Southern California Edison Wildfire Mitigation & Grid Resiliency

California State Legislative Conference Committee on Wildfire Preparedness and Response

August 7, 2018

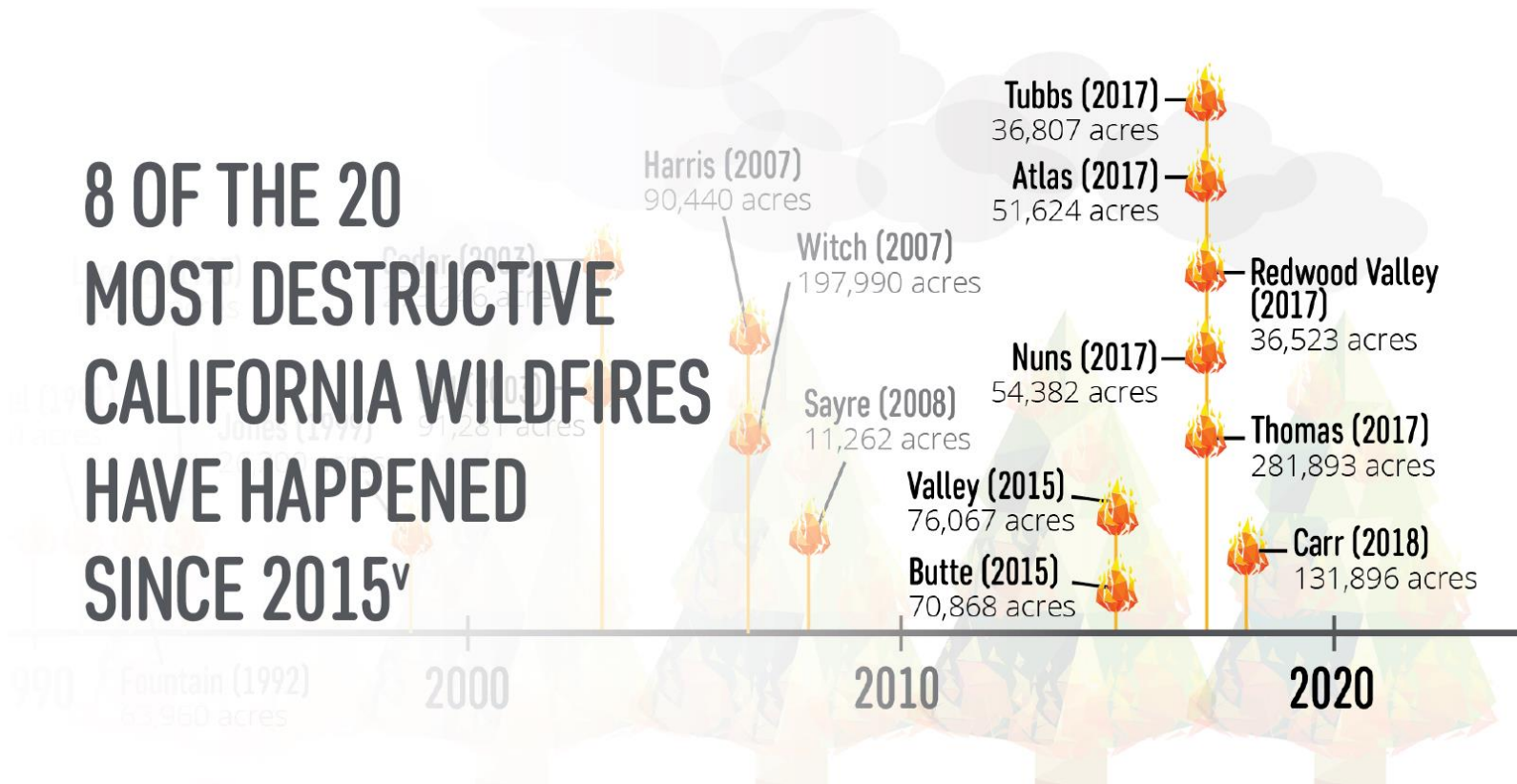Energy for What's Ahead℠

SOUTHERN CALIFORNIA EDISON®

CALIFORNIA'S WILDFIRE RISK

Year-Round Fire Season: Changes to California's climate means that the traditional notion of a fire "season" no longer exists

Hazardous fuel is building up: 9M acres of land contain ready-to-burn kindling from nearly 129M trees that have been killed or weakened by drought and bark beetle infestation

8 OF THE 20 MOST DESTRUCTIVE CALIFORNIA WILDFIRES HAVE HAPPENED SINCE 2015ᵛ

Harris (2007) 90,440 acres
Witch (2007) 197,990 acres
Sayre (2008) 11,262 acres
Valley (2015) 76,067 acres
Butte (2015) 70,868 acres
Tubbs (2017) 36,807 acres
Atlas (2017) 51,624 acres
Redwood Valley (2017) 36,523 acres
Nuns (2017) 54,382 acres
Thomas (2017) 281,893 acres
Carr (2018) 131,896 acres

2000   2010   2020

SCE'S WILDFIRE MITIGATION STRATEGY

We have long taken substantial steps to reduce the risk of wildfires, and we continue to proactively enhance our operational practices and infrastructure through our comprehensive wildfire mitigation strategy

Long-Standing Operational Practices

- Special procedures during Red Flag Warning
- Automated Recloser Blocking
- Restricted Work Practices
- Operation Santa Ana (joint patrol with fire agencies prior to fire season)

Investing in System Hardening of Electric Grid

- Fire-resistant Poles
- Covered Conductors
- Current Limiting Fuses
- Next-Gen Engineering Technology
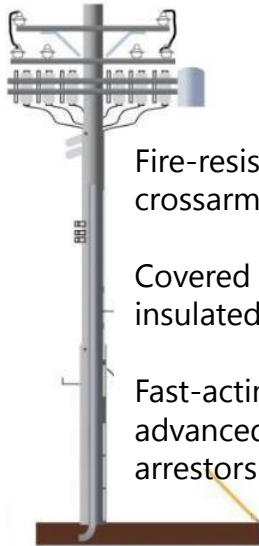
Bolstering Situational Awareness Capabilities

- Fire and Severe Weather Monitoring
- Rapidly Advancing Analytics to Improve Weather Prediction

Enhancing Operational Practices

- Extra-Sensitive Relay Settings
- Public Safety Power Shutoff & Community Engagement
- Vegetation Management

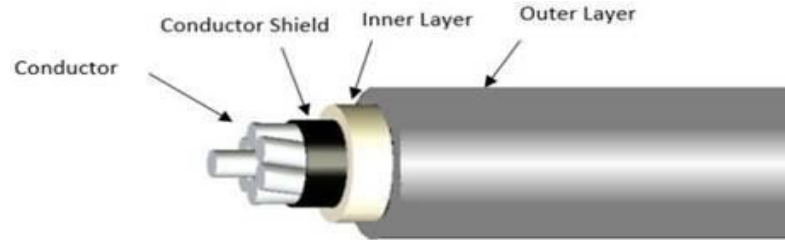# SYSTEM HARDENING ELEMENTS

Hardened System

Fire-resistant poles, crossarms and insulators

Covered conductors/ insulated wire wrap

Fast-acting fuses and advanced lightning arrestors

Current Limiting Fuses

Fault Tamer

X-Limiter CLF

Cross Section of Covered Conductor

Conductor Shield   Inner Layer   Outer Layer

Conductor

SCE crews are installing ≈ **4,000** circuit miles of covered conductor planned in a multi-year **Grid Resiliency Program** across the high fire risk areas in advance of CPUC application filing.

SCE'S ADVANCED FIRE AND SEVERE WEATHER MONITORING SYSTEM

Hi-Res Weather Data Visualization

Visualization shows weather conditions at the circuit level

Alerts notify meteorologists and incident response teams when conditions reach pre-identified thresholds
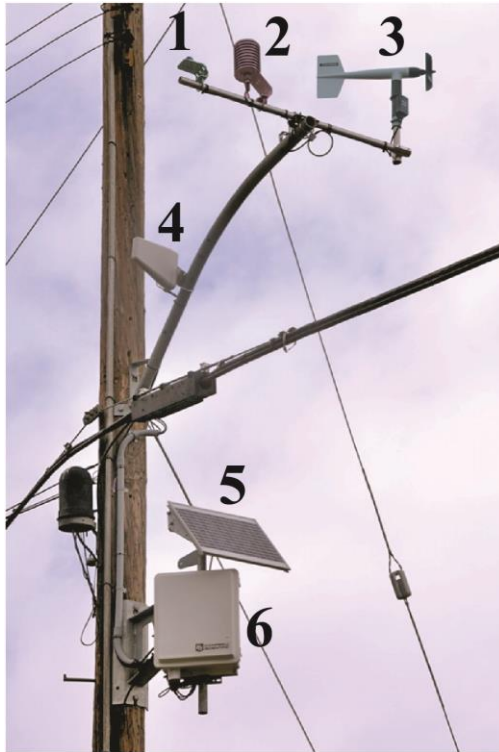
Weather Stations

Strategically deployed to collect high-resolution weather data

Enables more accurate forecasting at the circuit level

Situational Awareness Center

24/7 weather and situational awareness monitoring

Co-located with SCE's Emergency Operations Center and Watch Office

SCE meteorologists with electrical system and power delivery expertise

Fire Monitoring Cameras

New, HD cameras installed on SCE telecom tower to monitor wildfire activity

Remote-controlled pan-tilt-zoom helps to pinpoint wildfire locations and improve response times

SCE'S WEATHER NETWORK MANAGED BY IN-HOUSE METEOROLOGY TEAM

Anatomy of a Weather Station

1. Solar Sensor

2. Temperature/RH Sensor

3. Wind Monitor

4. Directional Cellular Antenna

5. Solar Panel

6. Data Logger
   Charge Controller
   Battery
   Cellular Modem:

- **47** weather stations installed

- **125** weather stations by Oct. 1, 2018

- SCE continuing to rapidly expand weather stations throughout high fire risk areas

- Real-time analysis and monitoring by in-house meteorologists trained in fire weather

- Additional data points to improve accuracy of weather models and provide access to real-time weather conditions at circuit level
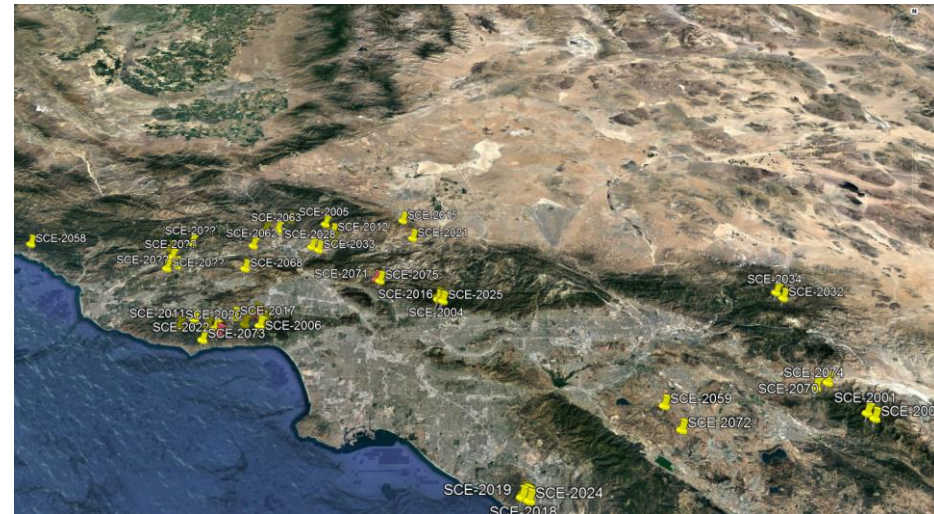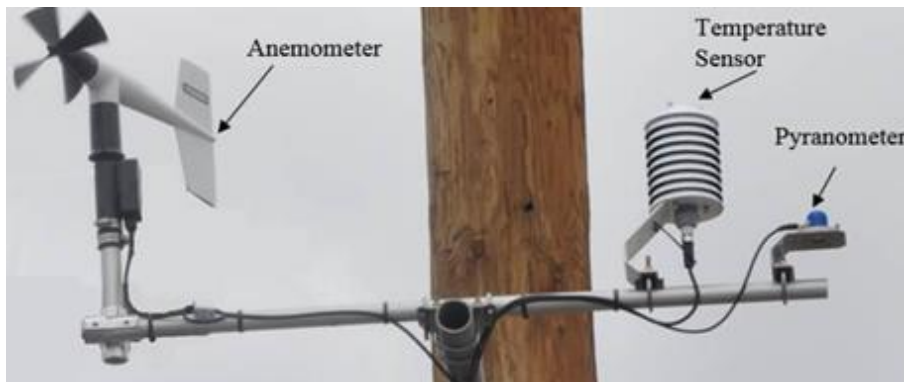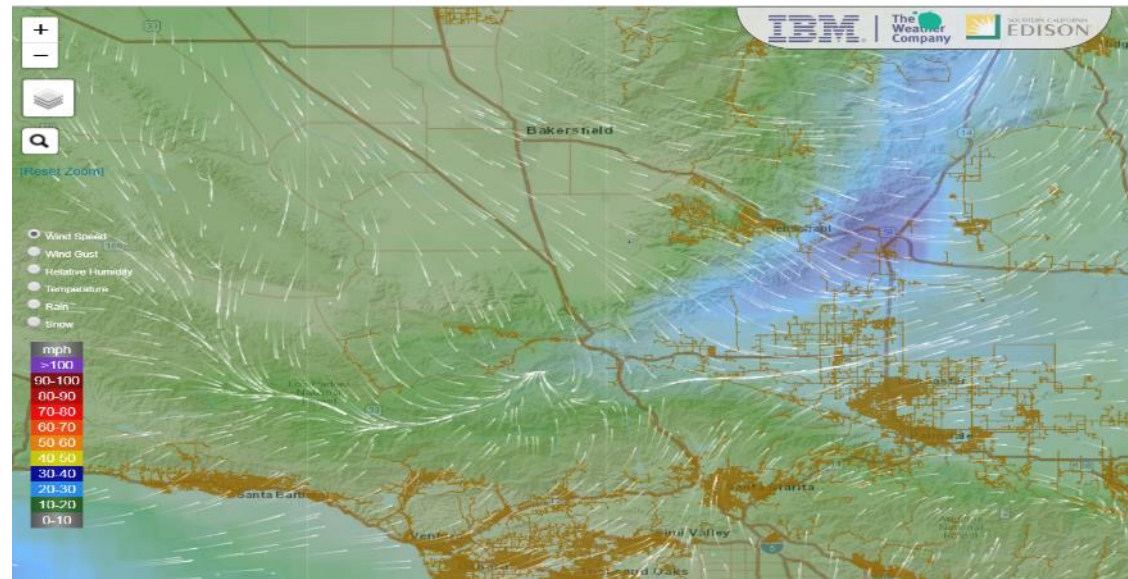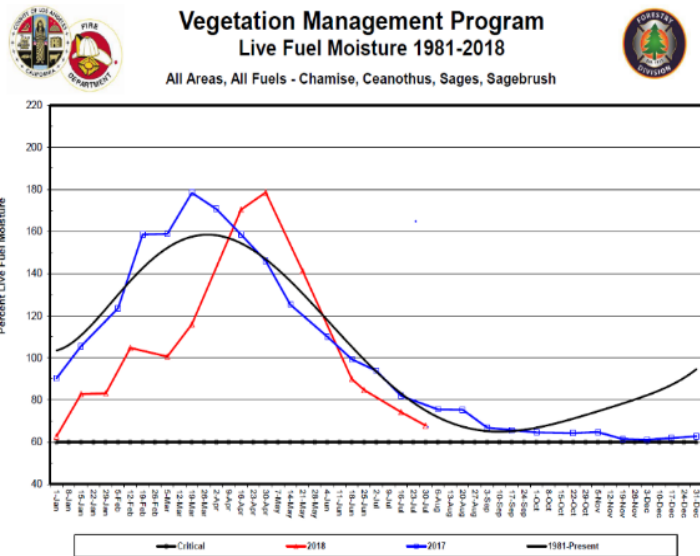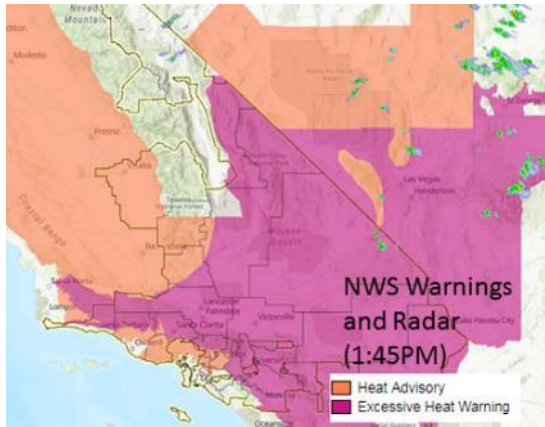
2 DAYS AHEAD

- Meteorologists prepare High Fire Risk Area Report to forecast fire potential at the *circuit level*

- Informed by hi-res weather model (500 meters) and visualization tool and circuit level weather conditions

- Key factors include wind speed, humidity, temperature, fuel moisture and real-time data from weather stations

Circuit Name	Day 1 (0-24 Hrs)							Day 2 (24-48 Hrs)						
	Max Temp (F)	Min Temp (F)	Max Wind (mph)	Max Gusts (mph)	Max Rain (QPF)	Min RH	Max Snow (QPF)	Max Temp (F)	Min Temp (F)	Max Wind (mph)	Max Gusts (mph)	Max Rain (QPF)	Min RH	Max Snow (QPF)
ANTELOPE VALLEY														
BOOTLEGGER	98	59	17	17	0	12	0	78	71	8	8	0	26	0
BOUQUET	78	75	8	8	0	37	0	105	63	11	11	0	9	0
CALIBER	80	79	8	8	0	22	0	106	64	16	19	0	5	0
CUYAMA	93	57	10	10	0	16	0	93	62	9	9	0	19	0
DAVENPORT	104	67	16	16	0	9	0	97	67	17	17	0	15	0
HUCKLEBERRY	79	74	10	10	0	29	0	101	54	21	24	0	6	0
HUGHES LAKE	80	74	12	12	0	25	0	103	62	22	30	0	5	0
KINSEY	77	74	9	9	0	35	0	105	61	13	13	0	11	0
LASKER	106	66	17	17	0	7	0	101	68	18	18	0	11	0
PICK	102	65	17	17	0	7	0	97	64	18	18	0	13	0
RAYBURN	100	68	19	19	0	12	0	79	78	10	10	0	28	0
RIDGE	96	68	12	12	0	15	0	78	75	7	7	0	31	0
SAND CANYON	105	66	15	15	0	9	0	98	62	16	16	0	16	0
SHOVEL	100	58	16	18	0	6	0	102	66	17	17	0	7	0
SUN VILLAGE	80	75	8	8	0	23	0	103	59	16	18	0	5	0
TEJON	105	68	19	23	0	7	0	99	68	18	18	0	11	0
TENNECO	90	51	14	14	0	14	0	91	51	10	10	0	16	0
TITAN	102	63	17	17	0	10	0	80	75	8	8	0	22	0
WHIP	100	66	20	20	0	11	0	80	78	11	11	0	28	0

Vegetation Management Program
Live Fuel Moisture 1981-2018
All Areas, All Fuels - Chamise, Ceanothus, Sages, Sagebrush

THREAT LEVEL MATRIX CRITICAL TOOL FOR OPERATIONS TEAMS

NWS Warnings and Radar (1:45PM)
- Heat Advisory
- Excessive Heat Warning

4-7 DAYS AHEAD

- Each day, SCE's meteorologists prepare 7-day threat matrix to forecast severe weather events at the *district level*

- Provides early indication to place incident management teams on alert in advance of upcoming weather events

- As date of weather event approaches, event confidence increases and Severe Weather Alerts are prepared to assess and predict potential impacts

Threat Level Matrix

Metro Los Angeles, Orange County, Inland Empire

Districts: Santa Monica, South Bay, Dominguez Hills, Covina, Monrovia, Montebello, Whittier, Long Beach, Fullerton, Santa Ana, Saddleback, Ontario, Foothill, Redlands, Menifee, Wildomar, Catalina, Huntington Beach

Hazard	7/31/2018	8/1/2018	8/2/2018	8/3/2018	8/4/2018	8/5/2018	8/6/2018
Day of Week	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday
Fire Weather	0	0	0	1	1	1	1
Wind	0	0	0	0	0	0	0
Heat	1	1	1	1	1	0	0

High Desert, Low Desert, Southern California Mountains

Districts: Antelope Valley, Victorville, Arrowhead, Palm Springs, Yucca Valley, Blythe, Ridgecrest, Barstow, Tehachapi

Hazard							
Fire Weather	1	1	1	2	2	2	2
Wind	0	0	1	1	1	2	1
Heat	2	2	2	1	1	1	1

0 = None
No System Threat. If a weather alerts are issued, it is as a "heads up" to clarify that the weather is not expected to cause any system problems or as a safety message.

1 = Low
Low system threats are frequent events that may cause minor or isolated issues to the system, but are not expected to cause any major or widespread outages or damage.

2 = Low to Moderate
Low to moderate system threats are occasional events that may cause clusters of minor issues, or several areas of isolated damage, but are unlikely to cause major or widespread outages or damage.

3 = Moderate
Moderate system threats are events that only occur relatively seldomly or several times a year. They may cause pockets of signifcant damage or widespread minor system issues.

4 = High
High system threats are events that are expected to occur no more than once or twice a year and may not occur for a certain weather parameter at all in a given year. Expect widespread damage and system issues.

5 = Major or Extreme
Major or extreme events are considered events of note and are not expected to occur every year. Widespread, catastrophic and/or complex impacts are expected to the system, causing a slow recovery.

HD CAMERAS EXPEDITE DETECTION AND RESPONSE TIME
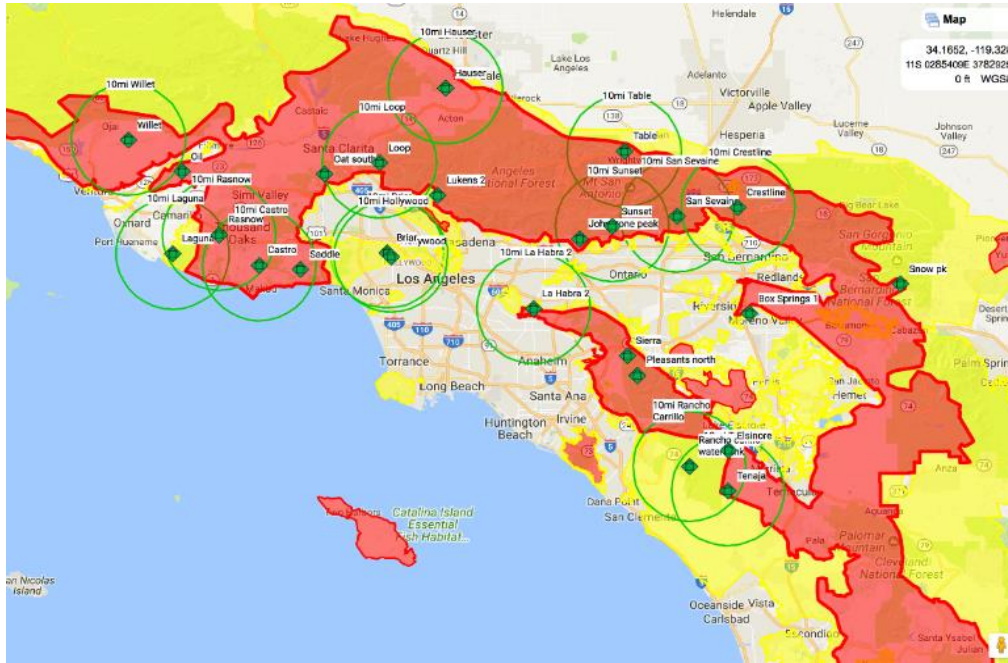
- Enables first responders to quickly detect, assess and respond to wildfire ignitions

- Pursuing expanding network of HD cameras beyond Santiago and Santa Ynez Peak
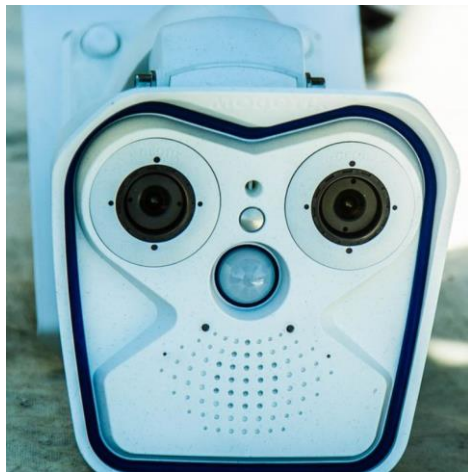
PUBLIC SAFETY POWER SHUTOFF

Last resort public safety measure to mitigate wildfire risk

4-7 DAYS AHEAD	3 DAYS AHEAD	2 DAYS AHEAD	1 DAY AHEAD	POWER SHUTOFF	POWER RESTORATION

• When forecasts indicate extreme weather, SCE will begin predictive modeling to assess potential impact	• SCE monitors fire weather watch alerts from the National Weather Service (NWS) and continues to refine predictive models	• Extreme fire weather conditions forecasted and NWS Red Flag Warning issued • Coordinate with local gov't and agencies (e.g. emergency responders) • **Initiate customer notifications on possible power shutoff**	• Extreme fire weather conditions imminent; continued modeling and more accurate forecasts determine affected areas • **Continue to coordinate and communicate with local government, agencies and customers of possible power shutoff**	• Extreme fire weather and dangerous conditions validated by field resources • Notify local government, agencies and customers of power shutoff	• Extreme fire weather subsides to safe levels and conditions validated by field resources • Inspections and patrols of equipment begin, then power is restored to affected communities • Agencies and customers notified of power restoration

PLANNING AND MONITORING　　　　　　　　　　　　**OUTAGE**

Note: Actual onset of weather conditions and other circumstances beyond our control may impact coordination and notification efforts

VEGETATION MANAGEMENT

- **20+** in-house certified arborists

- **800+** pruning contractors with **60** more crews added June/July 2018

- ≈ **900,000** trees inspected annually

- ≈ **700,000** pruned per year; **400,000** trees in high fire risk areas

- Dead, dying, diseased tree removal; total drought and bark beetle trees removed in 2017 was **39,000**

- Expanding use of Light Detection and Ranging (LiDAR) technology, an advanced laser surveying method, to enhance vegetation management in remote areas of our service territory

- Joint patrols with fire agencies

Dead, dying, diseased trees present a hazard and are removed to protect electrical facilities and eliminate risk of fire.