Stakeholder and Community Partnerships	Community Affairs (Government & Community Relations & Corporate Communications)
WSS Management, Performance and Monitoring	Wildfire Project Management Office (Planning & Technology)

5.3.2 Monitor and Audit

Hawaiian Electric will create a monitor and audit program for inspections and the implementation of the WSS. Hawaiian Electric plans to create an initial monitoring and audit program, and continually adjust and refine as it scales the program over time. The basis for the monitor and audit program will be the progress and performance metrics described in this section.

The objective of the program is to ensure that the WSS is being implemented as laid out in the WSS such that the risk of utility caused ignitions are reduced. The monitor and audit program is part of Hawaiian Electric's commitment to continuous improvement. These objectives will be accomplished through identification and review of impacted processes, identification and correction of gaps, and documentation of corrective actions and recommendations with formulation of recommendations that may apply broadly across WSS workstreams.

Hawaiian Electric proposes to initially monitor transmission and distribution ground and aerial inspections. The 2025–2027 goal is to:

- Inspect all distribution and transmission lines in high-risk areas annually and inspect all circuits in medium risk areas on a 3-year cycle.
- Remediate 90% within 3 months for hot B tags
- Ensure findings are at 90% or greater conformance to requirements

As part of the audit process, Hawaiian Electric plans to review performance on a representative sample against metrics. This includes:

- Review inspection processes for consistency across all islands from inspection to work completion
- Review current state of remediation tickets for a select representative set of structures for both ground and aerial inspections. Where there are missing or duplicate data, identify root causes and establish corrective actions
- Perform random inspection conformance checks comparing the ideal inspection to completed inspection, and quantify conformance rate

The monitor and audit program also intends to review processes and perform gap analyses that will:

- Identify gaps in process, data, and documentation and develop set of corrective actions
- Develop any required standards and expectations in performance to documented process
- Corresponding to corrective actions, describe new roles, responsibilities, and expectations for each impacted employee

Finally, the program should implement corrective actions, monitor progress, and repeat

- Develop to-be process that incorporates corrective actions
- Implement and document completion of corrective actions and monitor progress
- Identify any new training opportunities to reinforce process and process changes

5.3.3 Summary of WSS Management and Governance Scope and Cost

The following summarizes the current estimated scope and cost of the administration, implementation and governance of the WSS as required by the Order 41033. As Hawaiian Electric continues to refine its WSS, there may be other areas or initiatives that will require funding.

Table 5-5. Management and Governance Scope with Estimated Costs

Projected Scope	Current 2025–2027 Goal	Estimated Costs
Overall Program Management and Monitoring and Audit Functions	Establish a program management office to track, monitor and audit WSS implementation	$1.5 million
Expert Consultant Advisors and Support	Continued expertise to advise company on annual WSS updates and implementation of WSS.	$2.5 million

5.4 Continuous Improvement

Hawaiian Electric is dedicated to continuous improvement of its WSS by integrating lessons learned, advancing corrective actions, enhancing data quality, and refining mitigation practices. The future WSS reports will advance over time, informed by Hawaiian Electric's wildfire mitigation program, advanced risk modeling capabilities, and practices and practices of other electric utilities. Though each state and utility faces different wildfire risks, electric utilities that are mitigating wildfire risk are on a common journey and can learn from each other. Hawaiian Electric will proactively participate in this journey. Lessons learned from past incidents, technological advancements, other utilities, and stakeholder feedback will be systematically evaluated and incorporated into the WSS and reflected in future WSS updates. This includes ongoing benchmarking initiatives with other utilities and other measures described herein.

Compliance with QA/QC activities: A robust QA/QC Program institutes routine asset inspection and associated maintenance programs, validating that conditions are tracked and resolved within specified timelines. Continuous monitoring of wildfire risks: Conditions are monitored year-round to assess risk trends. This includes ongoing baseline evaluations and performance metrics to measure the effectiveness of wildfire mitigation efforts. Hawaiian Electric enhances situational awareness by analyzing data from an increasing number of weather stations and reviewing ongoing ignition and fire incidents. Adjustments are made to the WSS strategy based on real-time data and stakeholder feedback.

The IMP will drive continuous improvement in wildfire risk assessment and mitigation. By tracking the location, weather conditions, asset type, and cause information for every ignition, Hawaiian Electric will be able to use failure data specific to its assets to improve risk modelling and make informed decisions about risk factors and mitigation benefits. The IMP will help to produce important modeling inputs, such as the total number of ignitions on the system, the percentage of ignitions attributable to asset failure compared to other causes, and how effectively installed mitigations reduce ignitions. This data is useful in informing asset and vegetation management program funding and targeting resources where they are most needed.

5.5 Future Revisions to WSS

The WSS will undergo a comprehensive review every 3 years. In the meantime, the current WSS will be updated annually beginning in December 2025. Pursuant to Order No. 41033, the annual update will include a clean and redlined updated WSS, any proposed revised tariffs as applicable, total actual costs incurred to date and costs incurred since the last WSS, including a breakdown by cost category. The December 2025 update will also reflect any changes or developments arising from the Commission's review of this WSS.

As described above, wildfire mitigation efforts are a continuous improvement effort. Hawaiian Electric is at the early stage of its wildfire mitigation journey, and it is expected that its mitigation efforts and subsequent WSS will evolve and improve over time. For example, as more data is collected and the risk modeling is further developed and refined, the risk profile of the Hawaiian Electric territory in future updates may look significantly different compared to this WSS. Hawaiian Electric will also adapt to societal changes in wildfire risk management, including but not limited to, urban planning, fuels management and fire suppression capabilities. This WSS leveraged the available data, relied on expertise of subject matter experts, and was informed by other electric utilities experiences and lessons learned.

Hawaiian Electric looks forward to collaborating with the Commission and other stakeholders in this continuous improvement process.

6 PROJECTED COSTS

This section outlines the projected costs that cover the development, implementation, management and administration of the WSS as described herein.

Expenditures for wildfire mitigation are founded on the four pillars approach to wildfire mitigation. The WSS requires an expansion in existing programs, such as inspections and vegetation management, and new programs to harden the grid and build situational awareness, including extensive stakeholder and customer outreach. The WSS assessed the RSE of costly and complex mitigations such as covered conductor and undergrounding along with mitigations which are lower cost but can have adverse reliability impacts such as EFT and PSPS.

Budgets to implement this WSS are aligned with the WSS focus on investing capital and operational expenditures to address the higher risk areas.

6.1 Total Projected Costs of the WSS

The following tables in this section show the total cost to implement this WSS. The projected costs are primarily based on the current "target" goals described in Section 5.1.2.

6.1.1 Capital

Category	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Total	Total	Total
Capital ('000)	**2025**			**2026**			**2027**			**2025**	**2026**	**2027**
Harden the Grid	$42,020	$33,441	$22,175	$49,886	$27,280	$19,995	$47,808	$30,000	$27,153	$97,636	$97,161	$104,961
Expand and improve situational Awareness	$1,784	$1,245	$1,228	$1,128	$672	$638	$1,504	$896	$822	$4,257	$2,438	$3,222
Improve Operational Practices	$4,227	$5,000	$6,038	$2,016	$1,141	$1,134	$3,146	$3,136	$3,905	$15,265	$4,292	$10,187
Strengthen stakeholder and community partnerships	$291	$291	$581	$297	$297	$593	$302	$302	$605	$1,163	$1,186	$1,210
Modernizing the grid	$102	$119	$602	$8,326	$8,451	$7,299	$8,872	$8,939	$8,776	$824	$24,076	$26,587
Grant Funding	-$6,425	-$5,806	-$7,317	-$3,006	-$3,002	-$5,539	-$2,312	-$2,819	-$7,056	-$19,547	-$11,548	-$12,186
Total	**$41,999**	**$34,291**	**$23,308**	**$58,645**	**$34,839**	**$24,120**	**$59,320**	**$40,455**	**$34,205**	**$99,597**	**$117,605**	**$133,980**

Category	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Total	Total	Total
O&M ('000)	**2025**			**2026**			**2027**			**2025**	**2026**	**2027**
Harden the Grid		$204								$204	$0	$0
Expand and improve situational Awareness	$148	$148	$2,753	$209	$209	$3,378	$209	$209	$3,439	$3,049	$3,796	$3,857
Improve Operational Practices	$10,361	$7,302	$2,311	$8,882	$6,645	$4,914	$8,540	$6,293	$4,574	$19,974	$20,441	$19,407
Strengthen stakeholder and community partnerships	$193	$193	$902	$215	$215	$1,002	$215	$215	$1,002	$1,288	$1,432	$1,432
Wildfire risk analytics	$251	$251	$1,171	$242	$242	$1,131	$280	$280	$1,306	$1,672	$1,616	$1,866
Wildfire Management and Governance	$152	$152	$711	$226	$226	$1,054	$226	$226	$1,054	$1,016	$1,506	$1,506
Modernizing the grid	$24	$16	$1,175	$190	$202	$7,065	$225	$173	$6,441	$1,215	$7,456	$6,839
Total	**$11,129**	**$8,266**	**$9,023**	**$9,964**	**$7,739**	**$18,545**	**$9,694**	**$7,395**	**$17,817**	**$28,418**	**$36,247**	**$34,907**

6.1.3 Deferred

Category	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Total	Total	Total
Deferred ('000)	**2025**			**2026**			**2027**			**2025**	**2026**	**2027**
Expand and improve situational Awareness	$848	$688	$756	$874	$708	$779	$974	$790	$869	$2,292	$2,361	$2,632
Improve Operational Practices	$328	$822	$1,233	$335	$842	$1,270	$340	$859	$1,302	$2,383	$2,447	$2,502
Wildfire risk analytics	$240	$240	$1,122	$223	$223	$1,041	$234	$234	$1,093	$1,602	$1,488	$1,562
Modernizing the grid	$353	$357	$2,316	$1,100	$1,210	$9,053	$662	$731	$6,307	$3,026	$11,363	$7,700
Grant Funding	$0	-$367	-$1,532	-$891	-$1,104	-$1,834	-$764	-$932	-$1,618	-$1,899	-$3,829	-$3,315
Total	**$1,770**	**$1,739**	**$3,896**	**$1,640**	**$1,879**	**$10,310**	**$1,446**	**$1,682**	**$7,953**	**$7,404**	**$13,830**	**$11,082**

6.2 Projected Incremental WSS Costs

The following tables in this section show WSS incremental costs. These tables are the estimated portion of total costs for which Hawaiian Electric will seek EPRM cost recovery, because they are not funded by existing EPRM projects (i.e., the T&D [Transmission and Distribution] Resilience program) and are not business as usual costs for which recovery should be limited to Annual Revenue Adjustment provision. The full justification for EPRM recovery will be made in a separate application seeking EPRM cost recovery approval. Note that these cost estimates (less vegetation management and weather stations) are based upon work performed by Company workforce. As implementation plans are developed for the 2025-2027 period, portions of the engineering and construction activities currently based upon internal labor costs may need to be outsourced as the work volumes may exceed the capacity of Hawaiian Electric resources. Any increases to the incremental costs to implement this WSS will be included in the separate application seeking EPRM cost recovery.

6.2.1 Capital

Category	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Total	Total	Total
Capital ('000)	**2025**			**2026**			**2027**			**2025**	**2026**	**2027**
Harden the Grid	$822	$389	$246	$45,638	$22,404	$11,285	$43,000	$24,123	$11,476	$1,457	$79,327	$78,600
Expand and improve situational Awareness			$54	$1,128	$672	$638	$1,504	$896	$822	$54	$2,438	$3,222
Improve Operational Practices				$80		$328	$3,146	$3,136	$3,905	$0	$408	$10,187
Total	**$822**	**$389**	**$300**	**$46,846**	**$23,076**	**$12,251**	**$47,650**	**$28,156**	**$16,203**	**$1,511**	**$82,172**	**$92,009**

6.2.2 O&M

Incremental WSS	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Maui	Hawaii Island	Oahu	Total	Total	Total
O&M ('000)	**2025**			**2026**			**2027**			**2025**	**2026**	**2027**
Expand and improve situational Awareness	$133	$133	$2,686	$194	$194	$3,311	$194	$194	$3,372	$2,952	$3,699	$3,761
Improve Operational Practices	$23	$23	$105	$8,882	$6,645	$4,914	$8,540	$6,293	$4,574	$150	$20,441	$19,407
Strengthen stakeholder and community partnerships	$193	$193	$902	$215	$215	$1,002	$215	$215	$1,002	$1,288	$1,432	$1,432
Wildfire risk analytics	$251	$251	$1,171	$205	$205	$956	$205	$205	$956	$1,672	$1,366	$1,366
Wildfire Management and Governance	$152	$152	$711	$226	$226	$1,054	$226	$226	$1,054	$1,016	$1,506	$1,506
Total	**$752**	**$752**	**$5,574**	**$9,722**	**$7,485**	**$11,237**	**$9,380**	**$7,133**	**$10,959**	**$7,079**	**$28,445**	**$27,472**

6.3 Commission Approval or Acceptance and Cost Recovery Plan

Hawaiian Electric respectfully requests Commission approval or acceptance of this WSS by September 2025.[35] Approval or acceptance will establish the WSS as the agreed foundational plan and path forward and allow Hawaiian Electric to timely implement its WSS plan and seek cost recovery.

Hawaiian Electric will be seeking cost recovery approval for incremental WSS costs under EPRM via a separate application. In the interest of time, Hawaiian Electric will file that application to proceed, to the extent feasible, in parallel with review of this WSS. Hawaiian Electric expects to file that EPRM application before the end of the first quarter of 2025.

Hawaiian Electric also expects to propose modification to its pending application for recovery of Grid Modernization Phase 2, which will align with and support the implementation of the WSS as described herein, as well as overall reliability and resilience of the Hawaiian Electric transmission and distribution system.

6.3.1 Federal Funding Efforts

Hawaiian Electric pursued financial assistance programs such as Grid Resilience and Innovation Partnerships (GRIP) funded by the U.S. Department of Energy which provide financial support for utilities including Hawaiian Electric to implement grid modernization projects. GRIP funding is aimed at projects that improve the resilience of the grid to natural disasters, including wildfires, through advanced technologies and infrastructure upgrades. With over $10.5 billion allocated to grid resilience and innovation across the United States, the GRIP program supports efforts to enhance the flexibility, reliability, and resilience of the grid, particularly in the face of extreme weather events exacerbated by climate change. Among GRIP programs, Grid Resilience Utility and Industry Grants aim to fund electric grid operators, electricity storage operators, electricity generators, transmission owners or operators, distribution providers that will mitigate wildfires, floods, and other hazards. On October 25, 2024, Hawaiian Electric was notified that the application for GRIP funding for the Grid Mod Phase 2 program was not selected for award. The Grid Modernization Phase 2 program continues to progress through the Commission approval process, which if approved, would provide cross-cutting improvements to the WSS.

In terms of wildfire mitigation, GRIP funding enables utilities to implement crucial measures like the undergrounding of power lines in high fire-risk areas, upgrading equipment to fire-resistant components, and improving situational awareness through smart grid technologies.

Hawaiian Electric has been awarded GRIP funding through the project called "Climate Adaptation Resilience Program" totaling close to $200 million, of which $95 million is federal match. The project covers hardening of the electric transmission and distribution system through several solutions across the power grid, system operations, hazard removal and situational awareness. However, GRIP does not cover wildfire-specific

[35] Approval or acceptance by September 2025 will allow Hawaiian Electric time to accurately budget and plan for implementation in the most efficient manner for 2026.

operational strategies (e.g., vegetation management, inspections, or improving situational awareness efforts) that are part of the WSS. Instead, it enables Hawaiian Electric to invest in infrastructure and technologies that reduce the overall vulnerability of the grid to wildfires and extreme weather events.

Table 6-1, below, summarizes federal grants that Hawaiian Electric has pursued related to wildfire and resilience initiatives and the status of each opportunity.

Table 6-1. Summary of Hawaiian Electric Wildfire and Resilience Initiative Grant Pursuits

Title of Opportunity	Application Title	Awarding Agency	Status	Federal Match	Cost Share	Total	Cost Share
GRIP 1 Topic 1 - Grid Resilience (grid hardening)	IIJA GRIP, Round 1	DOE	Awarded	$95,313,716	$95,313,718	$190,627,434	50%
GRIP 1 Topic 2 - Grid Flex (Grid Mod Phase II)	IIJA GRIP, Round 1	DOE	Not Selected	$50,000,000	$54,443,273	$104,443,273	52%
GRIP 2 Topic 1 - Grid Resilience (wildfire focus)	IIJA GRIP, Round 2	DOE	Not Selected	$100,000,000	$100,000,000	$200,000,000	50%
GRIP 2 Topic 2 - Grid Modernization	IIJA GRIP, Round 2	DOE	Not Selected	$100,000,000	$105,000,000	$205,000,000	51%
GRIP 2 Topic 3 - State-wide Grid innovation (HECO and KIUC subapplicants)	IIJA GRIP, Round 2	DOE	Not Selected	$250,124,367	$250,124,387	$499,999,955	50%
Koʻolaupoko Critical Customer Hubs (3)	BRIC	FEMA	Submitted to FEMA	$8,329,318	$3,569,707	$11,899,025	30%
West Maui (Lahaina) Critical Customer Hubs	BRIC	FEMA	Not Selected	$3,808,500	$1,269,500	$5,078,000	25%
Lahaina Critical Customer Hubs (2)	HMGP	FEMA	Preparing Application	$3,808,500	$1,269,500	$5,078,000	25%
Wildfire Risk Model	HMGP	FEMA	Preparing Application	$750,000	$250,000	$1,000,000	25%
Deployable batteries for PSPS areas	HMGP	FEMA	Not Selected	$15,000,000	$5,000,000	$20,000,000	25%
AI for Vegetation Management	HMGP	FEMA	Not Selected	$7,575,000	$2,525,000	$10,100,000	25%
North Kohala Microgrid	HMGP	FEMA	Not Selected	$22,500,000	$7,500,000	$30,000,000	25%
Hazard tree removal - Maui	HMGP	FEMA	Not Selected	$2,250,000	$750,000	$3,000,000	25%
Total				$659,459,401	$627,015,085	$1,286,225,687	

Notes: BRIC = Building Resilient Infrastructure and Communities, DOE = U.S. Department of Energy, HECO = Hawaiian Electric Company, HMGP = Hazard Mitigation Grant Program, KIUC = Kauaʻi Island Utility Cooperative

Hawaiian Electric will continue to aggressively pursue federal grant opportunities as they arise.

This page intentionally left blank.

Appendices

This page intentionally left blank.

FILED

2025 Jan 10 P 15:33

PUBLIC UTILITIES

COMMISSION

F-319275

2025-0156