



SMUD 2019
**Wildfire
Mitigation Plan**

Powering forward.
Together.



Table of Contents



1.	Introduction	6
1.1	Policy statement	7
1.2	Purpose	7
1.3	Objectives	10
2.	SMUD	11
2.1	SMUD profile.....	11
2.2	The service area	12
2.3	The electric system	12
2.4	Purpose and vision.....	12
2.5	Goal and objectives	13
3.	Overview of preventive strategies and programs	14
4.	Risk analysis and risk drivers	18
4.1	Enterprise risk assessment	18
4.2	Climate change	20
4.3	Enterprise safety and wildfire risk	21
4.4	Key risk impacts	24
4.5	Table top exercise (TTX).....	24
5.	SMUD’s asset overview	25
5.1	Fire threat assessment in SMUD service territory.....	26
6.	Wildfire prevention strategy and program	29
6.1	Distribution grid operational practices.....	30
6.2	Transmission grid operational practices	31
6.3	Infrastructure inspections and maintenance	32
6.4	Vegetation management	34
6.5	Fire mitigation construction.....	35
6.6	System enhancement capital projects	35
6.7	Pilot projects	36
6.8	Emerging technologies.....	37
6.9	Workforce training	37

Table of Contents

- 7. **Response guidelines** 38
 - 7.1 Emergency preparedness and response 38
 - 7.2 Public and agency communications for a potential wildfire..... 40
- 8. **Restoration of service**..... 43
 - 8.1 Steps to restoration of service 43
 - 8.2 Reconstruction after a wildfire..... 44
- 9. **Performance metrics and monitoring** 45
 - 9.1 Accountability of the plan..... 45
 - 9.2 Metrics 47
 - 9.3 Maintenance performance targets 47
 - 9.4 Monitoring and auditing of the WMP..... 49
- 10. **Independent evaluation, public comment, and board presentation** 51
 - 10.1 Public comment 51
 - 10.2 Board presentation 51
 - 10.3 Independent evaluation 51
 - 10.4 California Wildfire Safety Advisory Board 51
- 11. **Appendix** 52
 - 11.1 Definitions 52
 - 11.2 References..... 53
 - 11.3 Acronym glossary..... 54
 - 11.4 Reference for SMUD plans..... 55

Table of Tables

Table 1. Plan compliance with Public Utilities Code 8387(b).....	8-9
Table 2. Mitigation programs/activities.....	15-17
Table 3. Asset description.....	25
Table 4. Overview of SMUD’s T&D assets in CPUC tiers	27
Table 5. Activities that address wildfire risk factors	30
Table 6. Accountability for the WMP components.....	46
Table 7. Metrics	47
Table 8. Programmatic targets.....	48
Table 9. System enhancement capital project targets	49

Table of Figures

Figure 1. Map of SMUD’s operating area.....	11
Figure 2. SMUD’s enterprise risk management process	19
Figure 3. ERM 5-step process.....	19
Figure 4. SMUD’s wildfire risk bow tie. Drivers and impacts are indicators that a risk event could occur, not a reflection of actual or threatened conditions.....	21
Figure 5. SMUD’s territory within CPUC Fire-Threat Map	26
Figure 6. CPUC Tier 2 and Tier 3 areas for SMUD’s UARP	28
Figure 7. Standardized emergency management system (SEMS) emergency operations coordination	39
Figure 8. SMUD’s pole clearing area with respect to Sacramento County boundary	55



1. Introduction

Over the last few years California has seen some of its most devastating and destructive wildfires. Climate change is recognized as a contributing factor (long hot spells, low moisture, etc.). This is the new (ab)normal, requiring a new way of thinking about wildfire mitigation planning.

In response, Senate Bill (SB) 901 authored by Senator Dodd, was enacted in 2018. SB901 requires every electric utility to prepare a wildfire mitigation plan (WMP).

SB 901 amended Public Utilities Code (PUC) section 8387. Section 8387 generally requires every publicly owned utility to construct, maintain, and operate its electrical facilities to minimize the risk of wildfire posed by those facilities. As amended by SB 901 section 8387 more specifically requires every publicly owned utility to prepare and present a WMP to its governing body by January 1, 2020, and annually thereafter.

The WMP must include vegetation management (VM) programs, inspection and maintenance programs, protocols for deactivating automatic reclosers and for de-energizing power lines in severe weather conditions. The plans are required to identify priority customers, such as first responders and local agencies, health care providers, water and telecommunication facilities, groups that assist children, elderly, mobility impaired and other vulnerable populations, and include communication programs for those customers. The plans need to describe how service will be restored after a wildfire and include processes for (i) measuring the performance of the plan measures, (ii) identifying and correcting any deficiencies in the plan and (iii) auditing implementation of the plan.

This document outlines SMUD's activities in accordance with these requirements.

1. Introduction

SMUD

As one of the largest publicly owned, locally governed, electric utilities in California, SMUD serves over 600,000 customers in its 900 square mile service area in the Sacramento County area, and operates a federally licensed hydroelectric project in El Dorado County known as the Upper American River Project (UARP). Based on a mutual agreement with PG&E, SMUD serves five PG&E customers from its UARP facilities, and thirteen PG&E customers in Northern San Joaquin County.

SMUD's service area has a much lower wildfire risk profile than other areas in the State that have suffered destructive wildfires in recent years. This is largely due to its more urban environment, flatter terrain, grasslands and other fuel sources outside forested areas and fewer wind events. Even in the UARP area SMUD is fortunate to have a lower risk environment.

1.1 Policy statement

SMUD's overarching goal is to provide safe, reliable and economic electric service to its local community. In order to meet this goal, SMUD constructs, maintains and operates its electrical lines and equipment in a manner that minimizes any risk of wildfire posed by its electrical lines and equipment.

1.2 Purpose

This WMP describes the range of activities that SMUD is taking to mitigate the threat of power-line ignited wildfires, including its various programs, policies and procedures. This plan is subject to direct supervision by SMUD's Board of Directors and primary responsibility for its implementation resides with the Chief Grid Strategy and Operations Officer.

This plan meets or exceeds the requirements of PUC section 8387 for publicly owned electric utilities to prepare a WMP by January 1, 2020, and annually thereafter. Reference Table 1 below for plan compliance and corresponding sections.



1. Introduction

Table 1. Plan compliance with Public Utilities Code 8387(b)

SB901 Requirement	Description	Plan Section Number
b (2) (A)	An accounting of the responsibilities of persons responsible for executing the plan.	9.1.1
b (2) (B)	The objectives of the wildfire mitigation plan.	1.3
b (2) (C)	A description of the preventive 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.	3
b (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.	9.3.1
b (2) (E)	A discussion of how the application of previously identified metrics to previous wildfire mitigation plan performances has informed the wildfire mitigation plan.	9.2.1
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.	6.1.1, 7.2
b (2) (G)	Appropriate and feasible procedures for notifying a customer who may be impacted by the deenergizing of electrical lines. The procedures shall consider the need to notify, as a priority, critical first responders, health care facilities and operators of telecommunications infrastructure.	7.1, 7.2
b (2) (H)	Plans for vegetation management.	6.4
b (2) (I)	Plans for inspections of the local publicly owned electric utility's or electrical cooperative's electrical infrastructure.	6.3
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:	4.3
b (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.	4.3
b (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.	5.1

1. Introduction

SB901 Requirement	Description	Plan Section Number
b (2) (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.	5.1
b (2) (L)	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.	4.3
b (2) (M)	A statement of how the local publicly owned electric utility or electrical cooperative will restore service after a wildfire.	8
b (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:	
b (2) (N) (i)	Monitor and audit the implementation of the wildfire mitigation plan.	9.4
b (2) (N) (ii)	Identify any deficiencies in the wildfire mitigation plan or its implementation and correct those deficiencies.	9.4.2
b (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.	9.3.1
b (3)	The local publicly owned electric utility or electrical cooperative shall present each 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.	10
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 web site 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.	10

1. Introduction

1.3 Objectives

The primary objectives of this WMP are to:

1. Minimize the probability that SMUD's transmission and distribution (T&D) system may be the origin or contributing source for the ignition of a wildfire;
2. Implement a wildfire plan that embraces safety, prevention, mitigation and recovery as a central priority for SMUD; and
3. Create a WMP that is consistent with state law and objectives.

SMUD has evaluated the prudent and cost-effective improvements to its physical assets, operations and training that can help to meet these objectives.

The secondary objective of this WMP is to improve the resiliency of SMUD's line standards and construction. As part of developing this plan, SMUD assesses new industry practices and technologies that will reduce the likelihood of an interruption (outage frequency) in service and improve the restoration (outage duration) of service. In addition, SMUD reviews available fire investigation reports for fires throughout California to understand root causes that can be addressed.

This WMP outlines the actions SMUD is taking to reduce the risk of potential wildfire-causing ignitions associated with SMUD's electrical infrastructure. This plan outlines the activities and programs that SMUD has put in place to enhance public safety, improve grid reliability and explore new technologies to help reduce overall wildfire ignition risk.

This WMP also addresses customer outreach and communication programs for customers that may be impacted in the unlikely event of a wildfire related de-energization. SMUD's long standing and continued cooperation with local agencies are also discussed and outlined.

This WMP also provides methodologies to measure the effectiveness of specific wildfire mitigation strategies and how those strategies measurably reduce the risk of catastrophic wildfire. Where a particular action, program component, or protocol is determined to be unnecessary or ineffective, SMUD will assess whether a modification or replacement is merited. This plan will also help determine if more cost-effective measures would produce the same or improved results.

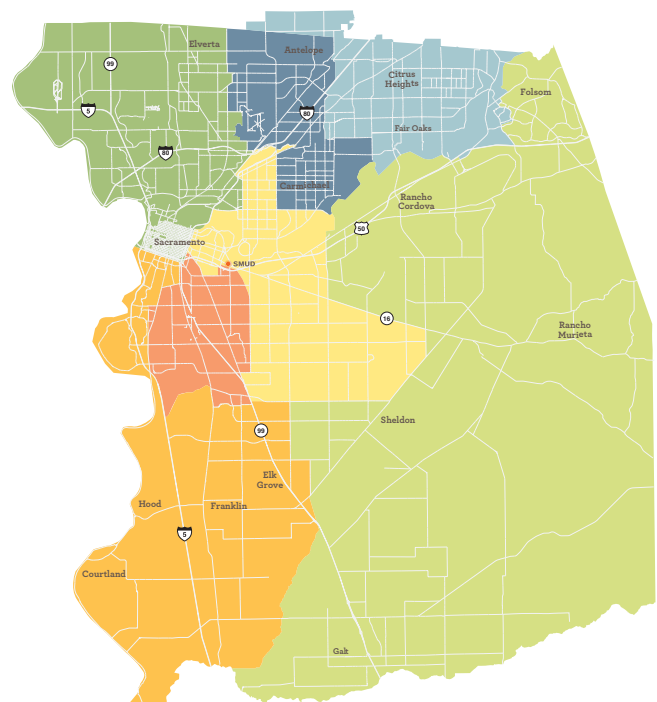


2. SMUD

2.1 SMUD profile

Headquartered in Sacramento, California, SMUD owns and operates an electric system that has provided retail electric service since 1946. SMUD generates, transmits and distributes electricity within a 900-square-mile territory that includes the principal parts of Sacramento County, and a small adjoining portion of Placer County (see Figure 1).

Figure 1. Map of SMUD's operating area



2. SMUD

SMUD is one of the largest community-owned electric utilities in the nation, recognized internationally for its innovative energy efficiency programs and use of renewable power technologies. As a publicly owned utility, SMUD is governed by a seven-member popularly elected Board of Directors that determines policy and appoints the Chief Executive Officer and General Manager who is responsible for SMUD's overall management and operations.

SMUD owns, operates and has ownership interests that are critical to maintaining the flow of power from generating facilities through the transmission lines to SMUD's service area. These assets are located in the geographic areas of Sacramento, El Dorado, Solano and Placer counties.

2.2 The service area

SMUD is the primary electric distribution service provider within an area of approximately 900 square miles in central California. The service area includes the State Capital, Sacramento, the populous areas principally to the northeast and south of the City of Sacramento and the agricultural areas to the north and south.

SMUD's electric system supplies power to a population of approximately 1.5 million with a total annual retail load of approximately 10,233 million kilowatt hours (kWh) for the year ended December 31, 2018¹. As the capital of the nation's most populous state, Sacramento benefits from the historically stabilizing influence of a large government sector. Sacramento is home to the State government headquarters, the Sacramento County seat, the City government and various special districts that combine to make government the largest single employment sector in the Sacramento area. Information technology, transportation, education and health services, leisure and hospitality, and construction serve as the other major sectors of employment and industry in the area.

SMUD's highest peak load in 2018 was 2,944 megawatts (MW), occurring July 25, 2018. SMUD's record peak load of 3,299 MW occurred on July 24, 2006, its' second highest peak load occurred on August 28, 2017 recorded at 3,157 MW².

2.3 The electric system

SMUD owns and operates a vertically integrated electric system that includes generation, transmission and distribution facilities.

SMUD supplies power to its bulk power substations through 230 kilovolt (kV) and 115 kV transmission systems. This system transmits power from SMUD's generation plants and interconnects with Pacific Gas & Electric (PG&E) and the Western Area Power Administration (WAPA). Power is distributed throughout Sacramento County via a 69 kV sub-transmission system except for the City's downtown area, which is served from the 115 kV transmission systems. The downtown area is served from 115/12 kV and 115/21 kV substations. The distribution system serving the remainder of SMUD's service territory is comprised of 69/12 kV and 69 kV substations with overhead and underground distribution circuits.

2.4 Purpose and vision

SMUD's Board of Directors has established the following mission and vision statements: "SMUD's purpose is to enhance the quality of life for our customers and community through creative energy solutions. SMUD's vision is to be the trusted partner with their customers and community, providing innovative solutions to ensure energy affordability and reliability, improve the environment, reduce our region's carbon footprint and enhance the vitality of our community."³

¹ SMUD Consolidated Financial Information and Statistics, December 31, 2018, pg. 4, Electric Sales Statistics.

² SMUD Consolidated Financial Information and Statistics, December 31, 2018, pg. 7, Power Statistics.

³ <https://www.smud.org/en/Corporate/About-us/Company-Information/Strategic-Direction>, July 15, 2019.

2. SMUD

2.5 Goal and objectives

For more than seventy years, SMUD has provided safe, reliable and affordable electricity, excellent customer service, community value, innovation and environmental leadership to its customers.

The Board has adopted a set of Strategic Directions (SD) with related metrics, which it considers essential in the continued success of the organization and its service to its customers. These include safety, reliability, competitive rates, enterprise risk management (ERM), access to credit markets, customer relations, environmental leadership and resource planning. SMUD's Board SDs are used as a guide in the decisions made about SMUD's policies and operations. The Board continually reviews and refines these guidelines to make sure it meets its customer's energy needs both now and in the future.

Some of the general elements in SMUD's business strategy are⁴:

- Safe and reliable energy and environmental protection: Developing and maintaining a sustainable and reliable power supply to meet peak demand growth consistent with state mandates for renewable energy and reduced carbon emissions.
- Customer and community services: Working closely with customers to provide the information, tools and incentives to assist them to more efficiently manage energy use, which will contribute to meeting greenhouse gas (GHG) emission targets and managing peak demand requirements.
- Long term financial stability: Managing price, volumetric and credit risks associated with energy and natural gas procurement and SMUD's finances to meet funding needs and maintain fair and reasonable energy rates.
- Workforce planning & development: Attracting, developing and retaining an inclusive, skilled and engaged workforce that reflects SMUD's values and is committed to achieving SMUD's mission.
- Operational independence and local control: Retaining local decision-making authority and operational independence.
- Community and Collaboration: Collaborating regionally to attract new businesses and grow existing business to diversify and strengthen the Sacramento economy.
- Long-term infrastructure investment: Maintain and improve SMUD's infrastructure in a cost-effective manner to ensure sustainable delivery of reliable energy and address economic and environmental concerns.
- Risk management: Maintain an ERM program designed to act as an early warning system to monitor changes in, and the emergence of, risks that could impact SMUD's business objectives.

⁴ <https://www.smud.org/en/Corporate/About-us/Company-Information/Strategic-Direction>, July 15, 2019.



3. Overview of preventive strategies and programs

This WMP addresses the preventive strategies and programs adopted by SMUD to minimize the risk of its electrical lines and equipment causing a wildfire. The strategies and programs included in the WMP are evolving and are subject to change. As new technologies, practices and networks develop, and other environmental influences or risks are identified, changes to address them may be incorporated into future iterations of the WMP which is, in effect, a living document.

This WMP integrates and interfaces with various operating policies and asset management and engineering principles which are themselves subject to change. As appropriate, the current version of documents are incorporated either as appendices to this WMP or by reference.

Table 2 is a summary of SMUD's programs and activities that support wildfire prevention and mitigation.

3. Overview of preventive strategies and programs

Table 2. Mitigation programs/activities

Design and construction
Ester-based insulating fluid (Envirotemp FR3 ⁵) in transformers
Non-expulsion equipment in Pole Clearing Area (PCA) and UARP 4kV
Light Detection and Ranging (LiDAR) Ortho, Oblique and Hyper Spectral Imagery
Potential installation of fire monitoring cameras on towers in the UARP transmission corridor
Increase overhead wire spacing to reduce wire to wire contact
Pole loading and placement
Transmission line rating remediation
Pole replacement and reinforcement
Wildfire resiliency design
Construction fire prevention program
Substation perimeter fencing
UARP 4kV circuit breaker upgrade
UARP 4kV bare wire replacement
Inspection and maintenance
Transmission line aerial patrols (helicopter)
Transmission line ground patrols
Transmission line infrared (IR) inspections (helicopter)
Transmission line splice assessment program
Transmission and distribution wood pole intrusive inspections
Transmission and distribution vegetation right-of-way maintenance
Transmission and distribution annual pole clearing program
Distribution detailed line inspections
Distribution line patrols
69 kV and Pole Clearing Area 12 kV IR inspections (helicopter)
Visual inspections of distribution substations
LiDAR inspection of transmission
Inspection and maintenance programs for T&D lines and substations
IR inspection of energized overhead T&D facilities and equipment
Drive by of overhead distribution facilities and equipment
Detailed inspection of T&D facilities and equipment
Supplemental inspections of high fire risk areas
On-ground routine inspection

⁵ Additional information: <https://www.cargill.com/bioindustrial/envirotemp/fr3>

3. Overview of preventive strategies and programs

Operational practices

Disabling reclosing during fire season
Transmission and distribution system vegetation management
Special work procedure for red flag warning (RFW)
De-energization notifications
Emergency Operations Planning: fire prevention plan
Hotworks procedures
Work procedures and training for persons working in locations and conditions of elevated fire risks
Safety and physical security protection teams
Increased staff for line and vegetation management crews in preparation of storm
Existing relationship with local government and fire safe councils
Transmission encroachment program
Provide liaison to county office of emergency services' (OES) during fire event
Leverage existing relationship with local government and fire departments
Targeted communications plan
Active environmental safety monitoring
SMUD's Emergency Operations Center partners with local emergency responders for coordination prior to and during an emergency
High fire threat district vegetation management inspection strategy
Inspecting trees with potential strike path to power lines
Expanded pole clearing
Expanded clearance distances at time of maintenance
Patrol and pruning, quality assurance
Increased vegetation clearance

3. Overview of preventive strategies and programs

Situational/conditional awareness

- Weather monitoring stations in targeted areas in the UARP
- Potential installation of cameras in key locations
- Coordinate and collaborate with Fire Safe Councils and County Office of Emergency Services throughout the year to prepare for RFW and high fire risk events
- Contractor safety training and orientation for transmission and distribution vegetation management work
- Monitors daily California Department of Forestry and Fire Protection website and active fires in California
- Shade Tree Program
- On-site personnel at specific periods

Response and recovery

- Planned de-energization during fire season
- Critical event communications process and procedures
- Strategy for minimizing public safety risk
- Emergency response plan
- Field operations recovery procedures
- California Independent System Operation (CAISO) coordination



4. Risk analysis and risk drivers

SMUD uses its existing ERM framework to identify and assess enterprise level risks. SMUD's ERM framework takes into consideration both quantitative and qualitative factors to determine the level of inherent and residual levels of a particular risk. An inherent risk level refers to the risk before any mitigations or controls are in place while the residual risk level refers to the risk after all mitigations and effective controls are considered.

4.1 Enterprise risk assessment

The ERM framework has a strong governance structure stemming from SMUD's Board of Director's Strategic Direction and overseen by an executive body, the Enterprise Risk Oversight Committee (EROC). The framework requires that all enterprise risks be owned by an Executive and managed at the Director level.

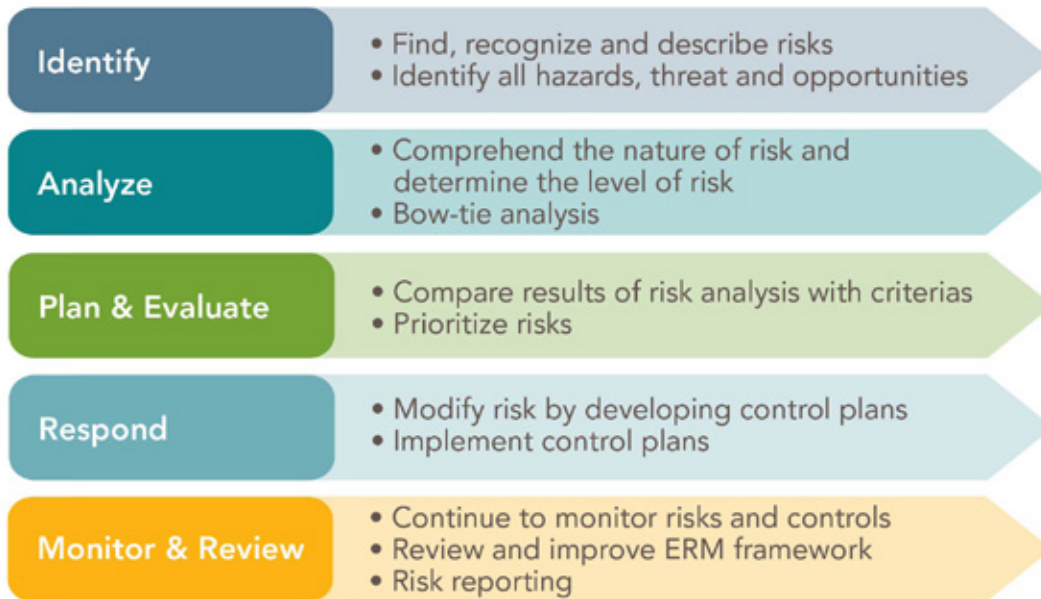
The ERM framework is a 5-step process and is integrated with SMUD's internal audit process to check for assurance of proper control implementation. The framework requires continuous communications and consultation throughout the life of the risk. The 5-step ERM process is shown in Figure 2 below. Figure 3 describes the objective of each step.

4. Risk analysis and risk drivers

Figure 2. SMUD's enterprise risk management process



Figure 3. ERM 5-step process



4. Risk analysis and risk drivers

During a risk evaluation, the Director, manager, stakeholders and subject matter experts (SMEs) are consulted. ERM staff gathers pertinent information to conduct the evaluation which includes a root cause analysis. Information gathered includes key risk drivers, key risk impacts, mitigations, processes, procedures, controls and internal/external risk trend. SMUD uses a commonly used framework called the bow-tie method for its root-cause analysis. This method allows easy visualization of the relationship between the risk event, its drivers and impacts, as well as preventive and mitigation activities. In addition, the method also allows for a structured risk analysis where quantification is not possible or desired. SMUD's ERM framework takes into consideration impacts to SMUD's finances, legal, regulatory and compliance, operations, reputation, public safety and workforce.

4.2 Climate change

The National Aeronautics and Space Administration (NASA) defines climate change as the change in the usual weather conditions and patterns found in a region.⁶ More specifically, it is a change in the average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the globe. According to NASA, scientists think that the Earth's temperature will keep increasing for the next 100 years. "This would cause more snow and ice to melt. Oceans would rise higher. Some places would get hotter. Other places might have colder winters with more snow. Some places might get more rain. Other places might get less rain."⁷

California has already been experiencing the impacts of climate change including prolonged droughts, increased coastal flooding and erosion and tree mortality. The state

has also seen increased average temperatures, more extreme heat days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow and both snowmelt and rainwater running off sooner in the year. In addition to changes in average temperatures, sea level and precipitation patterns, the intensity of extreme weather events is also changing. Extreme weather events and resulting hazards, such as heat waves, wildfires, droughts and floods are already being expected.⁸

California's Fourth National Climate Assessment issued in November 2018 says that "climate change is expected to increase the frequency and intensity of wildfires," consistent with many expert predictions that climate change would increase the risk of large and severe wildfires, including a potential increase in the total area burned.⁹ A number of climate-related factors have contributed to the increasing risk of wildfires. The severity of wildfires is generally a function of the condition of the combustible vegetation material involved, terrain or setting and weather conditions. Tree stress and mortality, including damage due to insect infestations such as the bark beetle exacerbate fire hazards creating a tinderbox, providing an environment for catastrophic fires. In addition, as air temperatures rise, forests and land are drying out, also increasing fire risks and creating weather conditions ripe for fire ignition and expansion.

Fire season has historically extended from early spring through the late fall, due to the dry and hot nature of these months in SMUD's geographic region. As a result of the increase in population density, development in the wildland-urban interface (WUI) and extreme weather conditions, there's a growing need for year-round fire prevention and preparedness.

⁶ Source: <https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html>

⁷ Source: <https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html>

⁸ California's Fourth Climate Change Assessment, January 16, 2019. <http://www.climateassessment.ca.gov/state/>

⁹ California's Fourth Climate Change Assessment, January 16, 2019. <http://www.climateassessment.ca.gov/state/>

4. Risk analysis and risk drivers

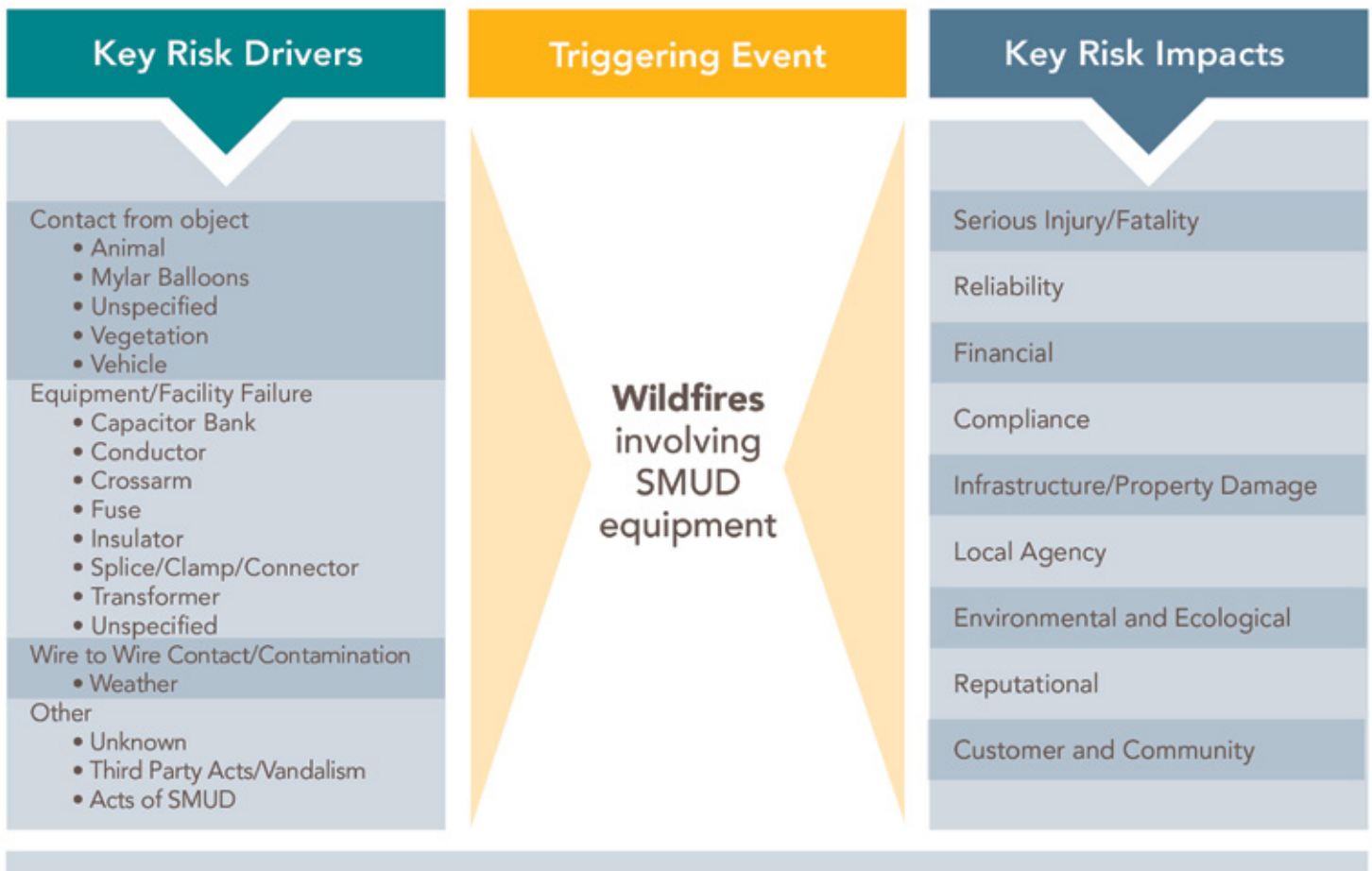
4.3 Enterprise safety and wildfire risk

Following SMUD’s ERM assessment process, SMEs were consulted in conducting a bow-tie analysis for wildfires which could potentially involve SMUD equipment. The SMEs focused on potential causes of powerline sparks that could start a fire. The bow-tie analysis was conducted to identify SMUD’s vulnerabilities, exposure to and

impacts from a wildfire as well as to identify current controls and mitigations to prevent wildfire occurrence, velocity and impact.

Figure 4 provides the risk bow tie, which summarizes the assessment process.

Figure 4. SMUD’s wildfire risk bow tie. Drivers and impacts are indicators that a risk event could occur, not a reflection of actual or threatened conditions



4. Risk analysis and risk drivers



4.3.1 Fire risk drivers

Powerline equipment is generally the same across all utilities; a small niche of manufacturers and suppliers are used to procure equipment for construction of facilities. Slight variances in design and construction may be expected between utilities. SMUD staff evaluated other utilities' fire causes and applied its own field experience to determine the potential risk drivers. Four categories were identified as potential for causing powerline sparks and ignitions:

- Contact from objects
- Equipment/facility failure
- Wire-to-wire contact/contamination
- Other

SMUD staff identified the following drivers associated with each category. These are discussed below but may not be limited to the following.

4.3.1.1 Contact from objects

Most overhead powerlines throughout the world are installed as bare wire on top of insulated poles and structures. Overhead powerlines are kept at a certain distance from the ground and from adjacent objects, based on the voltage level and applicable design criteria, to prevent contact and faults. However, with thousands of miles of overhead powerlines contacts from objects are anticipated by utilities and can occur throughout the year.

Animals and highly conductive mylar balloons are some of the objects that come into contact with powerlines which can cause sparks and arcs. While protection equipment such as circuit breakers, reclosers and fuses are installed to isolate the faults, there are time delays (within fractions of a second or seconds) associated with when the equipment senses the fault and proceeds to isolate (or "trip") the faulted section. The time delays are instant to the human, but not quite fast enough to prevent all sparks prior to tripping. Emitted sparks, molten metal or burnt foreign objects can fall on, and potentially ignite, any fuels underneath or near the powerline.

Vegetation such as trees, branches, palm fronds, etc., from inside and outside of powerline pathways can come into contact with powerlines at any time which can also cause sparks or arcs. Sometimes, the stress of contact is large enough to cause a connector or pole to fail which will lead to wires falling and touching the ground. In some instances, the tree or branch may continue leaning on the powerline and continue sparking or catch on fire due to resulting sparks.

Additionally, vehicles contacting poles or supporting guy wires can damage or break the pole. The heavy, broken pole in turn can put too much stress on connectors or crossarms and cause wires to break and fall to the ground potentially emitting sparks and arcs.

4. Risk analysis and risk drivers

4.3.1.2 *Equipment failure*

All man-made equipment fails, at some point or another during its life. Failure modes can be discrete (internal) or destructive (materials ejected). Failure components such as hot line clamps, connectors and insulators can result in wire failure and cause the wire to fall to the ground. The energized conductors can emit sparks prior to breaker or fuse tripping/isolating. Transformers and capacitor banks can have internal shorts that can potentially be destructive and eject materials which could create a spark, leading to a fire.

4.3.1.3 *Wire-to-wire contact/contamination*

When two or more energized conductors come into contact with each other they will cause sparks and possible material to be ejected. There are many factors that could lead to such an occurrence. Any type of shaking of the pole or high winds may cause the powerlines to sway and touch. A shaking pole can be caused by vehicle contact or livestock rubbing against a pole or supporting guy wires. Certain types of faults (shorts) down the line can cause powerlines to gallop (bounce and buck).

Contamination on insulators can create a path for electricity to flow. This unintended path can track and cause a fault. Typical causes are ash, dust, debris and bird excrement on the insulator. These causes can usually be determined by burn marks along the insulator.

4.3.1.4 *Other*

SMUD's powerlines traverse through many parts of its service territory which include residential properties, along road rights-of-way (ROW), within business parking lots, etc.

Non-SMUD equipment and construction projects could be a possible cause of ignition. Even though property owners and contractors take precautions, their equipment can come into contact with powerlines and cause sparking triggering fires in the vicinity. Although unintentional, these contacts may cause damage to powerlines, poles and supporting equipment which may cause sparks and trigger fires in the vicinity.

SMUD equipment can also be vandalized and damaged, which may cause sparks and fires.

SMUD takes pride in a properly trained and well-informed workforce. Crews perform switching, construction and maintenance on facilities daily. However, the tools and vehicles they use can be sources of sparks or ignition. For example, driving a truck over dry grass/brush can cause the dry grass/brush to ignite. As such, SMUD trucks are equipped with fire suppression equipment and staff are properly trained to respond to an ignition and in the use of the fire suppression equipment.

During RFW periods in the UARP, crews working in remote sites limit hot-work (such as welding, grinding, cutting etc.) to prevent an ignition. As a precaution, designated staff assigned as a fire-watch, may stay behind after work completion for up to thirty minutes to ensure a fire doesn't start after work crews leave a remote site. In particular, SMUD's VM contract crews have on-site fire suppression equipment, ex. fire rake, water backpack and shovels. On remote sites where a masticator is being used, crews have a 200 gallon or greater water tank on hand for fire suppression and perform a one-hour fire watch after work is complete.

4. Risk analysis and risk drivers

4.4 Key risk impacts

If one of the risk drivers listed above were to occur, resulting in a fire ignition or wildfire incident, there could be many potential consequences. The worst-case scenarios could include:

- Personal injuries or fatalities to the public, employees and contractors
- Damage to public and/or private property
- Damage and loss of SMUD owned facilities and assets
- Impacts to reliability and operations
- Damage claims and litigation costs, as well as fines from governing bodies
- Damage to SMUD's creditworthiness, or ability to borrow money or purchase insurance
- Environmental and ecological damage
- Damage to SMUD's reputation and loss of public confidence
- Customer and community impacts
- Bankruptcy

SMUD recognizes the impacts that wildfires can have on the company, community and local economy.

4.5 Table top exercise (TTX)

SMUD conducted a table top exercise (TTX) to test, analyze and enhance the current level of SMUD's internal coordination and expertise in responding to a potential wildfire threat to SMUD's facilities El Dorado County that could result in potential impacts to SMUD customers. The TTX was used to enhance general internal awareness, test SMUD standard emergency operating plans and procedures in the wildfire context and provide an opportunity to rehearse emergency practices in a simulated environment. The TTX's operational objectives were developed to evaluate SMUD's core response capabilities in three specific areas; (1) wildfire preparedness/mitigation, (2) emergency notification and response, and (3) short-term operations recovery procedures.

The TTX concluded SMUD possesses a requisite amount of experience, ability, knowledge and skill sets to adequately deal with this level of fire emergency/fire related outage. Additionally, SMUD departments have well established procedures and processes in place that provide the organization the ability to effectively respond and recover from a wildfire event, such as the one during this exercise.



5. SMUD’s asset overview

SMUD provides electricity to its customers via substations and T&D line assets. Table 3 depicts a high-level description of SMUD’s T&D assets.

Table 3. Asset description

Asset Classification	Asset Description
Transmission line assets	Assets include conductor, transmission structures and switches operating at or above 69 kV (only 69 kV lines that tied to generation are considered transmission).
Distribution line assets	Assets include overhead conductor, underground cabling transformers, voltage regulators, capacitors, switches, line protective devices and street lighting operating at less than 69 kV (all 69 kV lines not tied to generation are considered distribution).
Substation assets	Assets include major equipment such as power transformers, voltage regulators, capacitors, reactors, protective devices, relays, open-air structures, switchgear and control houses.

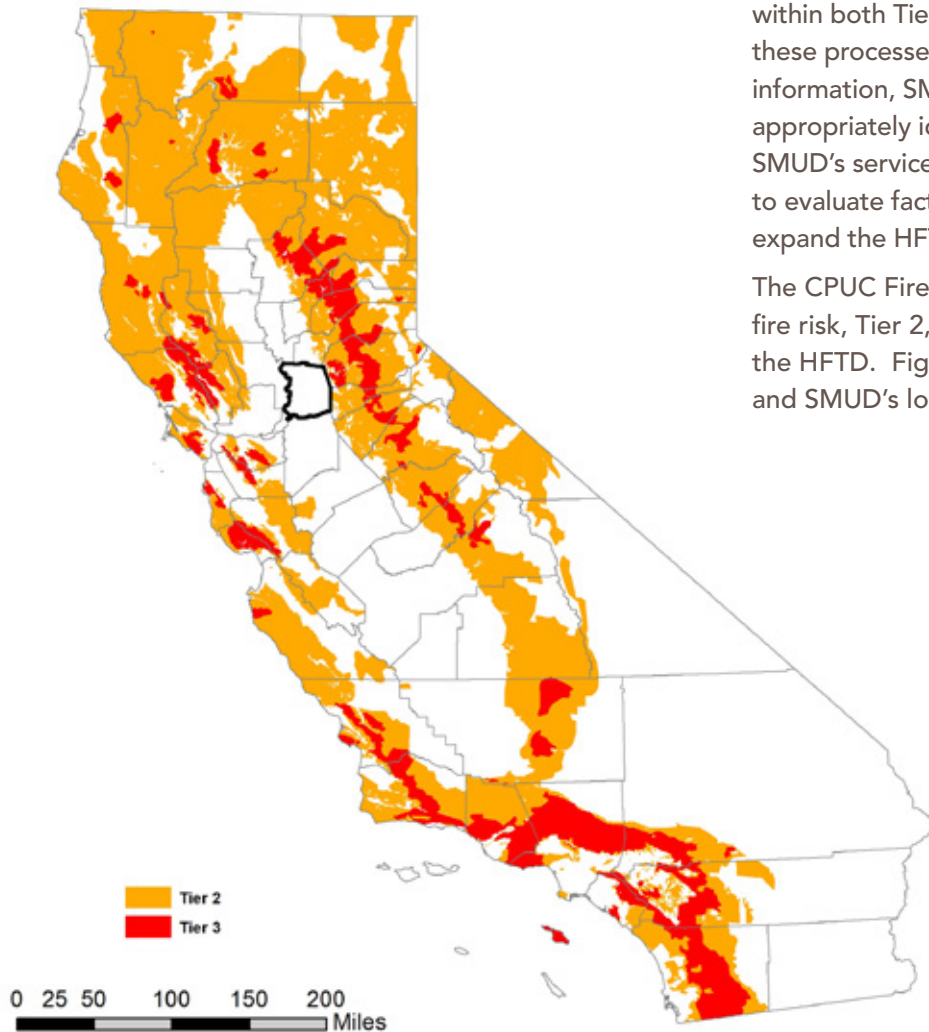
5. SMUD’s asset overview

5.1 Fire threat assessment in SMUD service territory

5.1.1 CPUC high fire threat district (HFTD)

SMUD directly participated in the development of the CPUC’s Fire-Threat Map¹⁰, which defines a Statewide high fire threat district (HFTD). SMUD has incorporated the HFTD map into its construction, inspection, maintenance, repair and clearance practices, where applicable.

Figure 5. SMUD’s territory within CPUC Fire-Threat



In the HFTD map development process, SMUD served as a territory lead, and worked with utility staff and local fire and government officials to identify whether any areas within SMUD’s service territory are at an elevated or extreme risk of powerline ignited wildfire. It was determined through that process and affirmed by both a peer review and a team of independent nationwide experts led by the California Department of Forestry and Fire Protection (CAL FIRE), that SMUD’s service area is properly situated outside the HFTD. Outside of its service area SMUD’s UARP facilities, including approximately 3 miles of 4kV power lines are situated within both Tier 2 and Tier 3 of the HFTD. Based on these processes, the existing environment and current information, SMUD believes that the HFTD map appropriately identifies the level of wildfire risk within SMUD’s service territory and UARP. SMUD will continue to evaluate factors that may indicate the CPUC should expand the HFTD to include additional areas.

The CPUC Fire-Threat map identifies Tier 3, extreme fire risk, Tier 2, elevated fire risk, and areas outside of the HFTD. Figure 5 depicts the CPUC Fire-Threat Map and SMUD’s location within the map.

¹⁰ Adopted by CPUC Decision 1-12-024.

5. SMUD’s asset overview

SMUD’s assets are located both within HFTD areas (including Tier 2 and 3) and areas not deemed within the HFTD (referred to as non-tier or outside HFTD in this document). Approximately one quarter of SMUD’s 468 overhead line-miles are located within the HFTD; of that

approximately 10% are located within Tier 3, that are deemed “Extreme Fire Threat.” None of SMUD’s 236 substations are located within the HFTD. Table 4 shows the breakdown of SMUD’s T&D assets by HFTD tiers.

Table 4. Overview of SMUD’s T&D assets in CPUC tiers

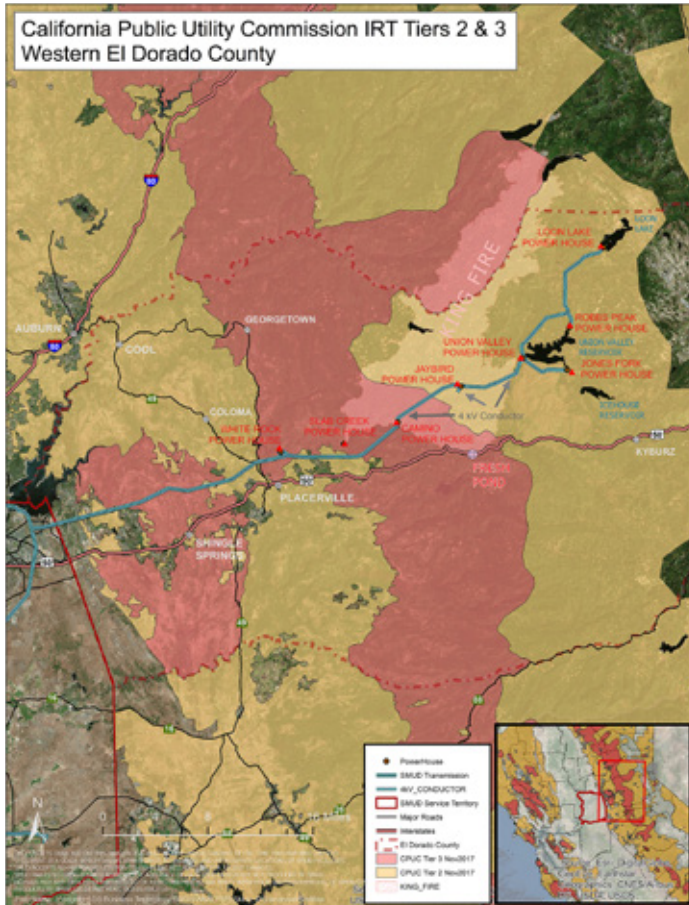
Asset	Total	Outside HFTD		Tier 2		Tier 3	
	Circuit-miles	Circuit-miles	%	Circuit-miles	%	Circuit-miles	%
Total OH transmission	468.1	335.2	72%	82	18%	50	11%
69 kV transmission lines	37.8	6.9	18%	30.9	82%	0	0%
115 kV transmission lines	47.0	47.0	100%	0	0%	0	0%
230 kV transmission lines	382.5	280.5	73%	51.5	13%	50.5	13%
Total OH distribution	3871	3868	100%	1.9	0.05%	1.2	0.03%
Total OH circuit-miles	4339	4203	97%	84	1.9%	51	1.2%
	Total No.	Outside HFTD		Tier 2		Tier 3	
Total load serving substations	236	236	100%	0	0%	0	0%

Note: All Tier 2 and Tier 3 facilities are located in the UARP area, outside of SMUD’s electric service territory.

5. SMUD's asset overview

Figure 6 below shows the UARP area where all of SMUD's Tier 2 and Tier 3 assets reside.

Figure 6. CPUC Tier 2 and Tier 3 areas for SMUD's UARP



5.1.2 CAL FIRE Fire Resource and Assessment Program (FRAP) California Statewide Fire Map

California law requires CAL FIRE to identify areas in the State based on the severity of the fire hazard that is expected to prevail there.¹¹ These areas or “Fire Hazard Severity Zones” are based on factors such as fuel (material that can burn), slope and the expected chance of burning. “CAL FIRE-FRAP has developed a rating of wildland fire threat based on the combination of potential fire behavior (fuel rank) and expected fire frequency (fire rotation) to create a 4-class index for risk assessment. Areas that do not support wildland fuels (e.g., open water, agricultural lands, etc.) are omitted from the calculation. Most large urbanized areas receive a moderate fire threat classification to account for fires carried by ornamental vegetation and flammable structures.”¹² This map considers all ignition risks, not just utility related ignitions. A portion of SMUD's service territory, measured in acreage, is within areas that CAL FIRE assess as exhibiting moderate-to-very-high fire risk; 40.6% is in moderate risk areas and less than 1% in high or very high-risk areas.

Although SMUD takes the CAL FIRE FRAP map Fire Hazard Severity Zones into consideration as part of its wildfire mitigation planning, SMUD's Wildfire Mitigation Plan references the CPUC Fire Threat Map which focuses on the risk of utility associated wildfires¹³.

¹¹ Cal. Pub. Res. Code §4201 et.seq.

¹² https://frap.fire.ca.gov/media/2445/ftthreat_map.pdf, July 15, 2019.

¹³ www.cpuc.ca.gov/firethreatmaps, July 19, 2019.



6. Wildfire prevention strategy and programs

SMUD has a robust set of measures to address potential wildfire risks. The WMP will incorporate existing efforts and identify the process moving forward to supplement them where a need is identified. SMUD regularly coordinates with local fire agencies and other first response agencies. It also participates with emergency operations activities in its system areas. SMUD has robust VM programs with accelerated VM trimming cycles and are using enhanced technologies including LiDAR and Hyper-Spectral Imagery (these technologies can help identify diseased trees and trees that are a risk to SMUD lines). It also has robust inspection and maintenance programs that include aerial patrols with helicopters, IR inspections using helicopters (which can detect heat from power equipment before an event occurs) and regular ground inspections of all facilities (including core

testing of the wood poles). SMUD is exploring potential system improvements such as the use of non-sparking equipment in key areas (e.g., use of CAL FIRE exempt fuses), replacing wood poles with steel in certain cases and the use of covered conductor alternatives. SMUD has protocols for disabling automatic reclosers and for de-energizing lines to protect public safety (some conditions that factor into these protocols include: RFW, forecasted temperatures above 100°F, winds exceeding design standards, low humidity). It also has an Outage Communications Plan that will be enhanced to address potential de-energization events (SMUD will include targeted messaging for affected areas that will set expectations and identify support resources). See the table 5 for activities that address key wildfire risk factors.

6. Wildfire prevention strategy and programs

Table 5. Activities that address wildfire risk factors

Activity	Risk Factor
Fuel	<ul style="list-style-type: none"> Vegetation management Fuels reduction Piloting use of LiDAR and Hyper-Spectral Imagery
Equipment/facility failure	<ul style="list-style-type: none"> Routine maintenance Focused design and construction standards to reduce ignition sources Transmission and distribution line detailed inspections and annual patrol No reclosing during fire season Non-expulsion fuses and arrestors Intrusive pole testing and pole replacement De-energization of lines during certain conditions
Contact from object(s)	<ul style="list-style-type: none"> Animal/Bird guards Raptor construction (increased line spacing) Increased vegetation clearances
Wire to wire contact	<ul style="list-style-type: none"> Weather station and monitoring
Other	<ul style="list-style-type: none"> SMUD worker/contractor education on fire ignition sources from normal work activities Fire watch 30 minutes after work completion in high risk areas

6.1 Distribution grid operational practices

6.1.1 Disabling reclosing during fire season

SMUD has adopted procedures for the operation of reclosers. For the purposes of those procedures, fire season is defined as:

- May 1 to October 1, or
- RFW in effect for areas inside or immediately surrounding the PCA

SMUD disables automatic reclosing on certain substation and line reclosers that extend into the PCA. In some cases, the line reclosers are completely bypassed with fuses if automatic reclosing cannot be disabled. On circuits where line reclosers are bypassed, the fuses provide protection to the end of the line. See Figure 8 for graphic of the PCA.

6.1.2 Planned de-energization during fire season

During fire season, SMUD has elected to take certain measures to mitigate the risk of wildfires in the PCA, that could potentially migrate to the HFTD areas. When weather conditions that precede wildfires are forecasted and a wildfire threat is imminent, SMUD's Distribution System Operations (DSO) personnel have the authority to de-energize select distribution circuits in the PCA. DSO personnel will use individual or multiple de-energization triggers listed below, as well as power system knowledge to make de-energization decisions. This decision requires a balancing of all these factors as well as a knowledge of the area and operation of the power system; no single element is determinative. DSO relies on weather data from various sources, including Wunderground.com and SMUD's internal Energy Management System.

6. Wildfire prevention strategy and programs

Triggers for de-energization of PCA circuits:

- Imminent fire danger
- Customer or community impacts
- RFW in effect for areas inside or immediately surrounding the PCA
- Critically dry vegetation that could serve as fuel for a wildfire
- Low humidity levels
- Temperatures over 100°F
- Winds projected beyond 12kV design criteria (56 mph)
- Mandatory fire orders in effect (as directed by any Agency Incident Commander)
- On-the-ground, real-time observation from SMUD or other agency field staff

SMUD's DSO personnel have the authority to de-energize portions of the distribution grid during emergency conditions when requested by local police or local fire officials. These are handled individually, and don't fall under SB901 requirements.

6.2 Transmission grid operational practices

6.2.1 *Disabling reclosing*

All Valley 115 kV, 230 kV and UARP 69 kV, 230 kV transmission auto reclosers are disabled and will remain disabled to mitigate wildfire risks.

6.2.2 *Planned de-energization during fire season*

SMUD's Power System Operators (PSO) have the authority to de-energize portions or all of the Valley and UARP transmission line(s) for safety, reliability, conditions beyond design criteria, threat of wildfires and during emergency conditions when requested by local law enforcement or fire officials.

During active fire season as declared by CAL FIRE the PSO is authorized to de-energize portions or all of the Valley and UARP transmission line(s) when there is imminent fire danger, mandatory fire orders are in effect,

and/or the transmission system is experiencing conditions beyond design criteria. The PSO will take a combination of many factors into consideration when implementing de-energization procedures, which include the triggers listed below, as well as power system knowledge. De-energization decisions require a balancing of all these factors as well as a knowledge of the area and operation of the power system; no single element is determinative.

- Extreme fire danger threat levels, as classified by the National Fire Danger Rating System
- A RFW declaration by the National Weather Service
- Low humidity levels lower than what is required for a RFW
- Sustained winds exceeding design standards
- Site-specific conditions such as temperature, terrain and local climate
- Critically dry vegetation that could serve as fuel for a wildfire
- On-the-ground, real-time observation from SMUD or other agency field staff

The PSO utilizes various operational and situational awareness tools to determine when de-energization is appropriate. The tools are listed below:

- Weather data telemetered into SMUD's Energy Management System; such as wind speed, wind direction, air temperature, barometric pressure, relative humidity
- US Forest Service – Wildland Fire Assessment System, <https://www.wfas.net/>
- CAL FIRE Incidents Information, http://cdfdata.fire.ca.gov/incidents/incidents_statevents
- CAL FIRE California Statewide Fire Map, <http://www.fire.ca.gov/general/firemaps>
- National Weather Service, <https://www.weather.gov/>
- Indji Watch real time operational tool
- Geographic Information System (GIS) based tools

6. Wildfire prevention strategy and programs



6.3 Infrastructure inspections and maintenance

SMUD performs a multitude of time-based inspections on its T&D facilities. A description of the inspections is summarized in the following sections.

6.3.1 Transmission line inspections

SMUD's transmission lines are grouped in two inspection areas. UARP region includes all lines east of Folsom going up to the hydro-electric facilities in the Sierras. The Valley region comprises of all transmission lines in SMUD's service territory.

6.3.1.1 Aerial patrols (helicopter)

SMUD uses helicopters to perform aerial inspections of transmission lines. During these patrols, line inspectors inspect the condition of line structures and attachments, any structural problems and safety hazards, damage to insulators, vibration dampers, hardware, conductors, static shield wires, optical ground wires, signs of hot spots, vegetation growth and tower identification signs (aerial signs).

Aerial patrols are performed twice a year on all lines in the UARP and once a year in the Valley.

6.3.1.2 Ground patrols

Line inspectors use a combination of walking and driving when conducting ground patrols. They visit transmission tower sites to make detailed visual inspections and on occasion they complete IR inspections. The line inspectors utilize binoculars to detect any damage to above ground components. Line inspectors may climb towers identified with severe corrosion or deformation to determine the corrective action required.

Ground patrols are performed annually on all lines in the UARP, and every two years on all lines in the Valley.

6.3.1.3 IR inspections (helicopter)

The line inspectors use IR cameras to inspect transmission lines as part of one of the helicopter patrols. An IR camera is used to identify "hot spots" on current carrying components of the transmission line. Hot spots could be an indication of loose connections that may fail. The images are saved, and written reports are prepared, which document the conditions found. The documentation identifies the location, problem found, date and time of the IR inspection. When the thermographer identifies abnormal conditions, these are reported for investigation and correction as necessary. Items identified are reported and scheduled for correction.

IR inspections are performed annually on all lines in the UARP, and every two years in the Valley.

6. Wildfire prevention strategy and programs

6.3.1.4 *Wood pole intrusive inspections*

Intrusive inspections require sample material be taken for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading. Wood poles are subjected to an intrusive inspection to determine and identify problems such as rot and decay. The inspection is performed using a calibrated drill bit that records the resistance and pressure required to drill a fixed diameter hole to a measured depth. The results are produced as a graph on a depth scale which is used to find voids and decay within the pole.

SMUD intrusively inspects wood poles at a minimum cycle of 10 years and a maximum cycle of 14 years.

6.3.1.5 *Vegetation right-of-way maintenance*

Both line inspectors and VM planners visually inspect the T&D ROW for encroachments, access road conditions and safety hazards. An annual helicopter patrol is also conducted to specifically inspect for vegetation issues that could threaten SMUD facilities. The VM ROW maintenance program's approach is to clear the ROW of incompatible species and to maintain low-growing diverse plant communities that are compatible with electrical facilities by using Integrated Vegetation Management (IVM) Wire Zone-Border Zone Management which is the industry standard. This is a long-term approach which supports system reliability through reclaiming the ROW and managing for future workload. This approach allows for ongoing monitoring of vegetation corridors to prevent encroachment into the minimum vegetation clearance distance (MVCD) and also ensures SMUD facilities meet or exceed state laws and industry standards.

Vegetation ROW inspections are performed annually on all transmission, 69 kV, and 4 kV lines in the UARP, and regularly one to three years on T&D lines in the Valley.

6.3.1.6 *Splice assessment program*

This program is designed to assess the integrity of transmission conductor splices. The technology used by an outside contractor uses an x-ray machine that encompasses a splice and takes an x-ray image of the splice. Inspectors then evaluate the image to determine the internal condition of the splice. This allows staff to identify splices that are potentially close to failure. A special type of in-line splice connector corrector is installed to strengthen the splice when needed.

6.3.2 *Distribution line inspections*

SMUD performs various inspections on distribution lines to ensure safety, reliability and consistency with standards in California Public Utility Commission (CPUC) General Order (GO) 95, GO 128 and GO 165.

6.3.2.1 *Detailed line inspections*

Line inspectors use a combination of walking and driving when conducting detailed line inspections (DLIs). They visit each SMUD pole to make detailed visual inspections. The line inspectors utilize binoculars to detect any damage to above ground components attached to the pole. The inspectors look for broken or loose hardware; mechanical damage to any component; condition of guy wires and anchors; condition of insulators and conductors; condition of disconnects and fuse holders; condition of risers and conduits; condition of transformers, reclosers and cap banks. Ground conductors, moldings, signs, and other minor hardware is also inspected. Similar inspections are performed on pad-mounted equipment and equipment installed below grade in vaults or building basements.

DLIs are performed every five years on all overhead distribution equipment and pad-mounted equipment, and every three years on underground equipment.

6. Wildfire prevention strategy and programs

6.3.2.2 Line patrols

Line patrollers patrol their designated service area and track their progress with a GIS enabled visualization tool. The use of the tool ensures that all devices within SMUD's service territory are patrolled. The patrollers are looking for obvious signs of defects, structural damages, broken hardware, sagging lines and vegetation clearance issues. Any anomalies found are addressed based on severity of the defect.

Line patrols are performed annually on all distribution lines and equipment.

6.3.2.3 69 kV and pole clearing area 12 kV IR inspections (helicopter)

SMUD performs helicopter IR inspections on 69 kV circuits in the Valley and 12 kV circuits within the PCA. See section 6.3.1.3 for additional description.

69 kV and PCA 12 kV IR inspections are performed every other year in the Valley.

6.3.2.4 Wood pole intrusive inspections

Distribution wood pole intrusive inspections follow the same criteria as transmission wood poles intrusive inspections. See section 6.3.1.4.

6.3.2.5 Annual pole clearing program

The pole clearing program is an annual requirement to clear vegetation around poles that have certain CAL FIRE non-exempt equipment on it in the PCA. This program is in compliance with California Public Resource Code 4292. The code calls for clearing vegetation within a 10-foot radius of a pole or tower on which non-exempt equipment is attached, unless such pole or tower meets certain criteria that makes it exempt from the clearance requirements. SMUD contracts this activity out for completion prior to May 15th of each year.

6.3.3 Distribution substation inspections

SMUD performs various inspections on substations to ensure safety and reliability. SMUD inspections meet or exceed standards in CPUC GO 174.

6.3.3.1 Visual inspections

Substation inspectors visit each SMUD substation to visually inspect the facility and all equipment within. The inspectors look for broken or loose hardware; vandalism or damage to any equipment; oil or gas leaks; perimeter fence security; condition of the buss, insulators and other hardware; condition of the control house; conditions of the poles/structures and lines exiting the substation; condition of the disconnects and fuses for signs of damage and connectivity.

Visual inspections are performed 10 times per year.

6.4 Vegetation management

SMUD's VM program is responsible for the patrol, work plans and quality control (QC) audits of the actual tree work for the T&D system in the Valley, as well as the Transmission system in the UARP. These activities are performed year-round in order to remain in compliance with applicable Federal Facilities Design, Connections and Maintenance (FAC) 003-4 and State regulations, including Public Resources Codes section 4292 and 4293; and incorporate the standards in CPUC GO 95 Rule 35.

6.4.1 Distribution system vegetation management

SMUD performs routine vegetation maintenance, such as pruning and removal, on a time-based interval. This interval consists of one, two, and three-year ground-based field patrols. The field patrols are ground based inspections of tree and conductor clearances and hazard tree identification. The results of the patrols are targeted areas for vegetation pruning or removal.

SMUD hires contracted tree crews to complete the identified annual vegetation work (pruning and removal) needed to ensure public safety and electric reliability as well as reduce wildfire risk in SMUD's service territory. During the tree work, the contractor aims to achieve up to 12 feet of clearance, unless otherwise directed by SMUD VM staff. The contractor also clears vegetation from SMUD's secondary voltage, service drops and pole climbing space on an as needed basis. SMUD's

6. Wildfire prevention strategy and programs

contractors follow American National Standards Institute (ANSI) A300 concepts and utility directional pruning, which supports proper pruning/tree health while achieving and maximizing the pruning cycle.

6.4.2 *Transmission system vegetation management*

SMUD VM planners perform annual ground-based field patrols to ensure compliance with state and federal regulatory requirements (Public Resource Code 4293) and alignment with standards in CPUC GO 95 Rule 35 and FAC 003-4. The field patrols are ground based inspections of tree and conductor clearances and hazard tree identification. The results of the patrols are targeted areas for vegetation pruning or removal. Additionally, SMUD completes annual aerial patrols to address the ongoing challenge of tree mortality due to drought and various insect vectors.

SMUD hires contracted tree crews to complete the identified annual vegetation work (pruning and removal) needed to ensure public safety and electric reliability as well as reduce wildfire risk in SMUD's service territory.

During the tree work, the contractor follows the planner's prescription to achieve the desired clearance. SMUD's contractors follow ANSI A300 concepts and utility directional pruning, which supports proper pruning/tree health while achieving and maximizing the pruning cycle. Additionally, SMUD's transmission VM program aligns with ANSI A300 Part 7 IVM standard.

6.5 Fire mitigation construction

6.5.1 *Ester-based insulating fluid (Envirotemp FR3¹⁴) in transformers*

Envirotemp FR3 fluid is a natural ester derived from renewable vegetable oils – providing improved fire safety, transformer life/load ability and environmental benefits that are superior to mineral oil and unsurpassed by any other dielectric coolant. SMUD began purchasing and installing pad mounted and pole mounted transformers with FR3 fluid in 2004. All new distribution transformers installed since 2004 and moving forward contain FR3 fluid. This includes replacements for old transformers and new installations.

6.5.2 *Non-expulsion equipment in PCA and UARP 4kV*

SMUD has identified additional targeted wildfire mitigation measures for the PCA and the UARP 4kV lines. A capital program is in place and scheduled for overall replacement of expulsion type equipment. SMUD may have to replace poles, lines, or equipment as ongoing activities. For this reason, SMUD crews will install non-expulsion equipment (CAL FIRE exempt equipment) if any construction activity occurs in the PCA or on the UARP 4kV lines.

6.5.3 *Weather stations*

SMUD has 14 weather stations within its service territory and UARP, eight are in the Sacramento Metropolitan area and six in the UARP. Of the six in the UARP, four new weather stations were installed in 2018 and are positioned on towers located within the HFTD. to support SMUD's de-energization procedures. Data from weather stations installed in SMUD's service territory and UARP assist in the real-time monitoring of weather conditions for situational awareness and to help inform implementation of mitigation measures such as de-energization of transmission lines.

6.6 System enhancement capital projects

SMUD forecasts and plans for upcoming work several years in advance. This planning process allows adequate level of staffing and funding for needed projects. This section identifies the specific upcoming projects that help reduce SMUD's wildfire risk.

6.6.1 *Install non-expulsion devices in PCA*

Projected Start Date: 2020

Expected Completion: 2022

This project will target SMUD's PCA to reduce the risk of fire ignitions by installing non-expulsion equipment (CAL FIRE exempt equipment¹⁵). Existing overhead fuses and fuse holders will be replaced with non-expulsion type fuses. Existing arresters will be replaced with new arrestors that have arc protection.

¹⁴ Additional Information: <https://www.cargill.com/bioindustrial/envirotemp/fr3>

¹⁵ Additional Information: <https://osfm.fire.ca.gov/media/8482/fppguidepdf126.pdf>

6. Wildfire prevention strategy and programs

6.6.2 Upgrade UARP 4kV breakers for remote operability

Projected Start Date: 2020

Expected Completion: 2020

This project targets SMUD's 4kV distribution system in the UARP to reduce the risk of fire ignitions. The 4kV circuit breakers will be upgraded to allow PSO to remotely de-energize the lines during high fire threat conditions. The upgrade will also bring back breaker status to PSO to provide confirmation of breaker open or close status.

6.6.3 Install non-expulsion devices in UARP 4kV system

Projected Start Date: 2019

Expected Completion: 2020

This project targets SMUD's 4kV distribution system in the UARP to reduce the risk of fire ignitions by installing non-expulsion equipment (CAL FIRE exempt equipment¹⁶). Existing overhead fuses and fuse holders will be replaced with non-expulsion type fuses. Existing arresters will be replaced with new arresters that have arc protection.

6.7 Pilot projects

Pilot projects are initiated to explore technologies and practices that are new to SMUD. These projects are intended for SMUD staff to evaluate the effectiveness and benefits of the technologies or practices. Based on the results of the pilots, SMUD may elect to integrate the technologies or practices into its various ongoing maintenance programs. The description of these projects follow.

6.7.1 LiDAR¹⁷ ortho, oblique and hyper spectral imagery

Start Date: 2017

Expected Completion: 2022

SMUD contracted with an external vendor to utilize LiDAR and remote sensing to supplement or enhance traditional "boots on the ground" vegetation patrols. Both LiDAR and Hyperspectral Imagery is obtained from rotary and fixed wing aircraft. The technology measures vegetation clearance distances from the conductor in both "as flown" and modeled conditions. Modeling is taking all the engineering calculations for maximum load and wind ratings to calculate clearance distances in a "worse-case scenario". The Hyperspectral and Ortho Imagery is used to pinpoint tree speciation and supports detecting tree health or condition that may not yet be visible to the naked eye. The vendor captured LiDAR data along the transmission corridors in the UARP, as well as the portions of Sacramento County designated as CAL FIRE's State Responsibility Area (SRA) for both T&D circuits. The Lidar detections are categorized by priority, and Urgent Critical Detections (as soon as SMUD VM receives notification, SMUD VM field checks within 1 business day, most within same day data is received), Urgent and Future Potential conflicts are field checked and tree work prescribed as needed within 2-3 week of obtaining the data. Additionally, longer range detection conflicts are prioritized and incorporated into routine annual patrols (Transmission & SRA Distribution). These are reviewed by SMUD VM Planners during annual patrols and tree work prescribed as required.

¹⁶ Additional Information: <https://osfm.fire.ca.gov/media/8482/fppguidepdf126.pdf>

¹⁷ Additional Information: <https://www.neonscience.org/lidar-basics>

6. Wildfire prevention strategy and programs

6.7.2 *Install fire monitoring cameras on towers in UARP transmission corridor*

Projected Start Date: 2020

Expected Completion: 2022

Fire monitoring cameras are a new technology tool that could be used to detect fire. An alarm is sent in real-time through a communications network to operators when the camera detects a fire in its field of vision. Operators can then verify and respond accordingly to prevent or reduce fire risks. SMUD's UARP transmission corridor travels through some remote locations of the Sierra Nevada mountain range where cell networks may not be available. SMUD will pilot the use of these cameras to see how it may help reduce SMUD's wildfire risk. The pilot project is in the early stages of development and project milestones have not been outlined.

6.7.3 *Feasibility study of 4kV lines in UARP*

Projected Start Date: 2019

Expected Completion: 2020

SMUD is evaluating the feasibility of various options for reconstruction of the UARP 4kV bare wire overhead lines. This evaluation will include options to re-conductor the lines with covered conductor, to re-conductor the lines with spacer cables, and to underground lines along the roadways as replacement of the overhead lines. This evaluation will be the basis for identifying one or potentially more projects for replacing the existing bare wires. We anticipate selecting an approach and initiating a construction project in 2020.

6.8 *Emerging technologies*

SMUD recognizes that numerous emerging technologies are developing and may play a role in building the resiliency of the system. SMUD will continue to monitor available technologies in future WMPs.

6.9 *Workforce training*

SMUD has work rules and complementary training programs for its workforce to help reduce the likelihood of the ignition of wildfires.





7. Response guidelines

7.1 Emergency preparedness and response

As a publicly owned utility, SMUD has planning, communication and coordination obligations pursuant to the California OES Standardized Emergency Management System (SEMS) Regulations, adopted in accordance with Government Code section 8607. The SEMS Regulations specify roles, responsibilities and structures of communications at five different levels: field response, local government, operational area, regional and state (see figure 7). Pursuant to this structure, SMUD regularly coordinates and communicates with the relevant safety agencies as well as other relevant local and state agencies, as a peer partner.

SMUD interacts with our emergency response agencies on a peer-to-peer relationship as SMUD's version of OES. As part of our response to a storm, fire, rotating outage, black start events, etc., we collaborate with the local OES and provide an agency representative (liaison) to the county (and/or city) Emergency Operations Centers (EOC) to ensure good communication and coordination. Our two primary coordination points are Sacramento County OES

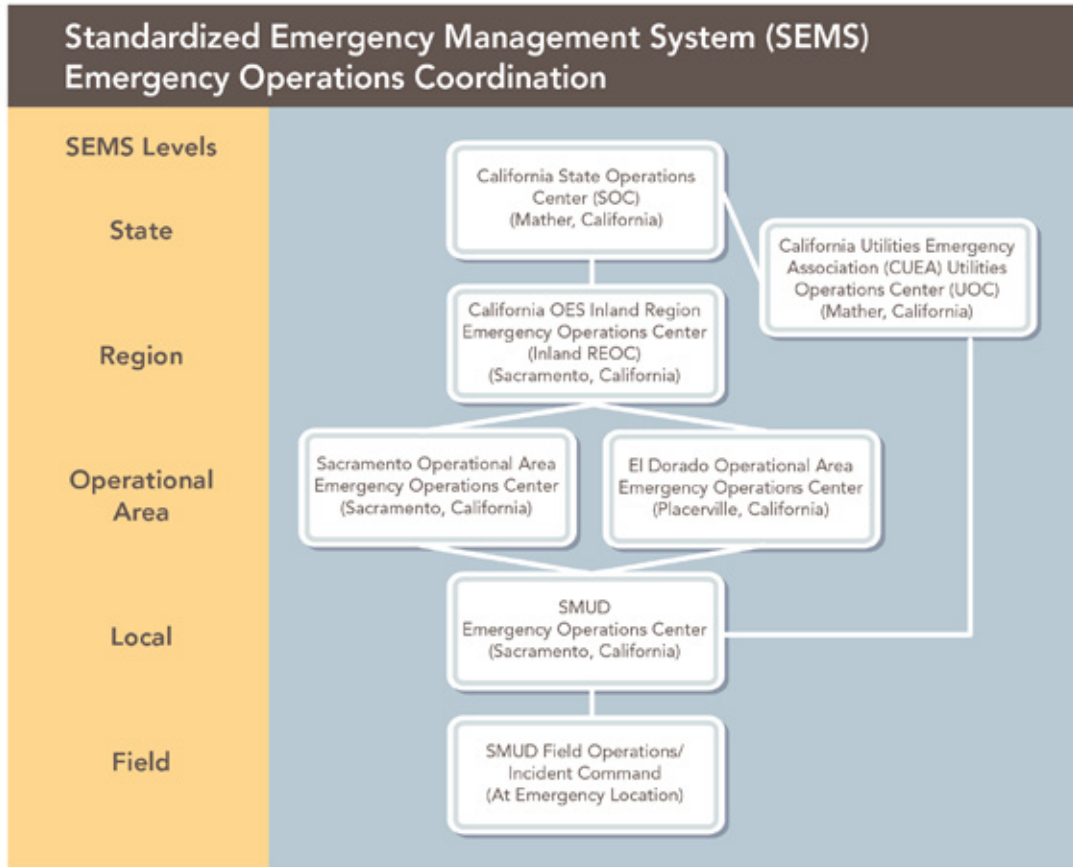
and El Dorado County Sheriff's Office OES (for the UARP region). Additionally, SMUD maintains good relationships with Yolo (gas pipeline), Placer County OES (service territory and UARP), Solano (wind farm) and Yuba (Camp Far West) counties.

For typical winter storms and emergency events, SMUD Emergency Preparedness staff contact the local OES and establish themselves as the duty officer for coordination. They also invite them to send agency representatives into SMUD's EOC. These representatives can include: City of Sacramento Assistant Fire Chief, Sac Metro Fire Battalion Chief, Folsom Fire Battalion Chief, local cities, Sacramento County Office of Emergency Services, the National Weather Service and other local critical infrastructure agencies, ensuring coordination for our service territory.

SMUD has employees who serve as utility representatives when needed at the State Operations Center for the California Utilities Emergency Association (CUEA), which provides a direct link for critical infrastructure coordination to the California State Operations Center.

7. Response guidelines

Figure 7. Standardized emergency management system (SEMS) emergency operations coordination



7. Response guidelines

7.2 Public and agency communications for a potential wildfire

Public safety is a guiding principle at SMUD. Shutting off power may be the safest approach and makes sense if the risk of a wildfire starting and spreading is severe. While SMUD's WMP activities are designed to mitigate wildfire danger, in instances of high fire threat conditions, one mitigation measure could result in an interruption of electrical service. SMUD proactively communicates to customers and key stakeholders through multiple channels about preparing for potential curtailments, and the power restoration process. SMUD recognizes that many entities and individuals are particularly vulnerable during extended power outages and makes every effort to provide up to date information to these populations prior to, during and after an event.

This proactive communication is utilized for:

1. A wildfire threat to localized circuits within the SMUD service territory that results in localized de-energization.
2. A wildfire threat to SMUD's UARP hydroelectric generation and transmission system that results in a de-energization event causing a capacity/energy shortage (rotating outages).
3. A wildfire threat to a major shared transmission line(s) that impacts the statewide grid or parts of it and creates a resource shortage for the utilities, including SMUD, that rely on the resources the line(s) provides.

SMUD's Contact Center, Strategic Account Advisors, Media Services, social media and smud.org will provide ongoing and available resources for communication and education for the overall customer base. Additionally, SMUD launched a webpage, smud.org/WildfireSafety, that provides information about SMUD's effort on wildfire planning and prevention, how to identify fire risk in areas where SMUD maintains electric facilities, emergency planning and preparation and SMUD's de-energization protocols.

SMUD also proactively communicates before potential emergency events about our efforts to prepare for and reduce wildfire risk.

In advance of peak fire season, SMUD will conduct ongoing education communication about how to prepare for emergencies in the event of a wildfire, natural disaster or major outage.

SMUD's Public Information Specialists will provide ongoing mass media communication via traditional news media channels and via Facebook and Twitter to provide customers and the community with information about an emergency or potential emergency. SMUD will use established standard outbound communications channels for unplanned outages.

SMUD's Government Affairs Representatives will reach out to the executive staff of local governments, elected officials, SMUD's state delegation, federal representatives and appropriate agency staff to provide initial contact and ongoing communications by email and phone with messages for their constituents.

Customers will be directed to the smud.org/WildfireSafety webpage for information where they'll be able to find:

- Wildfire Policy and Procedure brochure
- Information on how SMUD mitigates fire risk
- Emergency preparedness tips guide
- Links to additional resources
- Rotating outage map and periodic event updates
- Frequently Asked Questions on the shutoff process

In the time leading up to a potential or imminent safety shutoff, SMUD does its best to establish or maintain contact with customers it believes may be impacted (via the various channels mentioned above) and keep the media, local agencies and the public aware of the number of customers affected and SMUD's activities and restoration efforts.

Key stakeholders, federal, state and local elected officials, City and County executive staff and first responders are also contacted via a variety of channels and personnel. SMUD has specific personnel assigned to elected officials and agencies, and to critical customers including water and telecommunications utilities, potentially affected by a shutoff.

7. Response guidelines



7.2.1 Event communications

SMUD's goal is to provide as much advance notice as possible of a public safety power shutoff. SMUD will communicate with customers and key stakeholders in advance of an event, whenever possible. SMUD will make every effort to communicate directly and indirectly to all impacted customers but timelines may vary depending on severity and urgency of the circumstances.

Whenever possible, SMUD will provide potentially impacted customers with notice before implementing any de-energization action, using all available channels to reach customers and other stakeholders with outage information. Sudden onset of conditions could impact its ability to provide advanced notice to customers.

SMUD sends automated pre-recorded phone calls to customers in the impacted areas/neighborhoods advising when the outage is called and direct them to smud.org/outages for up-to-date information. smud.org has been updated with features to further enhance customer communications before and during de-energization events.

The Contact Center IVR (Interactive Voice Response) will have real-time recorded information informing each group of customers that may be impacted before the rotating outages begin. Messages will be customized and updated as needed for each specific event.

Among SMUD's vulnerable customers are those enrolled in the Medical Equipment Discount Rate program (MED rate). These customers rely on specialized medical equipment which are certified by a qualified health professional. A qualified health professional certifies the equipment in use at the home is essential to keep these customers healthy. Currently, SMUD has approximately 9,200 customers who rely on specialized medical equipment and who are enrolled in the MED rate program. SMUD will send these customers an email or letter each year to remind them of the risk of wildfire danger, to have an emergency back-up plan if an outage occurs and refer them to smud.org/WildfireSafety for more information.

7. Response guidelines

7.2.2 *Government agencies and essential service providers*

De-energization is a last resort to maintain public and customer safety during extreme fire risk conditions. If extreme fire danger resulted in de-energization or planned rotating outages, SMUD will provide proactive communications to alert key stakeholders and essential and critical customers like governments, agencies, utilities, healthcare and communications accounts to provide as much notice as possible to minimize the impact on our customers and community.

The following customer categories are considered essential and/or critical service providers:

- Jurisdictions and functional agencies providing essential fire, police and prison services
- Government agencies essential to national defense
- Hospitals, assisted living, and skilled nursing facilities
- Communication utilities, as they relate to public health, welfare, and security, including telephone utilities
- Radio and television broadcasting stations used for broadcasting emergency messages, instruction, and other public information related to the electric curtailment emergency
- Water and sewage treatment utilities identified as necessary for services such as firefighting

SMUD interacts regularly with executive staff of local governments and agencies, local elected officials, its state delegation, its federal representatives and key critical facilities customers to keep them updated on its wildfire mitigation efforts. SMUD also works closely with

staff members in various departments of regional and local governments, functional agencies, public utilities, nonprofits and other service providers on collaborative strategies and partnership opportunities.

Examples of SMUD's communication and engagement with elected officials, government agencies and commercial customers include:

- Regular in-person briefings with federal, state, and local elected officials and key staff on wildfire risk mitigation and other utility-related issues with comprehensive "leave-behind" materials
- Meetings with regional and local government staff and elected officials focused on individual districts, communities, and neighborhoods and mitigation opportunities
- Regular in-person and/or digital communication with critical facilities and key customers through SMUD Strategic Account Advisors
- Interagency projects, collaborative staff training efforts, and regular communication with first responders and essential service providers
- Cross-SMUD participation with the El Dorado County Wildfire Mitigation Stakeholder Group and at other El Dorado County government, public and community meetings
- Ongoing communication, collaboration and support for local Fire Safe Councils and other fire prevention agencies and nonprofits



8. Restoration of service

If a transmission or distribution line has been de-energized in anticipation of a wildfire threat, SMUD troubleshooters or patrollers must perform additional steps prior to re-energization. In an event of a wildfire where distribution poles or transmission structures were burned, additional steps must be taken to rebuild the lines.

8.1 Steps to restoration of service

SMUD work crews must take several important steps prior to restoring electrical service after a de-energization event.

- **Patrol.** SMUD crews patrol the line to look for vegetation in lines and any obvious damage that may prevent safe energization. Depending on the length of the lines, and number of circuits, the patrols can take a several hours to days to complete.
- **Repair.** During patrol, crews look for potential damage to the lines and poles. Where equipment damage is found, additional crews are dispatched with new materials to repair or replace damaged equipment. In some cases, VM crews may be called in to help clear an area of downed trees or branches that have fallen into the power lines while it was de-energized.
- **Test.** Once the lines and poles are safe to operate, crews test the infrastructure by closing the fuse, or breaker to re-energize the line segment.
- **Restore.** Power is restored and the outage communication system provides notification of power restoration to customers.

8. Restoration of service

8.2 Reconstruction after a wildfire

When infrastructure is damaged during a wildfire event, a lot of work is required to plan and execute the rebuilding effort. After local police and fire officials have given SMUD clearance, SMUD work crews can proceed with the assessment and rebuilding effort.

- **Assessment.** SMUD crews must patrol each line segment to determine the extent of damage that has occurred. The patrol involves assessing equipment damage, access issues, any cleanup/debris removal issues and determining personal protective equipment requirements for the crews. SMUD works with the local agency in charge of the fire to access impacted areas as soon as the area is deemed safe by fire officials. During this phase the VM team assesses vegetation damaged by the wildfire that could impact SMUD's facilities.
- **Planning.** After the initial assessment, SMUD supervisors, managers and engineers meet to plan the restoration. The team will work with system operations to prioritize the restoration efforts, targeting the circuits that serve the most critical infrastructure needs.
- **Mobilize.** Based on the size and complexity of the rebuild/restoration efforts, SMUD will coordinate the crews and material needs internally if possible. Mutual aid and contractors may be used on an "as needed" basis to provide additional support. VM crews will begin clearing the ROW and any dangerous trees that pose a threat to the restoration crews. SMUD maintains a critical material vendor list and has contracts it can draw on for labor and material needs; though in an instance of widespread catastrophic damage, necessary materials and labor could experience shortages that may delay work.
- **Rebuild.** The rebuild effort lead by SMUD will commence as soon as areas become safe and accessible. The lines will be rebuilt with a mix of temporary and/or permanent structures as determined during planning. The initial efforts will be to get the lines up and restore the damaged circuits. Depending on the extent of damage, demolition may be performed concurrently or after crews start installing new facilities. SMUD will incorporate new materials and technologies as indicated and available.
- **Restore.** SMUD, mutual aid, or contract crews will restore electric services to our customers as soon as possible after the wildfire. Depending on the extent of damages, customers may have to perform repairs on their facilities and pass inspections by local agencies prior to having full electric service restored. These are coordinated on an as needed basis.



9. Performance metrics and monitoring

This section identifies SMUD's management responsibilities for overseeing this WMP and includes the operating departments and teams responsible for carrying out the various activities described in the previous chapters. This section also identifies the metrics which are used to demonstrate compliance with this WMP.

9.1 Accountability of the plan

SMUD's Chief Grid Strategy and Operations Officer has overall responsibility for the WMP. The Chief Energy Delivery Officer and Chief Customer Officers are responsible for executing the various components of the WMP.

9.1.1 *SMUD operating unit responsibility specific to each component of the plan*

Table 6 lists the Director with responsibility for the departments or workgroups that are accountable for the various components of SMUD's WMP. In each case the Director or the Director's designees will be responsible for the accuracy of, and for operations in accordance with, the specified component of the plan.

9. Performance metrics and monitoring

Table 6. Accountability for the WMP components.

Mitigation Activities	Responsible Department and Workgroup
Risk analysis	Director, Treasury & Risk Management
Fire threat assessment in service territory	Director, Distribution Operations & Maintenance
Wildfire prevention strategy and programs	
<ul style="list-style-type: none"> • Disable reclosers • Planned de-energizations 	Director, Grid Operations (Transmission); Director, Distribution Operations & Maintenance
<ul style="list-style-type: none"> • T&D line patrols • Aerial patrols • 69kV & Transmission line IR inspections • Wood pole intrusive inspection • Splice assessment • Detailed line inspections 	Director, Line Assets
<ul style="list-style-type: none"> • Substation visual inspections 	Director, Substation Assets
<ul style="list-style-type: none"> • Vegetation management • Pole clearing program 	Director, Line Assets
Fire mitigation construction	
<ul style="list-style-type: none"> • FR3 fluid • Non-expulsion equipment 	Director, Distribution Operations & Maintenance
<ul style="list-style-type: none"> • Weather stations 	Director, Grid Operations (Transmission); Director, Distribution Operations & Maintenance
System enhancement capital projects	
<ul style="list-style-type: none"> • Install non-expulsion equipment in Pole Clearing Area 	Director, Distribution Operations & Maintenance; Director, Line Assets
<ul style="list-style-type: none"> • Feasibility study of 4kV lines in Upper American River Project area 	Director, Line Assets
Pilot projects	
<ul style="list-style-type: none"> • Light Detection and Ranging and Hyper-Spectral Imagery 	Director, Line Assets
<ul style="list-style-type: none"> • Fire monitoring cameras 	Director, Grid Operations (Transmission); Director, Distribution Operations & Maintenance
Emergency preparedness	
<ul style="list-style-type: none"> • SMUD Emergency Operations Centers 	Director, Facilities & Security Operations
<ul style="list-style-type: none"> • Public and agency communications for wildfires 	Director, Customer Care; Director, Retail Product Delivery & Sales; Director, Marketing & Corporate Communications

9. Performance metrics and monitoring

9.2 Metrics

This section provides the metrics used to measure the performance of the WMP and outlined programs.

9.2.1 Metrics and assumptions for measuring WMP performance

SMUD will track the following metrics to measure the performance of this WMP, and its effectiveness in reducing wildfires (see table 7). As industry risk metric standards continue to develop, SMUD will identify additional metrics to measure the reduction of wildfire risk in future plans.

SMUD is implementing a new system to track ignition events. The new system is modifying current processes to capture more detailed information related to wildfire risks. It is expected to be online by the end of 2019.

In the initial years, SMUD anticipates that there will be relatively limited data gathered through these metrics. However, as the data collection history becomes more robust, SMUD will be able to identify areas of its operations that are disproportionately impacted. SMUD will then evaluate potential improvements in future updates to this WMP.

PUC section 8387 subsection b(2)(E) requires a discussion of how the application of previously identified metrics to previous WMP performances has informed the WMP. This discussion is not applicable to this initial WMP. SMUD expects to include discussion on this issue in its next WMP update.

9.3 Maintenance performance targets

This section lists metrics used to evaluate SMUD’s inspection and maintenance programs (see table 8).

9.3.1 Maintenance program targets

Work is identified in annual work plans authorized on an executive level, and work that remains incomplete will be flagged in future work plans. Work may be field verified and open work notifications are regularly reviewed to allow management to prioritize work in accordance with current risks. SMUD’s target is always to complete 100 percent of the work within the initially scheduled time frame; however, emergencies or other unforeseen contingencies can occur that requires material and labor resources to be otherwise assigned. In this instance delayed work will be prioritized in following time periods. All work is completed within time periods to allow for the safe and reliable operation of the electric system in accordance with applicable requirements and industry standards.

Table 7. Metrics

Specific metric	Indicator	Measure of effectiveness	Bounds
Wire down events caused by SMUD equipment failure	Count of events	No material increase	Fire season (May 1 thru October 31)
Ignition events	Count of events	No material increase	

9. Performance metrics and monitoring

Table 8. Programmatic targets

Program	Target	Description
Distribution Line Inspections	≥95%	Perform all detailed line inspections within the compliance period set in General Order (GO) 95/165 by the end of the year. The inspections must be completed within the specified time intervals set for each inspection type. See section 6.4.1 for a detailed description of the program.
Distribution Wood Pole Intrusive Tests	≥95%	Perform all wood pole intrusive tests scheduled for the year. SMUD's goal is to perform wood pole tests within 10 years of installation, and 10 years thereafter. SMUD is on its fourth year of a re-baseline program to get all poles on the 10-year schedule. See section 6.3.2 for a detailed description of the program.
Distribution Annual Line Patrol	≥95%	Perform all annual distribution line patrols within the compliance period set in GO 95/165. See section 6.4.2 for a detailed description of the program.
Annual Pole Clearing Program	≥95%	Complete all vegetation clearing activities within the Pole Clearing Area (PCA) prior to the beginning of fire season of each year. See section 6.3.2.5 for a detailed description of the program.
Transmission Structure Patrols	≥95%	There are three inspection regions for transmission structure patrols. The UARP region is patrolled every year, and the Valley regions are patrolled every other year. The goal is to perform all scheduled patrols prior to the end of the year. See section 6.3.1.2 for a detailed description of the program.
Transmission Aerial Patrols (Helicopter)	≥95%	Aerial patrols are performed twice a year in the UARP, and once a year in the Valley (in permissible areas). The goal is to perform all scheduled patrols prior to the end of the year. See section 6.3.1.1 for a detailed description of the program.
Transmission IR Patrols (Helicopter)	≥95%	IR patrols are performed once a year in the UARP, and every other year in the Valley (in permissible areas). The goal is to perform all scheduled patrols prior to the end of the year. See section 6.3.1.3 for a detailed description of the program.
69 kV IR Helicopter Patrols	≥95%	IR patrols on the 69 kV in the Valley are performed every other year (in permissible areas). The goal is to perform all scheduled patrols prior to the end of the year. See section 6.4.3 for a detailed description of the program.
Pole Clearing Area	≥95%	SMUD will continue to annually manage the PCA to ensure compliance with PRC 4292 to prevent ignition and propagation of fire caused by SMUD electric overhead assets.
Distribution Vegetation Pruning/Clearing	≥95%	SMUD will continue to annually patrol and complete respective tree work to insure compliance with PRC 4293 to prevent ignition and propagation of fire caused by SMUD electric overhead assets.
Transmission Vegetation Pruning/Clearing	≥95%	SMUD will continue to annually patrol and complete respective tree work to insure compliance with PRC 4293 and NERC FAC-003-4 to prevent ignition and propagation of fire caused by SMUD electric overhead assets.

9. Performance metrics and monitoring

9.3.2 System enhancement capital project targets

Once a capital project is approved, it is planned for execution based on the upcoming year’s work schedule.

The targets in table 9, for the approved project are monitored via milestone achievements.

Table 9. System enhancement capital project targets

Program	Target	Description
Install non-expulsion devices in PCA	25% - 35% per year	This is a three-year project. Work performed for this project will be coordinated with other line work in the area for increased efficiency. The goal is 100% completion over the three-year period.

9.4 Monitoring and auditing of the WMP

The WMP will be reviewed annually. This annual review will align with SMUD’s existing business planning process. This review will include an assessment of the WMP programs and performance.

SMUD’s business planning process includes budgeting and strategic planning for a 3-5-year planning horizon.

9.4.1 Accountability

SMUD’s Chief Grid Strategy and Operations and Chief Energy Delivery Officers (collectively referred to as Chiefs) will be responsible for monitoring and auditing the targets specified in the WMP to confirm that the objectives of the WMP are met.

9.4.2 Identify deficiencies in the WMP

At any point in time when deficiencies are identified, the Chiefs or their delegates are responsible for correcting the deficiencies.

9.4.3 Written processes and procedures

The operational areas conduct their work according to written processes and procedures. Having written processes and procedures provides for consistency in the execution of programs and activities.

9.4.4 Monitor and audit the effectiveness of inspections

SMUD has existing quality control processes embedded into its existing general practice. However, for certain programs, there is a formal quality control process. The following depicts a few of these programs.

9.4.4.1 Distribution system inspections

SMUD’s maintenance planning group manages T&D line and substation assets. A key component in managing assets is the development of comprehensive inspection and maintenance programs. The maintenance planning group develops inspection and maintenance programs driven by the need to ensure the safe operation of T&D line and substation facilities, reduce risk of power-related wildfire, meet federal and state regulatory requirements, achieve reliability performance within mandated limits and optimize capital and operations & maintenance (O&M) investments. In addition, this group regularly monitors inspection and corrective maintenance records, as well as diagnostic test results to adjust maintenance plans and develop new programs. SMUD uses best industry practices in developing its maintenance plans.

9. Performance metrics and monitoring

SMUD's inspection and maintenance programs focus on the following objectives:

- Ensure employee and public safety
- Minimize risk of wildfire posed by power lines and equipment
- Maintain regulatory and SMUD policy compliance
- Improve the availability and reliability of the system
- Employ industry best practices
- Extend the useful life of equipment
- Minimize the total cost of equipment ownership

The maintenance planning group develops and issues annual inspection work plans during the last quarter of the current year for the following year, which are maintained in SMUD's Enterprise Asset Management (EAM) system.

SMUD's Grid Assets Department is responsible for performing the inspections and corrective maintenance. When deficiencies in SMUD facilities are identified, corrective maintenance notifications are created in SAP. The priority for corrective maintenance is to remove safety hazards immediately and repair deficiencies according to the type of deficiency, severity and HFTD tiers. Inspection notifications are monitored throughout the year to ensure timely completion via regular internal reports using SAP data. Enterprise applications are used to deploy, visualize and validate work based on business rules. These applications provide the visibility and monitoring of work required to make informed decisions and to achieve compliance with our inspection and maintenance programs.

9.4.4.2 *Vegetation management (VM)*

SMUD's vegetation clearing/pruning activities are performed by contractors. The contractors are quality audited by SMUD (VM) personnel. Distribution system

related work and contractors are field audited and approximately 7% of the tree work (pruning and removal) is reviewed. This quality assurance (QA) effort is tracked to monitor program effectiveness and overall tree work performance. For transmission, SMUD VM staff perform a quality control (QC) audit of 100% of the transmission system related work performed by the contractor. For both T&D QA efforts all deficiencies are reissued to the contractor management team and corrective action is required.

9.4.5 *Internal audit*

SMUD's internal audit department, known as Audit and Quality Services (AQS) provides independent, objective assurance and consulting services to the Board of Directors and management designed to add value and improve SMUD's operations. The AQS mission is to enhance and protect organizational value by providing risk-based and objective assurance advice and insight. The work of AQS provides reasonable assurance regarding the achievement of objectives in the following areas:

- Adherence to plans, policies and procedures
- Compliance with applicable laws and regulations
- Effectiveness and application of administrative and financial controls
- Effectiveness and efficiency of operations
- Reliability of data
- Safeguarding assets
- Accuracy of the SD monitoring reports

As part of AQS' process to develop its annual audit plan, AQS considers all enterprise risks and performs audits over a selection of processes across electric T&D as well as substation assets.



10. Independent evaluation, public comment and board presentation

SMUD conducted extensive stakeholder outreach during its preparation of the WMP. SMUD personnel met with local fire agencies and safe councils, OES and healthcare organizations. In addition, SMUD invited federal, state and local agencies, representatives of utilities, telecommunication providers, and critical care customers to attend stakeholder outreach meetings where information regarding the preparation and contents of the WMP were provided. A draft of the WMP was posted on SMUD's website, SMUD.org/WildfireSafety and made available for public comment for more than thirty days. Notice of the public review draft was provided to the above stakeholders and published in local newspapers, including the Sacramento Bee, on social media, and through electronic newsletter. Interested parties were also invited to comment on the plan at the time it was presented to SMUD's Board of Directors in a noticed public meeting.

10.1 Public comment

A draft copy of the WMP was made available to the public for comment from May 3, 2019 through June 21, 2019. A summary of comments received can be found in Table 9.

SMUD Board and Board Committee meetings are open and accessible to the public. Meeting notices and agendas are posted, at a minimum, 72 hours in advance at the SMUD office and on SMUD's website. Those who are unable to attend the meeting in-person can livestream the

meeting or view a recording on SMUD's website. SMUD offers the opportunity for persons interested in wildfire related matters to sign up to receive notifications any time wildfire is being discussed at an upcoming Board or committee meeting at smud.org/WildfireSafety.

10.2 Board presentation

The WMP will be posted on SMUD's website and be presented to the Board at a noticed public meeting in Fall 2019.

10.3 Independent evaluation

SMUD issued a public request for information, consistent with SMUD's current procurement practice, to identify the best qualified independent evaluator to assess the comprehensiveness of SMUD's WMP. SMUD contracted with a qualified independent evaluator with experience in assessing the safe operation of electrical infrastructure. The independent evaluator's report will be posted to SMUD's website and presented to SMUD's Board of Directors at a noticed public meeting.

10.4 California Wildfire Safety Advisory Board

On or before July 1, 2020, SMUD will submit the WMP to the California Wildfire Safety Advisory Board (CWSAB). The CWSAB will review and provide comments and advisory opinions regarding the content and sufficiency of the WMP. SMUD will consider comments and opinions received by the CWSAB in future plans.

11. Appendix

This section contains supporting information to the document.

11.1 Definitions

Distribution System Operations (DSO): SMUD’s DSO personnel is responsible for directing the safe and reliable operation of SMUD’s Distribution system while operating within current policies and procedures during normal and emergency situations. Distribution system operators prepare, check and administer the execution of safe and reliable switching procedures. DSO will monitor and maintain equipment loading levels to prevent damage to equipment. This group is also responsible for updating outage information timely and accurately so that information can be provided to internal and external customers.

Fire Hazard¹⁸: “Hazard” is based on the physical conditions that give a likelihood that an area will burn over a 30 to 50-year period without considering modifications such as fuel reduction efforts.

Fire Risk¹: “Risk” is the potential damage a fire can do to the area under existing conditions, including any modifications such as defensible space, irrigation and sprinklers and ignition resistant building construction which can reduce fire risk. Risk considers the susceptibility of what is being protected.

Hardening: Modifications to electric infrastructure to reduce the likelihood of ignition and improve the survivability of electrical assets.

High Fire Threat District (HFTD)¹⁹: The HFTD identifies areas of elevated and extreme fire risk related to electric utility facilities. These areas are reflected in a map adopted by the CPUC after an extensive public process. It is a composite of two maps:

1. Tier 1 High Hazard Zones (HHZs) on the U.S. Forest Service - CAL FIRE joint map of Tree Mortality HHZs (“Tree Mortality HHZ Map”). Tier 1 HHZs are zones in direct proximity to communities, roads, and utility lines and are a direct threat to public safety.
2. Tier 2 and Tier 3 fire-threat areas on the CPUC Fire-Threat Map. 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. 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.

Pole Clearing Area (PCA): SMUD defined area where poles with non-exempt equipment have annual vegetation clearing and/or pruning within a 10-foot radius in compliance with PRC 4292 prior to the start of fire season, currently May 1 of each year. The custom-defined PCA boundary includes SRA boundary and adjacent areas with similar vegetation, and portions of a Local Responsibility Area (LRA) in the southern part of Sacramento County. This boundary area exceeds the current SRA boundary due to similar vegetation and risk of ignition. Overhead electrical facilities crossing into and within the boundary of the PCA fall under special operating conditions and fall under enhanced maintenance programs.

Power System Operations (PSO): SMUD’s PSO personnel analyze, direct, monitor, control and/or operate SMUD’s Gas Pipelines and Electric Generation and Transmission Systems and associated facilities in a safe, reliable and efficient manner during routine and emergency situations. This position has the responsibility and authority to support and implement real-time actions.

¹⁸ Source: http://www.fire.ca.gov/fire_protection/downloads/siege/2007/Overview_Glossary.pdf

¹⁹ Source: <http://www.cpuc.ca.gov/FireThreatMaps/>

11. Appendix

Red Flag Warning (RFW)²⁰: A term used by fire-weather forecasters to call attention to limited weather conditions of particular importance that may result in extreme burning conditions. It is issued when it is an on-going event, or the fire weather forecaster has a high degree of confidence that Red Flag criteria will occur within 24 hours of issuance. Red Flag criteria occurs whenever a geographical area has been in a dry spell for a week or two, or for a shorter period, if before spring green-up or after fall color, and the National Fire Danger Rating System (NFDRS) is high to extreme and the following forecast weather parameters are forecasted to be met:

- a sustained wind average 15 mph or greater
- relative humidity less than or equal to 25 percent and
- a temperature of greater than 75 degrees F

In some states, dry lightning and unstable air are criteria. A Fire Weather Watch may be issued prior to the RFW.

State Responsibility Area (SRA)¹: "The California Board of Forestry and Fire Protection classify areas in which the primary financial responsibility for preventing and suppressing fires is that of the state. California Department of Forestry (CDF) has SRA responsibility for the protection of over 31 million acres of California's privately-owned wildlands."

Transmission and Distribution (T&D): At SMUD, for line maintenance purposes, the transmission system includes 230 kV, 115 kV, and 69 kV lines tied to generation facilities. The distribution system includes 69 kV lines not tied to generation facilities and 21 kV, 12 kV, and 4 kV lines.

Wildfire²¹: An unplanned, unwanted fire in an area in which development is essentially non-existent, except for roads, railroads, powerlines, and similar transportation facilities and structures, if any, are widely scattered ("wildland"), including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

11.2 References

- CPUC Fire Threat Map, ftp://ftp.cpuc.ca.gov/safety/fire-threat_map/2018/PrintablePDFs/8.5X11inch_PDF/CPUC_Fire-Threat_Map_final.pdf
- Public Utilities Code, Chapter 6. Wildfire Mitigation [8387], http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=8387&lawCode=PUC
- County Maps of Fire Hazard Severity Zones in SRA, <https://frap.fire.ca.gov/frap-projects/fhsz-in-sra-county-maps/>
- General Order 95²² contains rules for the design, construction, maintenance, inspection, repair and replacement of overhead utility lines. <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K464/209464026.pdf>
- General Order 165²², Inspection Requirements for Electric Distribution and Transmission Facilities. <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K552/209552704.pdf>
- General Order 166²², Standards for Operation, Reliability and Safety During Emergencies and Disasters <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K451/209451792.pdf>
- General Order 174²², Rules for Electric Utility Substations <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M031/K879/31879476.PDF>
- Power Line Fire Prevention Field Guide, 2008 ed. (New version being prepared by Cal Fire) <https://osfm.fire.ca.gov/media/8482/fppguidepdf126.pdf>

²⁰ Source: <https://w1.weather.gov/glossary/index.php?word=Red%20Flag%20Warning>

²¹ Source: <https://www.nwcg.gov/glossary/a-z#Wildfire>, July 19, 2019.

²² SMUD is not subject to CPUC jurisdiction, but has developed design standards, and maintenance programs that meet or exceed the regulations in GO 95, GO 128, GO 165, GO 166, and GO 174.

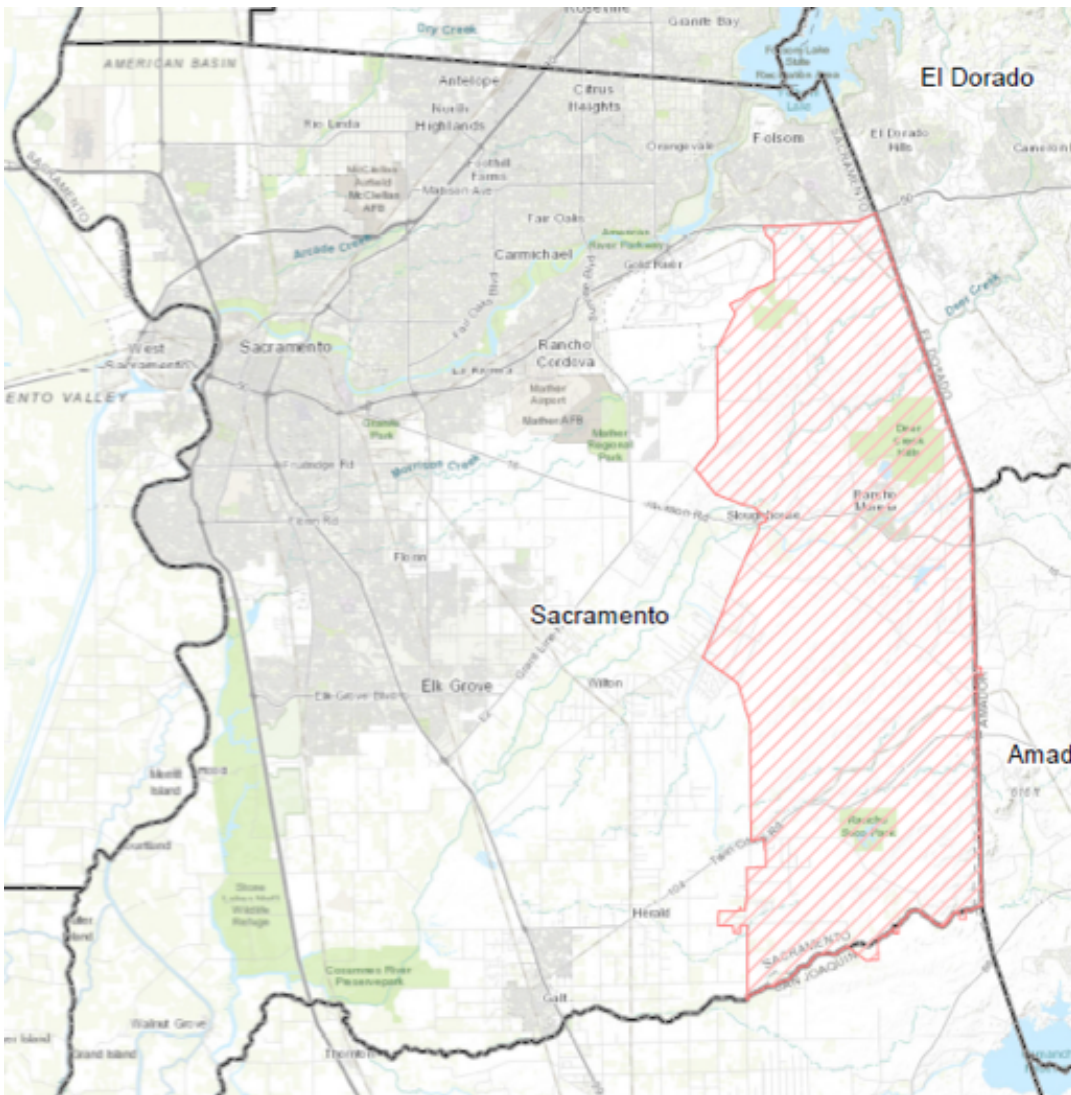
11.3 Acronym glossary

ANSI (American National Standards Institute)	MW (Mega Watts)
AQS (Audit and Quality Services)	NASA (National Aeronautics and Space Administration)
CAISO (California Independent System Operation)	O&M (Operations & Maintenance)
CAL FIRE (California Department of Forestry and Fire Protection)	EOC (Emergency Operations Centers)
CPUC (California Public Utilities Commission)	OES (Office of Emergency Services')
CUEA (California Utilities Emergency Association)	PCA (Pole Clearing Area)
DLI (Detailed Line Inspections)	PG&E (Pacific Gas & Electric)
DSO (Distribution System Operations)	PSO (Power System Operations)
EAM (Enterprise Asset Management)	PUC (Public Utilities Code)
ERM (Enterprise Risk Management)	QA (Quality Assurance)
EROC (Enterprise Risk Oversight Committee)	QC (Quality Control)
FAC (Facilities Design, Connections and Maintenance)	RFW (Red Flag Warning)
FRAP (Fire Resource and Assessment Program)	ROW (rights-of-way)
GHG (Greenhouse gas)	SB (Senate Bill)
GIS (Geographic Information System)	SD (Strategic Direction)
GO (General Order)	SEMS (Standardized Emergency Management System)
HFTD (High Fire Threat Districts)	SME (Subject Matter Expert)
IR (Infrared)	SRA (State Responsibility Area)
IVM (Integrated Vegetation Management)	T&D (Transmission and Distribution)
KV (Kilovolt)	TTX (Table Top Exercise)
KWH (Kilowatt Hours)	UARP (Upper American River Project)
LIDAR (Light Detection and Ranging)	VM (Vegetation Management)
LRA (Local Responsible Area)	WAPA (Western Area Power Administration)
MED (Medical Equipment Discount)	WMP (Wildfire Mitigation Plan)
MVCD (minimum vegetation clearance distance)	WUI (Wildland-Urban Interface)

11.4 Reference for SMUD plans

11.4.1 SMUD's Pole Clearing Area Map

Figure 8. SMUD's Pole Clearing Area with respect to Sacramento County boundary





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