Agenda

- Wildfire Mitigation Plan (WMP) Objectives
- 2019 WMP Accomplishments
- Lessons Learned
- High Fire Risk Area Boundary Changes
- 2020-2022 WMP Forecasted Ignitions after WMP Execution
- 2020-2022 WMP Strategy & Programs
- Maturity Model Self Assessment
- 2020-2022 WMP Cost Forecast
Wildfire Mitigation Plan Objectives

SCE is dedicated to the safety of the communities we serve

- The primary objective of SCE’s WMP is to protect public safety

- SCE’s second comprehensive WMP
  - Covers years 2020-2022
  - Builds on 2019 plan accomplishments and lessons learned
  - Retains foundational strategy for wildfire mitigation, and
  - Is a natural extension and refinement of our 2019 WMP and 2021 GRC filing

- Our WMP includes an actionable, measurable, and adaptive plan to:
  - Reduce the risk of potential wildfire causing ignitions associated with SCE’s electrical infrastructure in High Fire Risk Areas
  - Reduce the impact of PSPS to our customers and communities
  - Incorporate risk analysis to guide planning and prioritization
  - Improve coordination between utility, state, and local emergency management personnel
  - Advance new technologies and data analytics capabilities
  - Effectively engage the public about how to prepare for, prevent, and mitigate wildfires
SCE has made significant progress in 2019 to reduce wildfire risks and to enhance community engagement.

- **Community Meetings**: Conducted over 350 meetings and presentations with local government, tribal officials, community organizations, & general public.
- **Covered Conductor**: Installed 372 circuit miles of covered conductor. Total of 523 circuit miles installed.
- **Composite Poles**: Installed 1,421 Fire-Resistant Poles.
- **Enhanced Veg Mgmt**: 129,485 tree specific threat assessments completed. 5,917 Hazard Trees removed.
- **HD Cameras**: 91 HD Cameras installed. Total of 161 cameras installed providing 90% coverage of SCE’s HFRA.
- **Install Sectionalizing Devices**: Installed and commissioned 55 additional sectionalizing devices.
- **Branch Line Protection**: 7,765 Current Limiting Fuse locations installed. Over 10,000 fuse locations installed.
- **Enhanced Overhead Inspections**: 100% of Distribution & Transmission structures inspected in high fire risk area.
- **Weather Stations**: Installed 357 weather stations. Total of 482 weather stations installed.
- **Pole Brushing**: Inspected and cleared brush around 159,485 poles.
Lessons learned continue to inform and advance our WMP, but have not fundamentally changed our approach

| **Execution** | Achieved target volumes of major programs and completed 54 of 58 WMP activities, but rapid scaling of programs to more quickly reduce risk—particularly with contracted resources—resulted in opportunities to improve efficiency |
| **Resources** | Added resources to manage increased pace of inspections, vegetation management, and infrastructure hardening programs; competition from statewide mitigation activities will continue to constrain pace of growth |
| **Ignitions** | Too early to see meaningful reduction in HFRA ignitions, but ignition cause analysis validated our foundational programs and is informing further updates; continues to support use of PSPS as we aggressively deploy covered conductor |
| **PSPS** | Rapid maturation of tools minimized customer impact while still effectively avoiding many hazardous conditions; continuing to identify ways to reduce customer impacts |
| **Technology** | Observed meaningful benefits of mobile technology in field, data analytics for prioritization, and other promising technology (e.g. drones) to detect system issues; increases adoption and demand for technology use across plan |
SCE modified its High Fire Risk Area (HFRA) boundaries in 2019

- In August of 2019, SCE filed a Petition for Modification (PFM) of D.17-12-024 in which SCE proposed retaining some areas (<1%) of the Non-CPUC HFRA to be treated as CPUC Tier 2 and requested that the Commission formally include these areas in its HFTD.

- SCE’s PFM is still pending approval and SCE continues to execute its WMP across the updated HFRA.

### Before HFRA Evaluation vs. After HFRA Evaluation

<table>
<thead>
<tr>
<th>HFTD Tiers</th>
<th>Before HFRA Evaluation</th>
<th>After HFRA Evaluation</th>
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<tbody>
<tr>
<td></td>
<td>Area (Square Miles)</td>
<td>Percent of Service Territory</td>
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<tr>
<td>CPUC Tier 3 -- Extreme Risk</td>
<td>4,708</td>
<td>9%</td>
</tr>
<tr>
<td>CPUC Tier 2 -- Elevated Risk</td>
<td>9,571</td>
<td>18%</td>
</tr>
<tr>
<td>Non-CPUC HFRA</td>
<td>4,212</td>
<td>8%</td>
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<tr>
<td>Total</td>
<td>18,493</td>
<td>35%</td>
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</table>

<table>
<thead>
<tr>
<th></th>
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<tr>
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<td>9,571</td>
<td>18%</td>
</tr>
<tr>
<td>Non-CPUC HFRA</td>
<td>124</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Total</td>
<td>14,403</td>
<td>27%</td>
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</table>
### 2020-2022 Forecasted HFRA Reportable Ignitions Per Year after Execution of WMP, Compared to 5-Year Historical Average

<table>
<thead>
<tr>
<th>Year</th>
<th>Contact from Object</th>
<th>Equipment Facility Failure</th>
<th>Other</th>
<th>Wire-to-Wire &amp; Contamination</th>
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</thead>
<tbody>
<tr>
<td>5-Year Avg</td>
<td>22.4</td>
<td>9.8</td>
<td>5.8</td>
<td>1.4</td>
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<tr>
<td>2020</td>
<td>20.5</td>
<td>7.7</td>
<td>5.8</td>
<td>1.3</td>
</tr>
<tr>
<td>2021</td>
<td>18.1</td>
<td>6.8</td>
<td>5.8</td>
<td>1.2</td>
</tr>
<tr>
<td>2022</td>
<td>15.9</td>
<td>6.3</td>
<td>5.8</td>
<td>1.2</td>
</tr>
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</table>

**Forecast**

- 2020: ~35
- 2021: ~32
- 2022: ~29

**Sources:** SCE WMP 2020, Tables 18a, 18b, 31a and 31b

**Note:** This forecast is based on cumulative mitigation effectiveness of each of the mitigation measures against the ignition drivers that form the baseline historical ignitions, and does not account for the impact of numerous exogenous factors beyond the control of the utility (e.g. weather conditions, suppression responses, etc.), and as such this forecast represents significant range of uncertainty around the expected value calculations.
SCE’s 2020-2022 WMP Programs are further described in Tables 21-30.
### 1. Risk Assessment and Mapping

**SCE’s wildfire risk model continues to evolve to more granular and accurate representation of fire risk (probability of ignition & consequence)**

<table>
<thead>
<tr>
<th>GSRP</th>
<th>SMAP / RAMP</th>
<th>2019 WMP</th>
<th>2021 GRC</th>
<th>2020 WMP</th>
</tr>
</thead>
</table>
| • Fault-to-Fire Mapping | • Bowtie (Drivers, Outcomes, and Consequences) | • Wildfire Risk Model Development  
  – Probability of Ignition  
  – Fire Propagation (Reax)  
  – Fire Consequence (Reax+) | • Risk Prioritization at a Circuit and Segment Level | • Ignition Analysis for Distribution and Transmission |
| • Mitigation-to-Fault Mapping | • Probabilistic Modeling | | | • Enhanced Multi-Mitigation Assessments |
| • Mitigation Effectiveness / Cost Mitigation Ratios | • Multi Attribute Risk Score (MARS) | | | • RSE Calculation Enhancements  
  – Asset Useful Life  
  – Discount Rates  
  – Annual/Incremental RSE |
| • High Fire Risk Area (HFRA) Definition | • Mitigation Risk Spend Efficiency (RSE) | | | • Evolving Fire Propagation Modeling (i.e., Technosylva) |

2. Situational Awareness and Forecasting

- **Deploy 375-475 weather stations per year**

- **Improve Weather Modeling** through:
  - Installation of additional weather stations
  - Installation of 2nd High Performance Computing Cluster in 2020 and a 3rd after 2021
  - Performing updated fuel sampling in HFRA areas every two weeks (weather permitting)

- **Improve PSPS Operations** through:
  - Installation of additional weather stations
  - Fire Potential Index Enhancements
  - Deployment of Technosylva’s FireCast & FireSim
  - Continuation of Pre & Post patrols

- **Detect and prevent potential faults** that could cause ignitions through:
  - Distribution Fault Anticipation
  - Early Fault Detection
  - Open Phase Detection
3. Grid Design and System Hardening (1/2)

- Ramp up covered conductor deployment efforts – install at least **700 circuit miles in 2020**

- Aggressive plan to **deploy up to 4,500 circuit miles of covered conductor** by end of 2022

- **Targeted undergrounding evaluation**

- Continue to **target deployment in the highest risk and PSPS-impacted areas** based on risk-informed analysis
3. Grid Design and System Hardening (2/2)

- Other **infrastructure hardening** efforts in HFRA:
  - Composite poles and fire-resistant wraps
  - Fast-acting fuses
  - Remote controlled sectionalizing devices
  - Circuit breaker relay for fast curve

- Advancing various **detection and sensing technologies**
  - Deploy Rapid Earth Fault Current Limiter (REFCL) pilots
  - Open Phase down wire detection
  - Assess Distribution Fault Anticipation performance
4. Asset Management and Inspections

- Utilize both ground and aerial inspections to obtain 360° views of structures and equipment
  - Lessons learned from crossarm failure in 2019
- Aerial inspections on 165,000 distribution and 33,500 transmission structures
- Deploy various sensors and collect data (infrared, corona scanning, LiDAR and HD images/videos)
  - Leverage Unmanned Aerial Systems
- Redesigned inspection program to perform more frequent inspections of higher risk structures (105,000 distribution & 22,500 transmission structures)
- Leverage detection technologies using artificial intelligence and machine learning to complement manual inspections
5. Vegetation Management and Inspections

- Continue & expand key programs:
  - Expand brush clearance to **200,000-300,000** poles annually
  - Hazard Tree Management Program (HTMP) to assess **75,000** trees annually and timely mitigations
  - Continue Drought Relieve Initiative (DRI) inspections and timely mitigations
  - **Risk-based** HFRA vegetation management quality control inspections

- Integrated vegetation management platform to improve work planning, scheduling, notification, and reporting

- 2019 Lessons learned and challenges:
  - Resource shortage for qualified trimmers
  - Support from property owners and agencies
SCE expects to reduce the scope and impact of PSPS, however, PSPS will continue to remain available for extreme conditions in the long term.

6. Grid Operations and Protocols

Multi-Prong approach to mitigate impacts of PSPS

- **Switching Playbooks**
- **Targeted Grid Hardening**
- **Engineering & System Evaluation**
- **Microgrids & Resiliency Zones**
- **Customer Care**

Rapidly developing circuit-specific plans to reduce the impacts observed in 2019 by:

- Leveraging existing isolation equipment
- Targeting remediations
- Identifying small upgrades to reduce the number of customers impacted by PSPS
- Deploying more weather stations
- Pursuing microgrid opportunities when technologically and economically feasible
- Establishing Community Resource Centers
- Deploying Community Crew Vehicles
- Providing potable water
- Addressing food spoilage claims
- Conducting community outreach
7. Emergency Planning and Preparedness

SCE’s emergency preparedness and response plans consider numerous hazards that potentially impact SCE’s service territory and/or the electric grid.

**Customer Engagement & Education**
- Provide customers with important and consistent messaging
- Participate in statewide multichannel and multilingual media campaign
- Send letters to customers in HFRA in non-HFRA with information about PSPS, emergency preparedness, and SCE’s wildfire mitigation plan to customers in HFRA
- Host 8-12 community meetings in areas impacted by 2019 PSPS

**Emergency Response Training**
- Continue training ~540 existing and new SCE IMT members on de-energization protocols
- Determine additional staffing needs and train, exercise and qualify new staff
Traditionally, organizations across SCE have addressed data governance at the system and activity level focused on data quality, security, and compliance.

In 2019, SCE established new processes and tools to help manage large datasets associated with its wildfire mitigation activities (e.g. iPads, mobile applications).

In 2020-2022, SCE plans to invest in automation, machine learning, and artificial intelligence focusing on data architecture, management, and stewardship.

These refinements will help integrate wildfire mitigation data in areas like vegetation management, asset inspections, and PSPS allowing for greater insights from advanced analytics of asset health for improved risk modeling and prediction.

SCE will continue to develop foundational data governance strategy and a data quality framework / methodology to measure and manage master data quality.
9. Resource Allocation Methodology

- Wildfire mitigation activities have considerably increased the overall scope of utility work and pose challenges for resource allocation.
- In many cases, the same crews that support wildfire mitigation activities are responsible for executing SCE’s traditional infrastructure replacement work.
- Despite the importance of traditional infrastructure replacement work, SCE will pursue them at a slower pace in order to execute larger portions of higher safety risk reduction wildfire mitigation work.
- SCE will continually monitor safety & reliability and, where necessary, adjust short- and long-term plans to optimize resource allocation and prioritization of work.

*Human resources continue to be the binding constraint to accelerate more wildfire mitigation work*
10. Stakeholder Cooperation and Community Engagement

**SCE is committed to keeping its customers and key stakeholders informed of WMP activities, PSPS protocols, and general emergency preparedness**

- Plan to concentrate efforts in 2020 on communities impacted by multiple PSPS events
- Collaborate and share best practices with trade associations, technical organizations and establish an international wildfire committee with national and international agencies
- Continue to partner with all wildland fire suppression agencies as part of SCE’s overall fire mitigation efforts
- Explore virtual community meetings to increase the reach of the meetings
# Maturity Model Self-Assessment

## Rating Scale

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating Scale</th>
<th>Key Takeaways</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Risk Mapping and Simulation</td>
<td>0 1 2 3 4</td>
<td>- SCE is compliant across all categories (score of 1) and has mature practices across multiple categories (score of 3 is best-in-class)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SCE supplemented responses with robust commentary to establish context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Substantial progress made in 2019 included in baseline 2020 assessment masks overall growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SCE’s progress in analytical capabilities, enhancements in ability to assess wildfire risk, and prioritization of grid hardening initiatives will advance our maturity across multiple categories of this model</td>
</tr>
<tr>
<td>B. Situational Awareness and Forecasting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Grid Design and System Hardening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Asset Management and Inspections</td>
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<tr>
<td>E. Vegetation Management and Inspections</td>
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<tr>
<td>F. Grid Operations and Protocols</td>
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<td></td>
</tr>
<tr>
<td>G. Data Governance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. Resource Allocation Methodology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Emergency planning and Preparedness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Stakeholder Cooperation and Community Engagement</td>
<td></td>
<td></td>
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</tbody>
</table>

**Rating Scale:**

0=Below Regulatory Requirement; 1=Meets Regulatory Requirements; 2=Beyond Regulatory Requirement; 3=Consistent with Best Practice; 4=Improvement over best practices
# 2020-2022 WMP Cost Forecast

## Capital ($ Nominal Millions)

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>Total ('20-'22)</th>
</tr>
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<tbody>
<tr>
<td><strong>Actuals</strong></td>
<td></td>
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<tr>
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<td>Inspection &amp; Maintenance</td>
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<td>PSPS</td>
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<td><strong>WMP 2020-2022</strong></td>
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## O&M ($ Nominal Millions)

<table>
<thead>
<tr>
<th></th>
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<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>Total ('20-'22)</th>
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<td><strong>Actuals</strong></td>
<td></td>
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<tr>
<td>Inspection &amp; Maintenance</td>
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<td>30.3</td>
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<td>22.5</td>
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<td><strong>WMP 2020-2022</strong></td>
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<td>$499.8</td>
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<td>$321.1</td>
<td>$1,170.9</td>
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Discussion / Q&A