



Hetch Hetchy
Regional Water System

Services of the San Francisco Public Utilities Commission

SFPUC

WILDFIRE MITIGATION

PLAN

Version 2.0

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Table of Contents

ACRONYMS	1
1. INTRODUCTION.....	3
A. Purpose of the Wildfire Mitigation Plan.....	3
B. SFPUC Profile.....	5
C. Organization of the Wildfire Mitigation Plan	6
2. OBJECTIVES OF THE WILDFIRE MITIGATION PLAN.....	9
A. Minimizing Sources of Ignition.....	9
B. Resiliency of the Electric Grid	9
C. Measure Plan Effectiveness and Performance	9
3. ROLES AND RESPONSIBILITIES.....	9
A. Staff Responsibility for Fire Prevention, Response, and Investigation	11
B. SFPUC Roles during an Emergency.....	11
C. SFPUC Incident Command System.....	12
D. Unified Command	13
4. WILDFIRE RISK ANALYSIS AND RISK DRIVERS	13
A. Enterprise Wildfire Risk Reduction Methodology	13
B. Assessment of SFPUC’s High Fire Threat District	14
C. Particular Risks and Risk Drivers Associated with Topographic and Climatological Risk Factors.....	15
D. Particular Risks and Risk Drivers Associated with Operational Risk Factors.....	16
5. WILDFIRE PREVENTATION STRATEGIES AND PROGRAMS	17
A. Program – Vegetation Management	17
B. Program – Facility Inspections.....	20
C. Program – Situational Awareness.....	21
D. Program – Operating Conditions.....	22
E. Strategy – System Hardening	24

F. Strategy – Workforce Training.....	25
G. Strategy – Coordination with Other Agencies and Stakeholders	26
H. Strategy – Customer Communication:.....	27
I. Strategy – Circuit Reclosers.....	27
J. Strategy – De-energization.....	28
K. Strategy – Service Restoration	29
6. EVALUATING THE PLAN	30
A. Metrics and Evaluation	30
B. Impact of Metrics on Plan.....	31
C. Monitoring and Auditing the Plan.....	31
D. Identifying and Correcting Deficiencies in the Plan.....	32
E. Monitoring the Effectiveness of the Plan.....	32
7. INDEPENDENT EVALUATOR.....	32

ACRONYMS

BLM	Bureau of Land Management
CAL FIRE	California Department of Forestry and Fire Prevention
CCSF	City and County of San Francisco
Commission	SFPUC Commission
CMMS	Computerized Maintenance Management System
CPUC	California Public Utilities Commission
ESF	Emergency Support Functions
ESO	Electrical Safety Orders, State of California
FAC-003-4	NERC Reliability Standard: Transmission Vegetation Management
GO	CPUC General Order
HFT / HFTD	High Fire Threat / High Fire Threat District
HHWP	Hetch Hetchy Water and Power
HHW	Hetch Hetchy Water. The portion of the Hetch Hetchy Water and Power Division managed by the Water Enterprise. Commonly referred to as Hetch Hetchy Water and Power.
HHZ	High Hazard Zone
HRRR	NOAA's High-Resolution Rapid Refresh Model
IAP	Incident Action Plan
IC	Incident Commander
ICS	Incident Command System
kV	Kilovolt
LiDAR	Light Detection and Ranging - Survey technology for the evaluation of existing overhead electrical lines
Maximo	SFPUC's CMMS

NEC	National Electric Code
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRF	National Response Framework
NRLM	Natural Resources and Land Management
NWS	National Weather Service
PG&E	Pacific Gas & Electric
PIO	Public Information Officer
Plan	Wildfire Mitigation Plan
RFW	Red Flag Warning
SEMS	Standardized Emergency Management System
SFPUC	San Francisco Public Utilities Commission
SRA	State Responsibility Area
SVWTP	Sunol Valley Water Treatment Plant
SWIFT	Southwest Interface Team
TVMP	Transmission Vegetation Management Program
UC	Unified Command
USFS	US Forest Service
WMP	Wildfire Mitigation Plan
WST	Water Supply and Treatment Department

1. INTRODUCTION

A. Purpose of the Wildfire Mitigation Plan

Over the past several years California has experienced numerous catastrophic wildfires resulting in loss of human life and destruction and damage to personal property. The effects of climate change, such as hotter temperatures, more intense winds, drier fuels/vegetation are some of the contributing factors that fuel these fast moving and destructive fires. Electrical facilities of Investor Owned Utilities have been determined to be the source of ignition of many tragic incidents.

California Senate Bill (SB) 901, amended Public Utilities Code (PUC) § 8387. Section 8387(c) requires “Each local publicly owned electric utility and electrical cooperative shall construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of wildfire posed by those electrical lines and equipment. They will prepare a wildfire mitigation plan before January 1, 2020 and contract with a qualified independent evaluator with experience in assessing the safe operation of electrical infrastructure to review and assess the comprehensiveness of its wildfire mitigation plan. The independent evaluator (IE) shall issue a report that shall be made available on the internet website of the local publicly owned electric utility or electrical cooperative and shall present the report at a public meeting of the local publicly owned electric utility’s or electrical cooperative’s governing board.”

This Wildfire Mitigation Plan (WMP or Plan) describes the numerous programs that the San Francisco Public Utilities Commission (SFPUC) has in place to construct, maintain and operate their electrical facilities in order to minimize the risk that their equipment could be the origin or contributing source for a catastrophic wildfire. This Plan is subject to approval by the Commission and is implemented by the SFPUC’s Assistant General Manager of Water.

This plan meets or exceeds the requirements of PUC § 8387 for publicly owned electric utilities. As required, the SFPUC prepared its WMP and its Commission approved the WMP by January 1, 2020. As required, SFPUC had the Plan reviewed by an Independent Evaluator (IE) and will file the WMP with the California Wildfire Safety Advisory Board (“WSAB”) on or before July 1, 2020. SFPUC will prepare and file a revised plan annually thereafter.

The specific elements of PUC § 8387 are listed in Table 1 with the corresponding WMP sections listed that direct you to where the SFPUC describes their processes or programs to comply with the relevant requirements of PUC § 8387.

Table 1 – PUC § 8387 Compliance Requirements

PUC 8387 Code	Compliance Requirements and Corresponding Plan Sections	Plan Section
(a)	Each local publicly owned electric utility and electrical cooperative shall construct, maintain, and operate its electrical lines and equipment in a manner that will minimize the risk of wildfire posed by those electrical lines and equipment.	All
(b) (1)	The local publicly owned electric utility or electrical cooperative shall, before January 1, 2020, and annually thereafter, prepare a wildfire mitigation plan. After January 1, 2020, a local publicly owned electric utility or electrical cooperative shall prepare a wildfire mitigation plan annually and shall submit the plan to the California Wildfire Safety Advisory Board on or before July 1 of that calendar year. Each local publicly owned electric utility and electrical cooperative shall update its plan annually and submit the update to the California Wildfire Safety Advisory Board by July 1 of each year. At least once every three years, the submission shall be a comprehensive revision of the plan.	1.A
(2)	The wildfire mitigation plan shall consider as necessary, at minimum, all of the following:	
(2)(A)	An accounting of the responsibilities of persons responsible for executing the plan.	3.A
(2)(B)	The objectives of the wildfire mitigation plan.	2
(2)(C)	A description of the preventative strategies and programs to be adopted by the local publicly owned electric utility or electrical cooperative to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of dynamic climate change risks.	5
(2)(D)	A description of the metrics the local publicly owned electric utility or electrical cooperative plans to use to evaluate the wildfire mitigation plan’s performance and the assumptions that underlie the use of those metrics.	6
(2)(E)	A discussion of how the application of previously identified metrics to previous wildfire mitigation plan performances has informed the wildfire mitigation plan.	6.B
(2)(F)	Protocols for disabling reclosers and deenergizing portions of the electrical distribution system that consider the associated impacts on public safety, as well as protocols related to mitigating the public safety impacts of those protocols, including impacts on critical first responders and on health and communication infrastructure.	5.I & 5.J
(2)(G)	Appropriate and feasible procedures for notifying a customer who may be impacted by the deenergizing of electrical lines. The procedures shall direct notification to all public safety offices, critical first responders, health care facilities, and operators of telecommunications infrastructure with premises within the footprint of potential deenergization for a given event.	5.G & 5.H
(2)(H)	Plans for vegetation management.	5.A
(2)(I)	Plans for inspections of the local publicly owned electric utility’s or electrical cooperative’s electrical infrastructure.	5.B
(2)(J)	A list that identifies, describes, and prioritizes all wildfire risks, and drivers for those risks, throughout the local publicly owned electric utility’s or electrical cooperative’s service territory. The list shall include, but not be limited, to both of the following:	4
(2)(J)(i)	Risks and risk drivers associated with design, construction, operation, and maintenance of the local publicly owned electric utility’s or electrical cooperative’s equipment and facilities.	4.D
(2)(J)(ii)	Particular risks and risk drivers associated with topographic and climatological risk factors throughout the different parts of the local publicly owned electric utility’s or electrical cooperative’s service territory.	4.C
(2)(K)	(K) Identification of any geographic area in the local publicly owned electric utility’s or electrical cooperative’s service territory that is a higher wildfire threat than is identified in a commission fire threat map, and identification of where the commission should expand a high-fire threat district based on new information or changes to the environment.	4.B
(2)(L)	A methodology for identifying and presenting enterprise wide safety risk and wildfire-related risk.	4.A
(2)(M)	A statement of how the local publicly owned electric utility or electrical cooperative will restore service after a wildfire.	5.K

PUC 8387 Code	Compliance Requirements and Corresponding Plan Sections	Plan Section
(2)(N)	A description of the processes and procedures the local publicly owned electric utility or electrical cooperative shall use to do all of the following:	
(2)(N)(i)	Monitor and audit the implementation of the wildfire mitigation plan.	6.C
(2)(N)(ii)	Identify any deficiencies in the wildfire mitigation plan or its implementation and correct those deficiencies.	6.D
(2)(N)(iii)	Monitor and audit the effectiveness of electrical line and equipment inspections, including inspections performed by contractors, that are carried out under the plan, other applicable statutes, or commission rules.	6.E
(3)	The local publicly owned electric utility or electrical cooperative shall, on or before January 1, 2020, and not less than annually thereafter, present its wildfire mitigation plan in an appropriately noticed public meeting. The local publicly owned electric utility or electrical cooperative shall accept comments on its wildfire mitigation plan from the public, other local and state agencies, and interested parties, and shall verify that the wildfire mitigation plan complies with all applicable rules, regulations, and standards, as appropriate.	1.A
(3)(c)	(c) The local publicly owned electric utility or electrical cooperative shall contract with a qualified independent evaluator with experience in assessing the safe operation of electrical infrastructure to review and assess the comprehensiveness of its wildfire mitigation plan. The independent evaluator shall issue a report that shall be made available on the internet website of the local publicly owned electric utility or electrical cooperative and shall present the report at a public meeting of the local publicly owned electric utility's or electrical cooperative's governing board.	7

B. SFPUC Profile

The SFPUC is a department of the City and County of San Francisco (CCSF). The SFPUC provides retail drinking water and wastewater services to the City of San Francisco, wholesale water to three Bay Area counties, green hydroelectric and solar power to Hetch Hetchy electricity customers, and retail power to residents and businesses of San Francisco through the CleanPowerSF program. SFPUC's mission is to provide their customers with high quality, efficient and reliable water, power, and sewer services in a manner that is inclusive of environmental and community interests, and that sustains the resources entrusted to their care.¹

Hetch Hetchy Water (HHW), a division of the SFPUC, operates the Hetch Hetchy Water and Power Project. The HHW operates and maintains a system of assets including water storage and conveyance systems, power generation facilities, power transmission and distribution systems, roads, bridges, and other ancillary facilities. The assets making up these systems start at the Hetch Hetchy Reservoir located in Yosemite National Park and span all the way to the communities of Sunol and Newark in Alameda County, including the counties of

¹ "SFPUC About Us," San Francisco Public Utilities Commission: Our Mission. [Online]. Available: <https://www.sfwater.org/index.aspx?page=161>. [Accessed: 07-Apr-2020]
SFPUC Wildfire Mitigation Plan
Page 5
Version 2.0
December 10, 2019

Tuolumne, Stanislaus, San Joaquin, and San Mateo. HHW produces hydroelectric generation and transmits the power over the SFPUC transmission and distribution lines to the California electric grid. SFPUC serves only one customer directly from its transmission lines.

Additionally, Water Supply & Treatment (WST), a division of the SFPUC, operates and maintains overhead distribution lines in Alameda and San Mateo counties.

SFPUC owns, maintains and operates approximately 163 miles of 230 and 115 kV transmission lines, and distributes electricity at 22 and 2.4 kV through overhead lines (see Figure 1). The transmission facilities are within PG&E's and Modesto Irrigation District's service territory. The distribution facilities are within PG&E's service territory, where PG&E is the energy provider. SFPUC does not serve customers in the same manner as PG&E. SFPUC transmission facilities are designed to carry energy from SFPUC-owned hydroelectric plants to the grid. SFPUC distribution facilities are designed to take energy from either SFPUC-owned transmission, or from the grid, to power SFPUC Water Enterprise operations. Approximately 54 miles of SFPUC's transmission facilities and 52.3 miles of distribution facilities are located within the CPUC designated High Fire Threat District (HFTD) Tier 2 or Tier 3. The HFTD is comprised of a High Hazard Zone, and two high fire-threat areas where there is an increased risk for utility associated wildfires. The three areas are:

- Tier 1, High Hazard Zone – Zones which are in direct proximity to communities, roads, and utility lines, and are a direct threat to public safety.
- Tier 2, Fire-Threat Area - Depicts areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires.
- Tier 3, Fire-Threat Area - Depicts areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires.

C. Organization of the Wildfire Mitigation Plan

The SFPUC Plan includes the following programs, processes, and procedures that have been undertaken to support the SFPUC's goal of minimizing its risk that its facilities could be the origin or contributing source for a catastrophic wildfire:

- Section 2: Objectives of the Wildfire Mitigation Plan;
- Section 3: Roles and Responsibilities;
- Section 4: Wildfire Risks and Risk Drivers;
- Section 5: Wildfire Prevention Strategies and Programs;
- Section 6: Evaluating the Plan; and
- Section 7: Independent Evaluator.

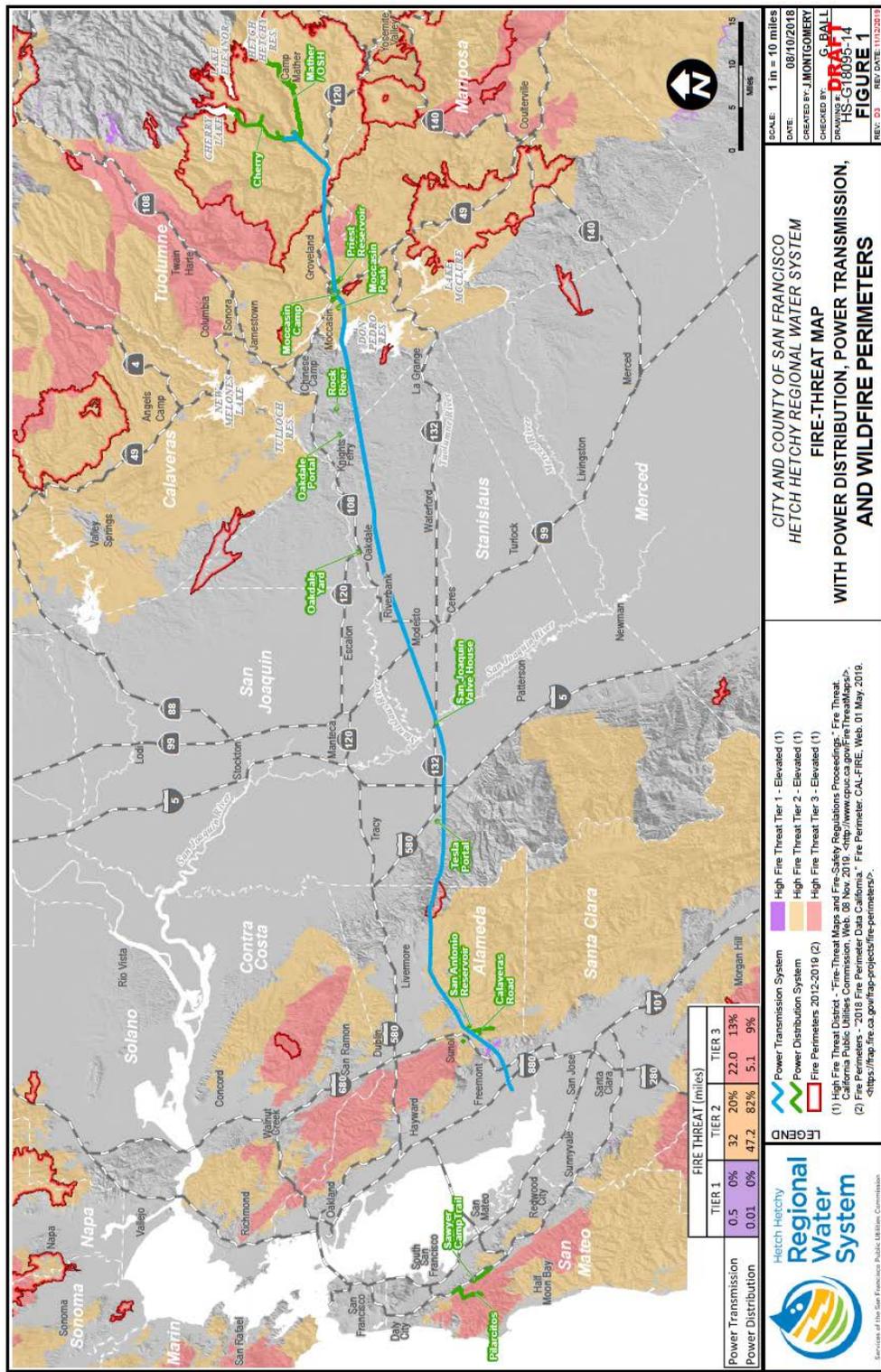


Figure 1 - SFPUC Power System

2. OBJECTIVES OF THE WILDFIRE MITIGATION PLAN

This Plan is built upon the following three principles:

A. Minimizing Sources of Ignition

The primary objective of this Plan is to minimize the probability that the SFPUC's electrical facilities may be the origin or contributing source for the ignition of a catastrophic wildfire. The SFPUC continues to evaluate prudent and cost-effective improvements to its physical assets, operations, and training to meet this objective. The SFPUC will implement additional recommendations over time through a process of reevaluation and continuous improvement.

B. Resiliency of the Electric Grid

The second objective of this Plan is to improve the reliability and resiliency of the electric grid. As part of the development of this Plan, the SFPUC will assess industry best practices and technologies that could reduce the likelihood of a disruption in service due to planned or unplanned events, and expediate grid recovery efforts following a major event, such as a fire.

C. Measure Plan Effectiveness and Performance

The final objective is to measure the effectiveness and performance of SFPUC's specific wildfire mitigation strategies described in this Plan. SFPUC will monitor the performance of their Plan and make improvements as necessary to improve safety, reliability and resiliency of their system. The Plan will also help determine if more cost-effective measures would produce the same or better results.

3. ROLES AND RESPONSIBILITIES

This section identifies the SFPUC management personnel responsible for development, approval, and implementation of this WMP and lists the operating departments responsible for carrying out the various activities described in the Plan.

- The San Francisco Public Utilities Commission has responsibility for approving this WMP.
- The SFPUC Assistant General Manager of Water has overall accountability for the development and implementation of the WMP.

- Department leads, or other designees, have responsibility for implementation of the specific components of the Plan (see Table 2).

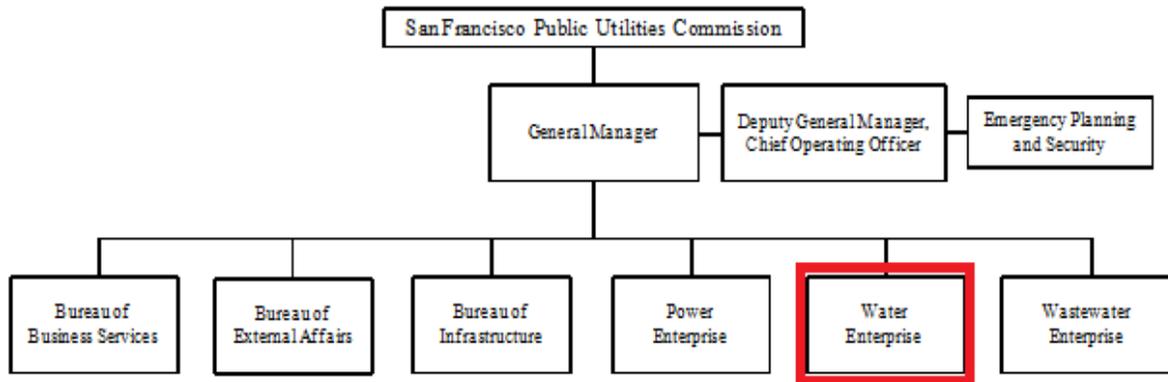


Figure 2 - SFPUC Organizational Structure

Table 2: Roles and Responsibilities of WMP Activities

Activity	HHW Division: All Transmission Facilities and Distribution Systems Located within Tuolumne County	WST Division: Distribution Systems Located in Alameda County and San Mateo County
Vegetation Management	HHW Operations and Maintenance Manager	NRLM Manager
Recloser Policy and Deenergization	HHW Operations and Maintenance Manager	HHW Operations and Maintenance Manager
Transmission Line Inspections	HHW Right of Way Manager; and Vegetation Manager	N/A
Transmission Line Maintenance	HHW Power Generation & Transmission Manager	N/A
Distribution Line Inspections	HHW Right of Way Manager; and Vegetation Manager	NRLM and Peninsula Area Manager
Distribution Line Maintenance	HHW Power Generation & Transmission Manager	HHW Power Generation & Transmission Manager
Substation Inspections	HHW Power Generation & Transmission Manager	WS&T Distribution & Maintenance Manager
Plan Review	HHW Division Manager; and SFPUC Assistant General Manager of Water	WS&T Division Manager; and SFPUC Assistant General Manager of Water
Plan Approval	SFPUC Commission	SFPUC Commission

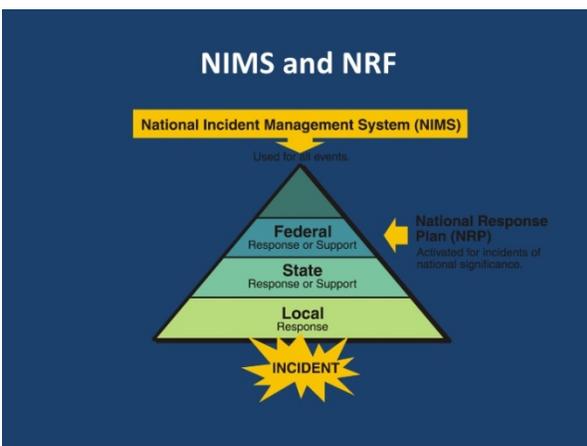
A. Staff Responsibility for Fire Prevention, Response, and Investigation

Operation of its overhead electrical lines in a safe and reliable manner is a core value at SFPUC. SFPUC staff have the following responsibilities regarding fire prevention, response, and investigation:

- Conduct work in a manner that will minimize the risk of ignition for a potential wildfire;
- Take all reasonable and practicable actions to mitigate the risk of fires resulting from electric facilities or work activities;
- Coordinate with federal, state, and local fire management personnel to ensure that appropriate preventative measures are in place;
- Immediately report fires, pursuant to specified procedures;
- Take corrective action when observing or having been notified that fire protection measures have not been properly installed or maintained;
- Ensure compliance with relevant federal, state, local, and industry standard requirements;
- Ensure that wildfire data is appropriately collected; and
- Maintain adequate training programs for all relevant employees.

B. SFPUC Roles during an Emergency

The CCSF has adopted the concept of Emergency Support Functions (ESF) from the Federal National Response Framework (NRF). ESFs represent function-specific groupings of activities needed during local emergency response. Under this framework for the CCSF, the SFPUC represents the Coordinating Department for the following: “Water and Utilities” (ESF #12). In addition, SFPUC is the supporting department for “Public Works and Engineering” (ESF #3), “Emergency Management” (ESF #5), and “Mass Care, Emergency Assistance, Housing and Human Services” (ESF #6).



C. SFPUC Incident Command System

The SFPUC is Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) compliant and utilizes the Incident Command System (ICS) to respond to emergencies. In accordance with these requirements, the SFPUC has established a multi-tiered emergency organizational structure that utilizes the five following emergency response functions, activated as necessary:

- **Incident Command (IC):** Provides overall direction and establishes priorities and objectives. Command staff assignments include Public Information Officer (PIO), Liaison Officer, Safety Officer, and Security Officer, all in support of the IC.
- **Operations Section:** Manages tactical operations at the incident level directed toward reducing immediate hazards, saving lives and property, establishing situation control, and restoring normal conditions. This function implements priorities for operational activities established by the Command function.
- **Planning Section:** Gathers and assesses situational information and intelligence related to the incident and prepares Incident Action Plans (IAPs). IAPs set objectives for the operational period, as established by the Command function.
- **Logistics Section:** Obtains resources to support emergency response operations, including personnel, supplies, equipment, communications equipment, medical support, food, transportation, and facilities support.
- **Finance Section:** Tracks costs related to emergency response and provides procurement and administrative support for incident management activities.

² “National Response Framework.” LinkedIn SlideShare, 30 Mar. 2010, www.slideshare.net/bkoch/national-response-framework.

³ “National Response Framework.” LinkedIn SlideShare, 30 Mar. 2010, www.slideshare.net/bkoch/national-response-framework.

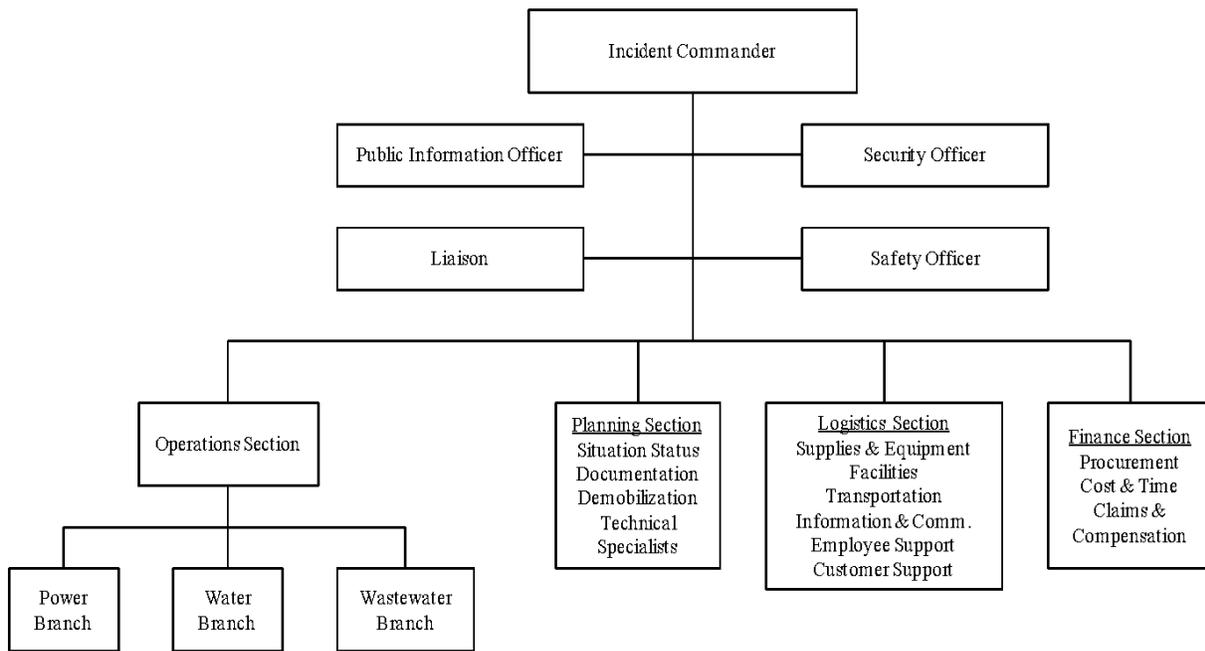


Figure 5 - SFPUC ICS Structure

D. Unified Command

In general, a single IC handles all aspects of an emergency response. However, a single IC may be expanded into a Unified Command (UC). The UC is a structure that brings together multiple ICs from more than one of the major organizations involved in the incident, to coordinate an effective integrated response while concurrently carrying out jurisdictional responsibilities. The UC concept may be used whenever multiple jurisdictions are involved in a response effort and at any level of the response.

4. WILDFIRE RISK ANALYSIS AND RISK DRIVERS

A. Enterprise Wildfire Risk Reduction Methodology

The SFPUC currently relies on personnel with extensive system knowledge and experience to inform them of potential safety and reliability risks to the power grid. The SFPUC complies with local, state, federal, and industry standards applicable to construction, inspection, and maintenance of the electric transmission and distribution systems. Personnel will analyze service interruptions or equipment failures, determine the root cause, and develop a remediation plan to reduce or eliminate future occurrences. The SFPUC does not experience a high incident rate of system interruptions or equipment failures, however,

moving forward they will use the data collected by the metrics defined in this WMP to inform them of future system enhancements that may be required to improve system safety, resiliency, reliability, and reduce the risk of their electrical facilities being the source of ignition for a wildfire.

During critical fire weather events the SFPUC will disable reclosers and, if necessary, de-energize lines for public safety.

The SFPUC continues to monitor industry best practices and emerging technologies and will evaluate and/or implement programs that support their continuous efforts to improve safety and reliability of the SFPUC power grid.

B. Assessment of SFPUC's High Fire Threat District

This plan focuses on the SFPUC owned and operated electrical facilities located within the CPUC HFTD in Tuolumne, Stanislaus, San Joaquin, Alameda, and San Mateo counties. SFPUC facilities include 230 and 115 kilovolt (kV) transmission lines, and 22 and 2.4 kV distribution facilities. These facilities are located from the Sierra Nevada Mountains, which includes densely forested areas at higher elevations, flat dry land in the San Joaquin Valley, and west into the Southern Coast Mountain range.

The SFPUC staff relied on the CPUC fire threat map and agrees with the CPUC that the fire-threat areas designated within the HFTD map appropriately identify the wildfire risks in close proximity to SFPUC electrical facilities. SFPUC will continue to monitor and evaluate risk factors in close proximity to their facilities and, if required, recommend to the CPUC if revisions should be considered for the fire-threat areas.

The SFPUC has overhead electrical facilities within Tier 2 and Tier 3 HFT zones, located in Tuolumne, Alameda, and San Mateo counties. Tiers 1-3 descriptions, number of miles of overhead electrical lines, and substation facilities owned by the SFPUC are summarized in Table 3.

Table 3: Definition of HFTD Zones and Electrical Facilities by Tier

Zone	Description	Facilities	Quantity
Tier 3	Tier 3 fire-threat areas depict areas where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires.	Transmission lines:	22.0 miles
		Distribution lines:	5.1 miles
		Substations:	0
Tier 2	Tier 2 fire-threat areas depict areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires.	Transmission lines:	32.0 miles
		Distribution lines:	47.2 miles
		Substations:	4
Tier 1	Tier 1 High Hazard Zones are zones in direct proximity to communities, roads, and utility lines, and are a direct threat to public safety.	Transmission lines:	0.5 miles
		Distribution lines:	0.0 miles
		Substations:	0

C. Particular Risks and Risk Drivers Associated with Topographic and Climatological Risk Factors

The University of California at Davis defines climate change as “significant changes in global temperature, precipitation, wind patterns and other measures of climate that occur over several decades or longer.”⁴ California is already experiencing the impacts of climate change including extended drought conditions, hotter temperatures, and drier fuel sources, among others.

The SFPUC’s primary risk drivers associated with topographic and climatological risk factors for a catastrophic wildfire can be attributed to:

- Extended drought;
- Lack of early fall rains;
- High temperatures;

⁴ “Climate Change Terms and Definitions.” Science and Climate, climatechange.ucdavis.edu/science/climate-change-definitions/.

- High winds;
- Low relative humidity;
- Steep terrain;
- Vegetation type;
- High fuel loading as the result of decades of fire suppression in fire-adapted landscapes;
- Dry fuel sources;
- Dry lightning conditions; and
- Tree mortality.

The SFPUC regularly collaborates with local weather and fire authorities to evaluate fire and weather conditions within the area the SFPUC overhead electrical lines are located and develop fire mitigation strategies prior to experiencing critical fire weather conditions. SFPUC watersheds fall within the State Responsibility Area (SRA) with CAL FIRE being the main cooperator in wildland fire response.

D. Particular Risks and Risk Drivers Associated with Operational Risk Factors

At this time the SFPUC has limited data available to establish specific trends to inform them of potential fire risk drivers associated with their facilities. The SFPUC has been closely monitoring fire mitigation programs initiated by other utilities and evaluate if similar programs could benefit the SFPUC in supporting their risk reduction efforts. Additionally, SFPUC closely monitors wildfire activity in California with particular interest in the ignition source of the incident. When a known incident occurs involving electrical facilities, SFPUC staff will evaluate the incident and make an assessment if they could experience a similar incident based on the root cause found. Although the SFPUC has identified a number of programs to minimize their fire risk exposure they have identified the following two priority areas:

1. Contact from objects,
 - a. Vegetation contact
2. Equipment / facility failure,
 - a. Replace non-exempt equipment on 4292 poles with exempt equipment. (See Sec. 5.E.)

5. WILDFIRE PREVENTATION STRATEGIES AND PROGRAMS

The SFPUC meets or exceeds local, state, federal, and industry standards applicable to construction, maintenance, and inspections of the electric transmission, distribution, and substation facilities. The following programs have been identified to reduce the risk that SFPUC facilities could be the origin or contributing source for a catastrophic wildfire.

A. Program – Vegetation Management

The SFPUC meets or exceeds the minimum industry standard vegetation management practices. For applicable transmission-level facilities, the SFPUC complies with the North American Electric Reliability Corporation (NERC) Standard FAC-003-4, and the SFPUC Transmission Vegetation Management Program.

For both transmission and distribution level facilities, SFPUC is compliant with: (1) Public Resources Code (PRC) § 4292; (2) PRC § 4293; (3) CPUC GO 95, Rule 35 (Table 4a); and (4) CPUC GO 95, Appendix E Guidelines to Rule 35 (Table 4b). These standards significantly increase clearances required within the HFTD (Table 4b, column Case No. 14 or HFT Zones). The recommended “time-of-trimming” guidelines in CPUC GO 95 do not establish a mandatory standard, but instead provide useful guidance to utilities. The SFPUC will use specific knowledge of tree species and growth rates to determine the appropriate time-of-trimming clearance in each circumstance. The SFPUC performs this work with two internal Registered Professional Foresters and an internal part-time Registered Professional Forester. The SFPUC has two internal Vegetation Management crews made up of one laborer supervisor, one operating engineer, two arborists, and eight laborers. Each crew has a manager.

- **230kV/115kV Transmission Lines**– aerial inspections are conducted annually. These flights are overseen by the right of way group, in conjunction with the line crew. In addition, ground inspections are also conducted in Tier 2 and 3 HFTDs by a forester, arborist and/or trained staff. In addition, work orders for vegetation removal may be generated by linemen during their normal course of equipment maintenance activities. Following inspections, work orders are generated, and the vegetation management crews perform any corrective maintenance noted in the work orders. The forester is responsible for ensuring that all work orders are

completed and closed out. Forty-one corrective maintenance work orders were issued in 2019. These work orders have been closed. The SFPUC may also perform mechanical or herbicide treatments under some sections of the transmission lines. Work orders are generated annually for this activity. A goal for the 2021 WMP is to develop an improved work order tracking process for the 115kV line inspections and ensure that corrective maintenance work orders are submitted and completed within the specified due date. The SFPUC is working to expand staffing with the primary focus of creating a process to accomplish this goal.

- **Distribution Lines** - aerial inspections are conducted annually. These flights are overseen by the right of way group. In addition, ground inspections are also conducted by a team of foresters, arborist and/or trained staff. Work orders for vegetation removal may be generated by watershed keepers or linemen during their normal course of daily activities. Following inspections, work orders are generated, and the vegetation management crews perform any corrective maintenance noted in the work orders. Forty-five corrective maintenance work orders were issued in 2019. These work orders have been closed.

Subject matter experts (foresters or trained professionals) are responsible for ensuring that all work orders are completed and closed out. A goal for the 2021 WMP is to develop an improved work order tracking process for the distribution inspections and ensure that corrective maintenance work orders are submitted and completed within the specified due date. The SFPUC is working to expand staffing to support this work to maintain compliance with industry requirements and regulations.

Table 4a:

GO 95, RULE 35				
Case No.	Type of Clearance	Trolley Contact, Feeder and Span Wires, 0-5 kV	Supply Conductors and Supply Cables, 750-22,500 Volts	Supply Conductors and Supply Cables, 22.5 – 300 kV
13	Radial clearance of bare line conductors from tree branches or foliage	18 inches	18 inches	¼ pin spacing
14	Radial clearance of bare line conductors from vegetation in the Fire-Threat District	18 inches	48 inches	48 inches

Table 4b:

GO 95 APPENDIX E GUIDELINES TO RULE 35		
<p>The radial clearances shown below are recommended minimum clearances that should be established, at the time of trimming, between the vegetation and the energized conductors and associated live parts where practicable. Reasonable vegetation management practices may make it advantageous for the purposes of public safety or service reliability to obtain greater clearances than those listed below to ensure compliance until the next scheduled maintenance. Each utility may determine and apply additional appropriate clearances beyond clearances listed below, which take into consideration various factors, including: line operating voltage, length of span, line sag, planned maintenance cycles, location of vegetation within the span, species type, experience with particular species, vegetation growth rate and characteristics, vegetation management standards and best practices, local climate, elevation, fire risks, and vegetation trimming requirements that are applicable to State Responsibility Area lands pursuant to Public Resources Code Sections 4102 and 4293.</p>		
Voltage of Lines	Case No. 13 (non-HFT Zones)	Case No. 14 (HFT Zones)
Radial clearances for any conductor of a line operating at 2,400 or more volts, but less than 72,000 volts	4 feet	12 feet
Radial clearances for any conductor of a line operating at 72,000 or more volts, but less than 110,000 volts	6 feet	20 feet
Radial clearances for any conductor of a line operating at 110,000 or more volts, but less than 300,000 volts	10 feet	30 feet
Radial clearances for any conductor of a line operating at 300,000 or more volts	15 feet	30 feet

B. Program – Facility Inspections

The SFPUC performs the following inspections and maintenance of transmission and distribution facilities in accordance with applicable industry standards. Work orders for detailed inspections and corrective work are managed through a computerized maintenance management system (CMMS). The SFPUC's CMMS is Maximo.

- **Transmission System:** The SFPUC maintains 834 lattice transmission towers. Detailed ground inspections are performed on a five-year cycle. In 2019, a total of 258 tower inspections were scheduled and completed. Aerial patrols are performed annually and consist of a visual inspection of tower members and related hardware, dampers, conductors, and insulators. Additionally, the patrol personnel use infrared technology to detect hot spots.

LiDAR surveys have been performed on a five-year cycle; however, the frequency of LiDAR surveys is being reevaluated. In 2021, the SFPUC will evaluate its entire transmission inspection program and revise or update as needed.

SFPUC is considering a pilot program to evaluate the feasibility and cost effectiveness of using drones to conduct transmission line patrols. SFPUC will provide a program update in the 2022 WMP.

During 2019, 214 corrective maintenance work orders were generated during inspections and 105 have been closed out. The remaining 109 orders are prioritized and scheduled for completion, as required, to maintain compliance.

- **Distribution System:** The SFPUC owns, operates, and maintains 1,744 distribution poles. The SFPUC meets or exceeds CPUC GO 165 which establishes minimum requirements for electrical distribution facilities regarding inspections (patrols and detailed), condition ratings, schedule and performance of corrective actions, record keeping and reporting to ensure safe and high-quality electrical service. The SPUC does not own any underground facilities. Corrective action work orders are created during the inspection and assigned a priority. During 2019, four corrective maintenance work orders were issued, and all work orders have been completed.

The majority of the SFPUC’s distribution poles (1585 out of 1744) are inventoried in Maximo. Maximo is used to issue corrective work orders and track inspection of these assets. In 2019, the remaining 159 distribution poles were inventoried and added to Maximo. The objective for 2020 is to reevaluate and develop an improved reporting program, outlining an annual plan and improved tracking of inspections for these assets.

- **Substations:** The SFPUC owns, operates and maintains five substations. Four substations are within the Tier 2 HFTD and one is outside the HFTD. SFPUC performs regularly scheduled inspections to ensure safety and reliability and meets or exceeds the requirements of CPUC GO 174.

C. Program – Situational Awareness

To improve SFPUC’s situational awareness and increase visibility of their overhead electrical transmission lines, SFPUC partnered with PG&E and Conifer Communications to install two cameras on SFPUC towers that are within the HFTD. PG&E purchased the cameras and Conifer provides the telecommunication for viewing on the ALERTWildfire site.

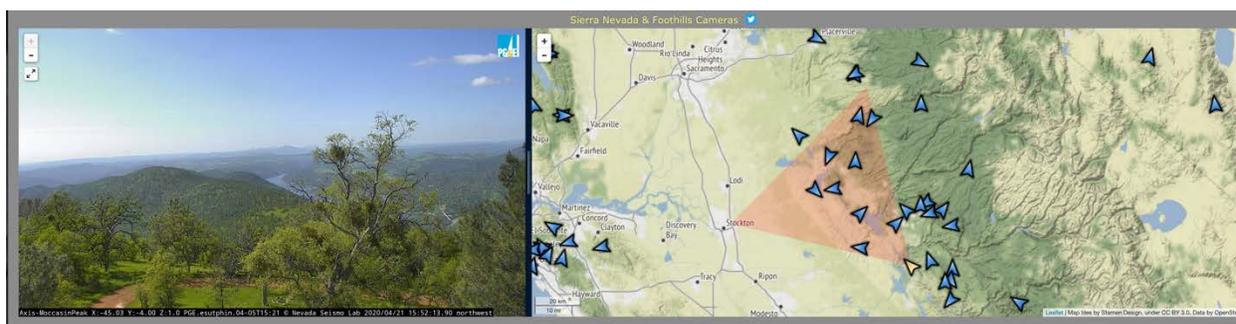


Figure 6 - ALERTWildfire Cameras⁵

SFPUC staff evaluate wind speed conditions using forecast models from NOAA’s High-Resolution Rapid Refresh (HRRR) which generates average and peak wind forecasts for the next 24-hour operating period. The automated process generates an email with the forecast to

⁵ “SFPUC Service Area Cameras.” ALERTWildfire, www.alertwildfire.org/sierra/?camera=Axis-MoccasinPeak. SFPUC Wildfire Mitigation Plan
Page 21
Version 2.0
December 10, 2019

SFPUC Planning staff. Data is reviewed daily and is used to support operational strategies for the SFPUC overhead electrical lines to determine if any operational restrictions should be implemented or lines de-energized for public safety.

The process discussed above for assessing critical fire weather conditions and situational awareness will capture any adverse conditions caused by dynamic climate change risks, allowing the SFPUC's wildfire response to address changing climatological conditions.

D. Program – Operating Conditions

In addition to the SFPUC's various wildfire mitigation programs they also closely monitor critical fire weather conditions impacting the area where their overhead electrical lines are located to inform them if additional operating restrictions should be implemented. Dry fuel sources, high winds, low relative humidity, and dry lightning conditions can contribute to elevated fire risk conditions. The SFPUC collaborates with multiple stakeholders including Bureau of Land Management (BLM), National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), US Forest Service (USFS), PG&E, and CAL FIRE to:

- Leverage situational awareness;
- Provide real-time monitoring data from local weather stations;
- Produce wind forecast models; and
- Monitor fire condition warning systems that gauge fire threat conditions.

Based on this information, the SFPUC can mobilize personnel and take other specific actions to mitigate a potential fire threat and reduce the risk to their electrical facilities.

Daily assessment of conditions is performed to minimize the risk of fire ignitions that could be caused by field operations and used in operational strategies to reduce the risk of wildfire ignition.⁶ Conditions are classified as Normal (no restrictions), Elevated (restricted operations) and Red Flag Warning conditions as defined in SFPUC Work Order Fire

⁶ It should be noted that restriction activities apply to SFPUC staff as well as SFPUC contractors, and others with access rights to SFPUC fee title watershed lands in Alameda, Santa Clara, and San Mateo counties.

Mitigation Procedure OPS-1002. Operational restrictions are included in Sections 5.I and 5.J respectively, for disabling circuit reclosers and de-energizing lines. The source of information used by the SFPUC to determine restrictions varies by county and is summarized below:

- All counties:
 - A Red Flag Warning (RFW) is issued by the NWS for weather events which may result in extreme fire behavior that will occur within 24 hours.
 - Red Flag Conditions (RFC) are designated by the NWS.
- During RFC, no spark generating activities are allowed.

- Tuolumne County:
 - Normal and Elevated conditions are determined from information provided by the USFS. The USFS generates daily information for SFPUC facilities in Tuolumne County (High South), which is based on data collected at Mount Elizabeth. The USFS Project Activity Levels are either “permissive wood cutting day” or restricted activities as defined by levels A-E and Ev. Data is obtained by the crew leader daily and used to determine operating restrictions.
 - Normal Condition (no operating restrictions): “Permissive wood cutting day.”
 - Elevated Condition (restricted operations): USFS Project Activity Level A-E or Ev.
- Central Valley:
 - Normal and RFW conditions are accessed on the NWS Fire Weather internet site.
 - RFW: No spark generating activities can occur.
- Alameda, Santa Clara, and San Mateo counties:
 - Conditions are determined by NRLM daily and issued to staff performing work in these counties.
 - Normal Condition (no operational restrictions):
 - Average wind < 10 mph
 - Humidity > 20%
 - Temperature < 80 F

- Elevated Condition (restricted operations):
 - Average wind > 10 mph
 - Humidity < 20%
 - Temperature > 80 F

The SFPUC is evaluating the operating condition criteria and work restrictions and will provide an update for all counties (each work zone) in their 2021 WMP.

E. Strategy – System Hardening

The SFPUC’s electric facilities are designed, constructed, and maintained to meet or exceed CPUC GO 95 and other relevant federal, state, or industry standards. The SFPUC will explore and develop a 10-year capital plan that will consider some, or all, of the following to reduce the risk that SFPUC facilities could be the origin or contributing source for a catastrophic wildfire:

- Replacement of high risk (non-exempt) equipment:
 - Approximately 15 percent of SFPUC distribution poles support non-exempt equipment as defined by PRC § 4292. These poles support electrical equipment that protects distribution lines from damage and allow isolation during outages. Examples of non-exempt equipment as defined in PRC § 4292 are: fuses, switches, lightning arrestors, hot tap (hot line) clamps, and split bolt connectors. Engineering has identified lower risk alternatives (exempt equipment) and are developing a replacement strategy which will be based on risk reduction and system priorities. Mitigation work performed in 2019 is summarized in Table 5. SFPUC plans to continue maintaining a firebreak which consists of clearing of not less than 10 feet in each direction from the outer circumference of such pole or tower following the replacement of non-exempt equipment with exempt equipment.
 - SFPUC will provide a program schedule in their 2021 WMP.

Table 5: Work Performed in 2019 on 4292 Poles

	Total in HFTD as of January 1, 2019	2019 Mitigated	Total in HFTD as of January 1, 2020
4292 Poles	219	Work performed on 25 poles	214
Expulsion Fuse	176	13	163
Switch	5	3	2
Lightning Arrestor	124	8	116
Connectors	70	1	69
Total	375	25	350

- Replace copper conductor:
 - Though few miles of copper conductor remain, the SFPUC is evaluating the risk of failure and/or replacement of the remaining conductor with aluminum-based wire.
 - The SFPUC will provide an update of this analysis in their 2021 Plan.
- SFPUC will evaluate the feasibility and economic benefit of overhead to underground conversion of distribution facilities in the HFTD.
 - SFPUC expects to provide a program update in their 2021 WMP.
- SFPUC will evaluate the feasibility and economic benefit of reducing our distribution line footprint (small hydro generation at remote facilities).
 - SFPUC expects to provide a program update in their 2022 WMP.

F. Strategy – Workforce Training

The SFPUC has implemented complementary training programs for its workforce to ensure continuous improvement and help reduce the risk that SFPUC facilities could be the origin or contributing source for ignition of a catastrophic wildfire.

- **Basic Fire Training:** SFPUC right-of-way crews were provided basic fire training regarding minimizing potential fire dangers, practicable actions to suppress fires, the importance of reporting fires, and fire safety. Crews were also provided training on how

to use fire mitigation and suppression equipment, including hand tools and water pumps. The training will be expanded to more SFPUC crews in 2020.

- **Vegetation Management:** SFPUC staff who perform vegetation management were provided refresher training for vegetation clearances (GO 95, Rule 35; PRC §§ 4292 & 4293, and NERC FAC-003-4). Annual training is provided every spring prior to the region experiencing critical fire weather conditions.

G. Strategy – Coordination with Other Agencies and Stakeholders

The SFPUC collaborates with multiple stakeholders to assess critical fire weather conditions in a continuous effort to enhance fire safety throughout the region.

- The SFPUC participates as a partner in the Southwest Interface Team (SWIFT); a partnership including CAL FIRE, USFS, BLM, Tuolumne County, and private landowners. Since 1999, the SWIFT has planned and implemented wildfire protection activities within the 132,000-acre (~206 sq. mi.) project area; cooperatively planning and implementing a strategic fire fuel break system, designed to reduce the threat of loss to life, property, and resources in the Southern Tuolumne and Northern Mariposa county wildland-urban interface. The SWIFT meets monthly throughout the year.
- In Alameda, Santa Clara, and San Mateo counties the SFPUC organizes an annual first responder liaison meeting in coordination with CAL FIRE to supplement ongoing communication with all first responders, including county sheriff officers and local fire departments. The SFPUC watershed lands in these three counties are State Responsibility Areas (SRA) and SFPUC staff are in regular communication with local CAL FIRE staff throughout the calendar year.

In addition to the SWIFT team collaboration, SFPUC staff toured the Hetch Hetchy Project facilities with a CAL FIRE Captain, including switchyards and transformer decks, so that CAL FIRE could become more familiar with site specific hazards, and hydrant locations. SFPUC staff and CAL FIRE worked collaboratively to develop a facility map of Early Intake Switchyard, and to make the map available at the CAL FIRE station and in CAL FIRE trucks.

Additionally, SFPUC had a private fire company (retired CAL FIRE Captain) evaluate fire suppression tools on work vehicles and water suppression equipment. Additional fire suppressant tools were purchased in 2019.

H. Strategy – Customer Communication:

Other than providing service to SFPUC owned and operated facilities SFPUC provides service to only one retail customer that is served directly from a SFPUC line. This customer, a business facility located in the Stanislaus National Forest, has a backup generator and experiences no impacts when utility power is interrupted. SFPUC does not consider this a formal Public Safety Power Shutoff (PSPS) program however SFPUC does collaborate with the aforementioned stakeholders regarding potential power interruptions.

SFPUC staff meet with their one customer and Yosemite National Park staff and provide them with an overview of SFPUC's protocols for disabling reclosers, potential de-energization of the circuit for safety, and service restoration. Although SFPUC does not provide power to USFS owned facilities, SFPUC staff meet with the Stanislaus National Forest staff and provide them with the same information.

I. Strategy – Circuit Reclosers

The SFPUC employs manual and automatic reclosers on its transmission and distribution circuits. A recloser could be a line device or relay that is programmed to reclose the line/circuit and attempt to restore service following an interruption. If the circuit is equipped with a recloser and a fault on the line is detected the circuit breaker will open and deenergize the circuit. After a programmed time delay the protective relay is programmed to signal the circuit breaker to “reclose and test” the circuit. If the cause of the fault is still present the breaker will open and stay open, however, if the cause of the fault has cleared the breaker will remain closed restoring service.

Due to minimal impacts to SFPUC operations and customer all automatic reclosers are disabled when the Stanislaus National Forest changes the fire danger condition from Low to Moderate. The SFPUC will not enable the reclosers until the Stanislaus National Forest changes the fire danger condition to Low, usually following the onset of fall/winter precipitation and the burn environment is not conducive for large wildfires. If a fault is

experienced on a line, aerial and/or ground inspections will be performed before the lines are reenergized.

In 2019, the reclosers were disabled by June 5, and remained disabled until November 27, when fuel (vegetation) conditions improved following a period of wet weather and the burn environment was not conducive for large wildfires.

J. Strategy – De-energization

During critical fire weather conditions, it may be necessary to deenergize SFPUC distribution and/or transmission circuits, within the HFTD, for public safety. SFPUC could deenergize a circuit(s) if requested by fire personnel; or if it is determined by SFPUC personnel that a combination of factors pose a significant risk to SFPUC facilities. Those risks could be one or a combination of factors, such as, high winds, low relative humidity, low fuel moisture, hot temperatures, etc., or per request of field personnel.

Due to minimal impact to SFPUC operations and customer, de-energization of circuits for safety is a strategy that SFPUC has chosen to use. SFPUC does not consider this a formal PSPS program however SFPUC does collaborate with the impacted stakeholders regarding potential power interruptions.

The distribution line feeding Sunol Valley Water Treatment Plant (SVWTP) and adjacent facilities may not be deenergized due to the criticality of the asset.

SFPUC staff developed an automated process for evaluating critical fire weather conditions and inform them if any transmission or distribution lines could be at risk and should be considered for de-energization. The automated process retrieves two indicators on an hourly basis:

1. Adjective Fire Danger Indices (e.g., moderate, high, very high). This information comes from the Mount Elizabeth weather station – product of the National Weather Service Weather Information Management System
2. Wind speed and maximum wind gust gridded forecasts
 - a. Obtained from High-Resolution Rapid Refresh Model
 - b. 3-km, hourly resolution, issued once per hour.

The automated process produces a warning message issued to the Moccasin Primary Control Center, water operations, and HHW management. The thresholds that must be met to generate the message include:

- Wind speeds greater than 25 mph,
- Wind gusts greater than 45 mph.

SFPUC reviewed previous critical fire weather events in 2019 and de-energized our distribution lines for one event. Outage periods were as follows:

- October 26 through October 31 in the Bay Area; and
- October 26 through October 28 for high elevation distribution lines in the Sierras.

The lines were inspected, and no damage was found prior to re-energizing.

K. Strategy – Service Restoration

If a transmission or distribution line is de-energized for safety during critical fire weather conditions SFPUC personnel must conduct a full patrol of the line prior to re-energizing. When critical fire weather conditions improve (subside) and SFPUC leadership give approval to re-energize the line(s), SFPUC field personnel will conduct the line patrols via helicopter, vehicle, or on foot depending on weather conditions and access to facilities. Priority for patrols and restoration will be given to the transmission system first, followed by the distribution system.

The SFPUC maintains a contract task order with a helicopter service and can call on them to conduct aerial patrols. Using a helicopter for patrols significantly reduces the time required to complete a full patrol, provided weather conditions have improved enough for safe flight operations to take place.

Following a wildfire SFPUC will restore service when it is safe for personnel to access the damage areas. SFPUC will not access burn areas until the Agency Having Jurisdiction (i.e. Cal Fire, USFS, local fire agency, etc.) gives permission to enter to conduct damage assessment. Following a full damage assessment SFPUC will conduct repairs and restoration following established priority and restoration procedures.

6. EVALUATING THE PLAN

A. Metrics and Evaluation

The SFPUC will track the following metrics to measure the performance and effectiveness of their WMP in reducing the risk of SFPUC facilities being the source or contributing source for the ignition of a catastrophic wildfire. The SFPUC prepared a Plan in 2019 with metrics and has updated those metrics for the Plan to be in place as of January 2020. Provided below are:

- 2019 Calendar Year: Metrics and Evaluation
- 2020 Calendar Year: Metrics

2019: The SFPUC established metrics in the 2019 Wildfire Mitigation Plan. The metrics provided in Table 5 are for calendar year 2019.

Table 5: 2019 Metrics and Evaluation

Metric	Metric Description	Incidents
1	Reportable ignitions in HFTD associated with electric overhead conductors.	0
2	Vegetation clearance and inspections completed in an HFT zone	Complete (HHW verified through a combination of aerial and ground inspection).
3	Number of times a system is de-energized within the HFTD	1

2020: The SFPUC has updated metrics for 2020. These metrics include:

- **Reportable Ignitions:** For purposes of this metric, fire ignition is defined as follows:
 - An SFPUC facility was associated with the fire;
 - The fire was self-propagating and of a material other than electrical and/or communication facilities;
 - The resulting fire traveled greater than one linear meter from the ignition point; or
 - The SFPUC has knowledge that the fire occurred.

In future Plans, the SFPUC will provide the number of electric facility caused fires that occurred and were less than 10 acres in size. Any electric facility caused fires greater than 10 acres will be individually described.

- **Wires Down:** The second metric is the number of downed distribution and transmission wires. For purposes of this metric, a wires-down event includes any instance where an electric transmission or primary distribution conductor falls to the ground or onto a foreign object. The SFPUC will divide the wires down metric between wires down inside and outside of the HFTD.

The SFPUC will not normalize this metric by excluding unusual events, such as severe storms. Instead, the SFPUC will supplement this metric with a qualitative description of any such unusual events.

Table 6: 2020 Metrics and Evaluation

Metric	Metric Description	2019 Incidents	2020 Incidents	2021 Incidents
1	Reportable ignitions in the HFTD associated with electric overhead conductors	0		
2	Vegetation clearance and inspections completed in a HFTD	Complete		
3	Number of times a system is de-energized within the HFTD	1		
4	Wire down in HFTD	1 ¹		
5	Wire down outside HFTD	0		

¹ Line was deenergized for construction at a SFPUC substation at time of incident (February 2019).

B. Impact of Metrics on Plan

In the initial years, the SFPUC anticipates that there will be relatively limited data gathered through these metrics. Therefore, it will be difficult to draw meaningful conclusions based on this data. Over time, as more data is collected, SFPUC will be able to identify areas of its operations that could be more at risk and inform the SFPUC on potential improvements to their plan.

C. Monitoring and Auditing the Plan

SFPUC staff will continuously monitor projects and metrics outlined in this WMP. It is anticipated that progress of hardening projects and data collected will inform SFPUC staff of system improvements and areas that need additional attention. SFPUC staff are committed to

providing safe and reliable power to the region and also reduce the risk that SFPUC facilities could be the source of ignition for a catastrophic wildfire.

This Plan is subject to review and approval by the Commission. The SFPUC staff will review, update, and present this plan to the Commission on an annual basis. Additionally, a qualified independent evaluator will present a report on this Plan to the SFPUC.

D. Identifying and Correcting Deficiencies in the Plan

The SFPUC is committed to making this Plan effective and robust. The SFPUC is also aware that identifying gaps and deficiencies in the Plan is a continuous process, which is learned through experience. Once identified, any gaps or deficiencies will be corrected.

The SFPUC understands that changes to the Plan could occur due to new policies, changes in strategies, changes in technology, or any overlooked areas. These may add gaps to the Plan, however these gaps should be identified and addressed during annual WMP updates.

The SFPUC will evaluate such gaps and determine a solution. Any such changes will be incorporated into the Plan and will be submitted to the Commission for review and consideration as a part of the annual review. Changes requiring additional funding or personnel will be submitted and are subject to approval through the CCSF biennial budget process.

E. Monitoring the Effectiveness of the Plan

The SFPUC strives for continuous improvement in their goal to reduce the risk of SFPUC facilities being the origin or contributing source for a catastrophic wildfire. The SFPUC will continuously monitor and evaluate the wildfire mitigation efforts described in this WMP and pursue improvements in their ongoing goal of providing safe and reliable power to the region.

7. INDEPENDENT EVALUATOR

PUC § 8387(c) requires the SFPUC to contract with a qualified independent evaluator, with experience in assessing the safe operation of electrical infrastructure, to review and assess the comprehensiveness of this WMP. The independent evaluator must issue a report that is

posted to SFPUC's website. This report must also be presented to the SFPUC Commission at a public meeting.

The SFPUC followed its standard professional service contracting procedures for contracting with a qualified independent evaluator and selected the successful candidate based on the evaluator's level of experience with wildfire mitigation plans, familiarity with similar type and size utilities, knowledge of the utilities design and construction standards, and recommendations from references.