

Southern California Edison
2022-WMPs – 2022 Wildfire Mitigation Plan Updates

DATA REQUEST SET O E I S - S C E - 2 2 - 0 0 1

To: Energy Safety
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Job Title: Consultant
Received Date: 3/4/2022

Response Date: 3/9/2022

Question 03:

Regarding Section 4.1 – Lessons Learned:

- a. The Guidelines for section 4.1 include a requirement that “If any of the lessons learned are derived from data, include visual/graphical representations of this/these lesson(s) learned.” According to Table SCE 4-1, it appears multiple changes made to the WMP are derived or based at least in part on data.
- i. Please indicate if and where within the WMP are relevant visuals for the following changes (as taken from Table SCE 4-1): Risk Assessment and Mapping – Additional weather scenarios and granular fuel data; Risk Assessment and Mapping – Mitigation Selection for High Consequence Segments; Situational Awareness – Longer evaluation periods for weather modeling enhancements (SA-3); Grid Design and System Hardening – Rapid Earth Fault Current Limiter (REFCL) (SH-17); Grid Design and System Hardening – Vibration Dampener Retrofit; Grid Design and System Hardening – Secondaries; Asset Management – Decrease in Distribution / Transmission HFRI inspections find rates (IN-1.1 and IN 1.2); and Vegetation Management and Inspections – Decrease in Scale of Dead and Dying Tree Removal Program (VM-4).
- ii. Provide graphical representations for any of the changes noted in Q03ai for which there are no graphical representations in the 2022 WMP update.
- iii. If SCE believes any of the above referenced changes in Q03ai are not “derived from data,” indicate which changes and explain why.

Response to Question 03:

- i. **Please indicate if and where within the WMP are relevant visuals for the following changes (as taken from Table SCE 4-1):**

Below, SCE notes either where within the WMP the relevant visuals are for the applicable table elements, or provides visual/graphical representations of each identified line-item. While the narrative provided in Table SCE 4-1 may provide adequate representation of the identified lessons learned, SCE hopes these additional visual/graphical representations help aide in the understanding of these lessons learned.

Risk Assessment and Mapping	Mitigation Selection for High Consequence Segments	SCE has performed analysis indicating that segments with consequence risk of 300 acres or greater within the first eight hours (High Consequence Segments) necessitate mitigation of the majority of risk for all significant ignition risk drivers.	SCE is further refining its mitigation selection based on this analysis to identify which distribution HFRA segments will be best served by which mitigation or suite of mitigations.
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Risk Assessment and Mapping – Mitigation Selection for High Consequence Segments

- Please refer to SCEs 2022 WMP Figure SCE 7-20 (pg. 221) for a visual/graphical representation of Mitigation Selection for High Consequence Segments.

Risk Assessment and Mapping	Additional weather scenarios and granular fuel data	In the prior version of the Technosylva Wildfire Risk Reduction Model (WRRM), SCE utilized 41 weather scenarios. Similarly, SCE used fuels data accounting for present fuel conditions. SCE determined that a wider range of both fuel and wind driven conditions was needed for its risk modeling.	In 2021, SCE added an additional 400+ weather scenarios to better represent a wider range of both fuel and wind driven fire conditions. Similarly, SCE incorporated a more granular fuel model to account for fuel regrowth in recently burned locations with fuel regrowth projected out to the year 2030.
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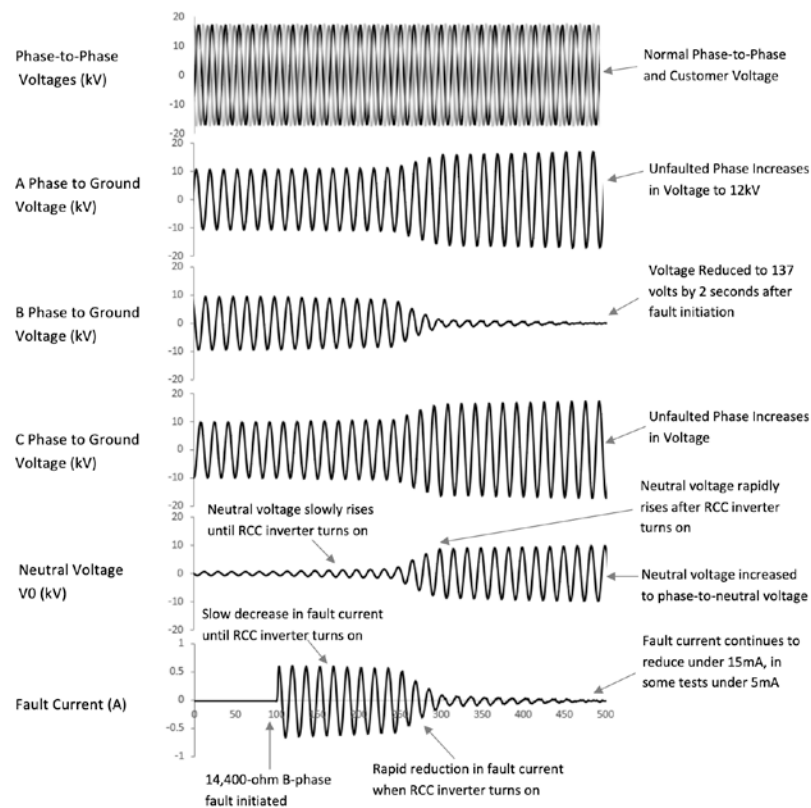
Risk Assessment and Mapping – Additional weather scenarios and granular fuel data

- Please refer to SCEs 2022 WMP Figure SCE 4-5 (pg. 45) for a visual/graphical representation of Additional weather scenarios and granular fuel data.

Grid Design and System Hardening	Rapid Earth Fault Current Limiter (REFCL) (SH-17)	SCE studied three REFCL technologies: Ground Fault Neutralizer (GFN), Resonant Grounded Substation (RGS), and Isolation Transformer (IT), to mitigate ground faults. SCE received the GFN and RGS equipment in 2020 and began construction in late 2021. SCE expected significant reduction in ignitions associated with phase-to-ground faults where GFN was deployed as compared to historical averages. Effectiveness was confirmed by staged fault tests showing voltage on the faulted conductor is reduced quickly enough to prevent the ignitions that the technology is designed to prevent.	SCE will begin developing GFN for more locations in 2022 and will continue to evaluate RGS and Information Technology (IT) in the pilot phase.
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Grid Design and System Hardening – Rapid Earth Fault Current Limiter (REFCL) (SH-17)

- Description:** Staged fault testing was performed in May 2021. In that testing the Ground Fault Neutralizer demonstrated its ability to detect and act on half ampere faults and reduce the energy release from both high and low impedance faults. See below for an example of waveforms which were measured during that testing. In this test, a 14,400-ohm resistor was connected to ground. The Ground Fault Neutralizer successfully detected and acted on this fault bringing the voltage on the faulted phase well under 250 volts within two seconds.

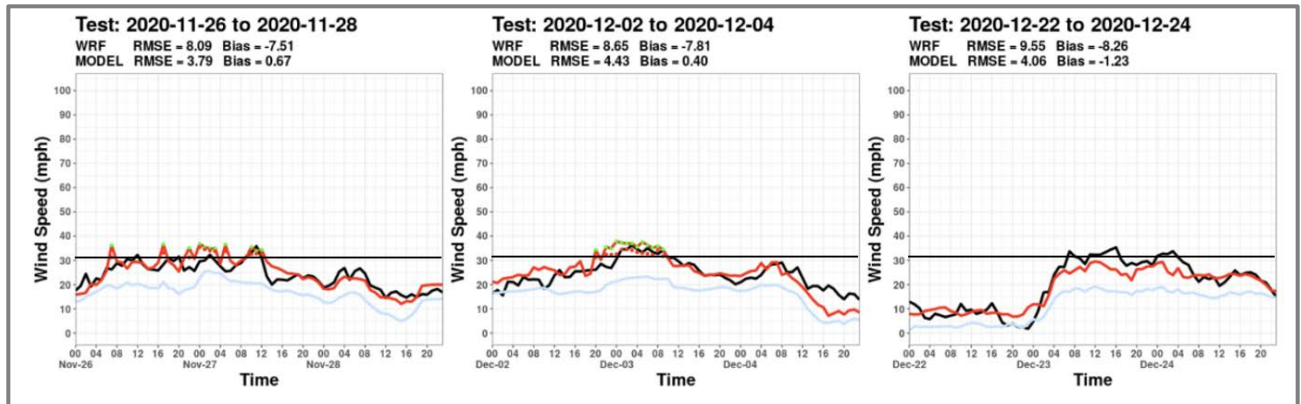


- ii. **Provide graphical representations for any of the changes noted in Q03ai for which there are no graphical representations in the 2022 WMP update.**

Situational Awareness	Longer evaluation periods for weather modeling enhancements (SA-3)	PSPS customer notifications are based on weather modeling. More accurate weather modeling will improve the accuracy of customer notifications. However, enhancements to the models require time to properly test and evaluate before incorporating into operations. In 2020 and 2021, SCE made substantial improvements to the modeling, but needed more time to test before operationalizing the enhancements.	SCE will be deploying ML capabilities on 500 weather stations and is building earlier deadlines into its scope of work prior to the start of the 2022 fire season to provide for a longer evaluation period. The evaluation will include new verification statistics and more tailored output.
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Situational Awareness – Longer evaluation periods for weather modeling enhancements (SA-3)

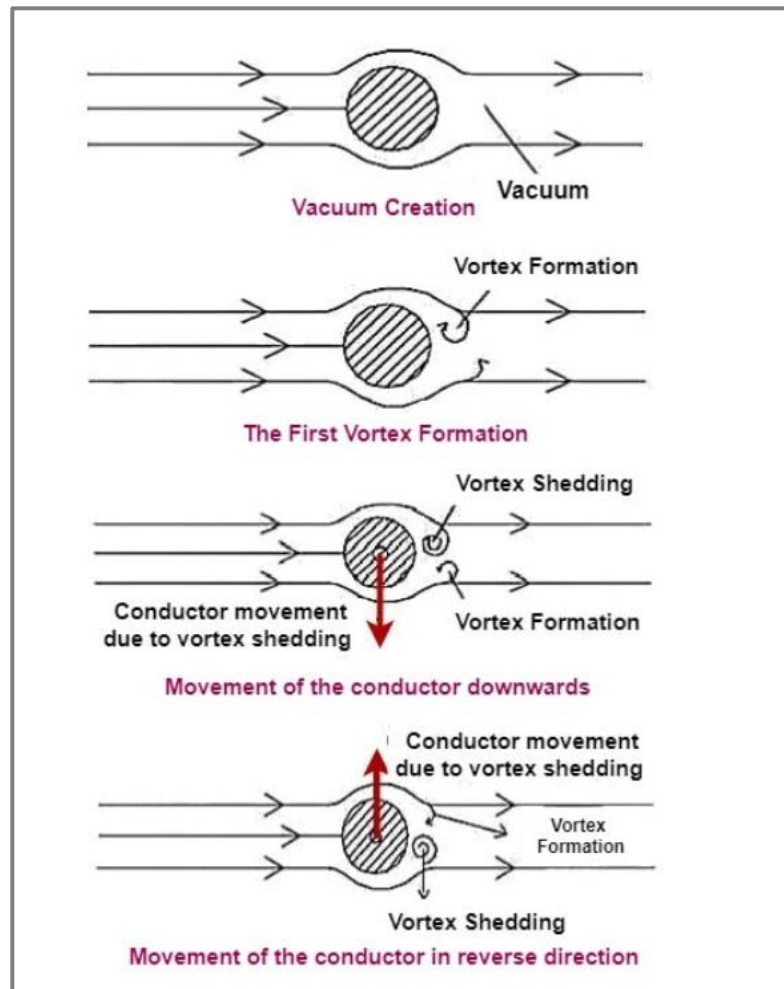
- **Description:** As provided in the Figure, the machine learning forecast (red) has been demonstrated to be effective at removing forecast biases present in raw weather model forecast (blue) when compared to available observations (black).



Grid Design and System Hardening	Vibration Damper Retrofit (SH-16)	A study was conducted to determine the susceptibility of the 2018 to 2020 covered conductor installations to Aeolian vibration.	SCE included a new activity in the 2022 WMP for Vibration Damper Retrofit to retrofit prior covered conductor installations with dampers designed to stop wind-driven Aeolian vibration that may lead to conductor abrasion or fatigue over time.
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Grid Design and System Hardening – Vibration Dampener Retrofit

- Description:** The graphic illustrates the mechanism of Aeolian vibration. However, for more information on Aeolian vibration and vibration dampers, please refer to the following report: https://www.preformed.com/th/images/pdfs/Energy/Transmission/EN-ML-1007-4_Aeolian_vibration_basics.pdf



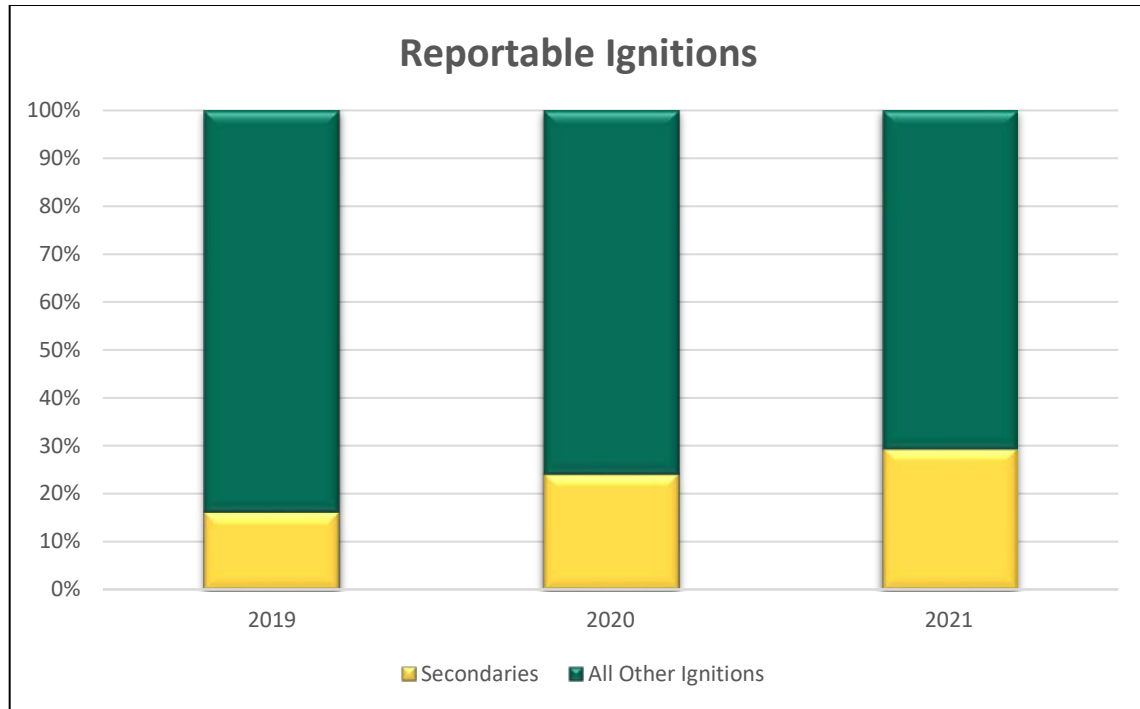
Citation: *Aeolian Vibration of Transmission Conductors.*

StudyElectrical.Com. <https://studyelectrical.com/2019/07/aeolian-vibration-of-transmission-conductors.html>

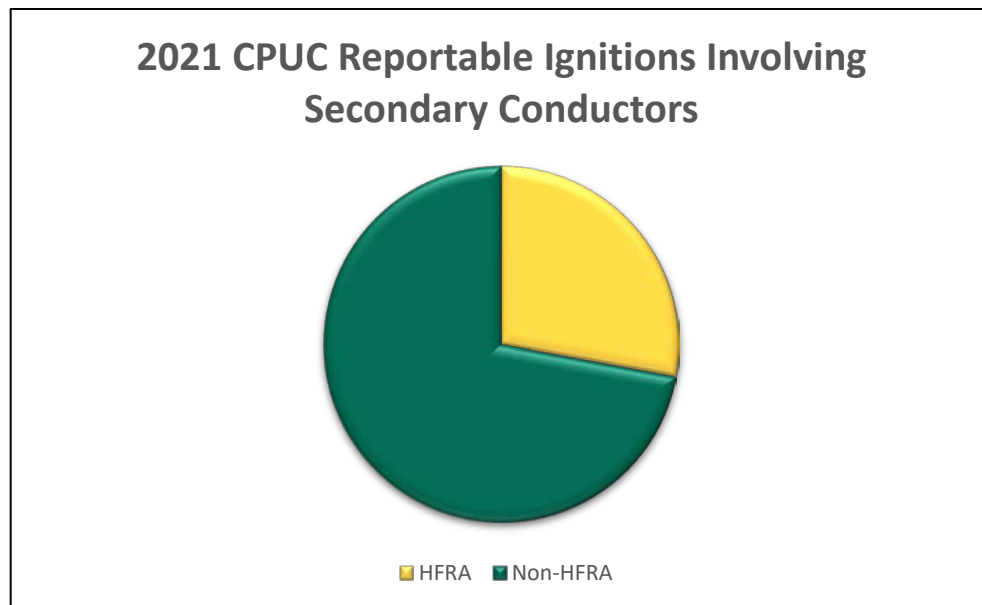
Grid Design and System Hardening – Secondaries

Grid Design and System Hardening	Secondaries	<p>Between 2019 and 2021 there have been 99 California Public Utilities Commission (CPUC)-reportable ignitions where Secondary conductor is listed as the "Root Cause Equipment."</p> <p>Approximately 30% of CPUC-reportable ignitions in 2021 involved secondary conductors across SCE's service territory, with approximately 25% of these ignitions occurring in HFRA.</p>	<p>SCE is mitigating high risk secondary conductor locations, including remediating connectors and inspecting and trimming vegetation. SCE is also developing a long-term secondary connection covering to replace taping and is evaluating a breakaway that disconnects and de-energizes service and secondary connector at a predetermined mechanical load, which prevents ignitions if the wires fall due to fallen trees or excessive winds.</p>
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- **Description:** The below graph illustrates CPUC reportable ignitions from 2019-2021, split by those associated with secondary conductor and all other ignitions.



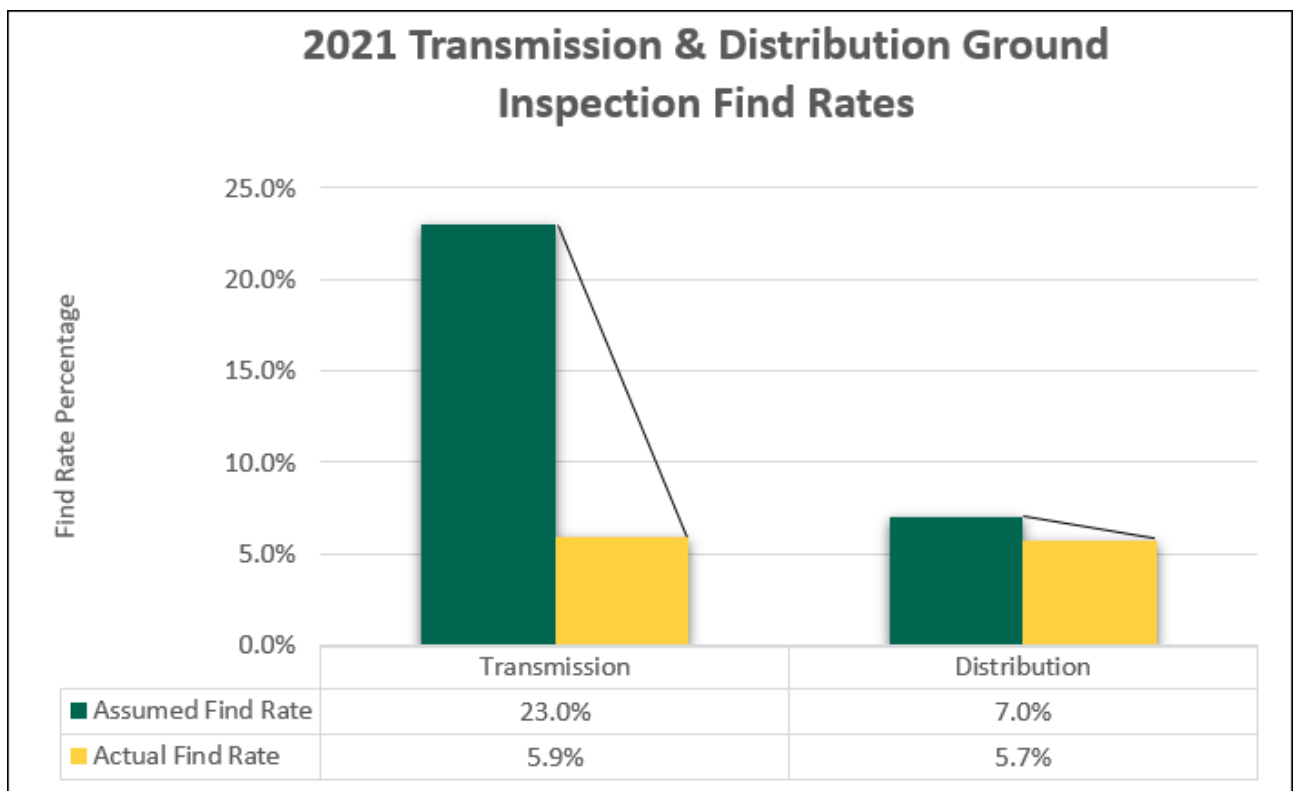
- **Description:** HFRA vs non-HFRA secondary caused ignitions that occurred in 2021.



Asset Management and Inspections	Decrease in Distribution / Transmission HFRI inspections find rates (IN-1.1 and IN-1.2)	SCE relied on historical find rates (i.e., the percentage of inspections that identify the need for a remediation) to forecast the remediation portion of HFRI inspections for the 2021 WMP. Notably, the assumed find rate for Distribution HFRI ground inspections in the 2021 WMP Update was 7.0%, based on inspections as of mid-year 2020. The actual find rate in 2021 has since come down to 5.7%.	SCE is assuming the lower find rate for planning purposes. This can reduce the number of contractors required to perform the work and allow for deployment of resources to other risk mitigation activities. SCE balances these opportunities with the potential for additional work that may result from changes or additions to the inspection form resulting from lessons learned throughout the year.
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Asset Management – Decrease in Distribution / Transmission HFRI inspections find rates (IN-1.1 and IN 1.2)

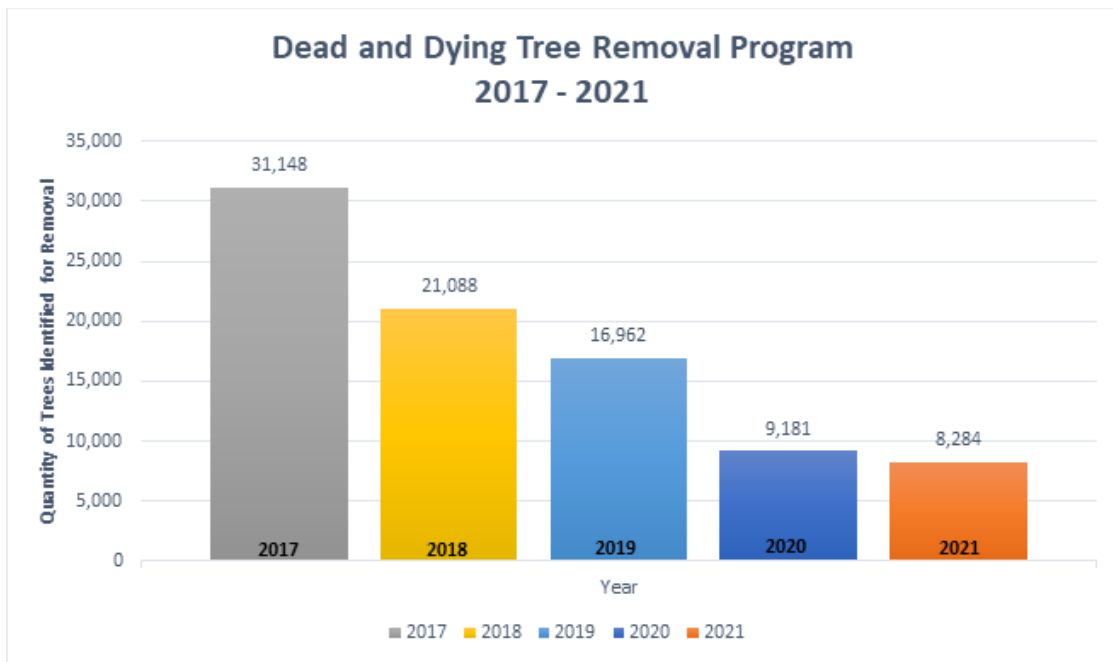
- **Description:** The below graph shows transmission & distribution ground inspection find rates for 2021.



Vegetation Management and Inspections	Decrease in Scale of Dead and Dying Tree Removal Program (VM-4)	The decrease in scale of the Dead and Dying Tree Removal Program is primarily due to a lower than anticipated find rate of dead, dying, and diseased trees, resulting in less work needing to be completed. Circuit patrols continue to be performed as planned for the year, however, the volume of trees in need of removal is lower than anticipated.	SCE reduced its 2021 WMP Forecast to align with actual dead and dying tree find rate and will take its findings from 2021 into account in its 2022 WMP.
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Vegetation Management and Inspections – Decrease in Scale of Dead and Dying Tree Removal Program (VM-4)

Description: Below is a chart that illustrates the decrease in the quantities of trees identified for removal in the Dead and Dying Tree Removal Program from 2017 to 2021.



- iii. If SCE believes any of the above referenced changes in Q03ai are not “derived from data,” indicate which changes and explain why. SCE believes all of the above reference changes in

SCE believes all of the above referenced changes in Q03ai are derived from data and has provided references to the commensurate sections or graphical representations herein depicting the changes.