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Carla Peterman
Senior Vice President
Strategy and Regulatory Affairs

December 9, 2020

Caroline Thomas Jacobs
Director, Wildfire Safety Division
California Public Utilities
Commission 505 Van Ness Avenue
San Francisco, CA 94102

SUBJECT: Southern California Edison's Second Quarterly Report on 2020-2022 Wildfire Mitigation Plan for Ongoing Class B Deficiencies

Dear Director Thomas Jacobs,

Southern California Edison (SCE) is submitting its second Quarterly Report (QR), attached herein, for Class B deficiencies pursuant to Wildfire Safety Division (WSD) Resolutions WSD-002 and WSD-004 (Resolutions) that were ratified by the California Public Utilities Commission (CPUC or Commission) on June 11, 2020. In its Resolutions, the WSD identified five Class B deficiencies that require SCE to submit ongoing QRs to address the deficiencies' conditions. SCE's first QR for all 28 Class B deficiencies was submitted on September 9, 2020 and five Class B deficiencies identified as having ongoing QR requirements have subsequent QRs due approximately every three months through June 2021.[1]

The Guidance Statement detailed, among other things, the process that the WSD will implement to evaluate QRs. The Guidance Statement provides that:

[T]the WSD will evaluate the sufficiency of an electrical corporation's QR filing in accordance with the following factors:

- Completeness – The QR is complete and comprehensively responds to the condition;
- Effectiveness – The information provided in the QR reasonably resolves the deficiency.

SCE's second QR includes updated responses to Guidance-9 and Guidance-10 included in WSD-002 (referred to as Guidance deficiencies and apply to all electric utilities), and SCE-5, SCE-9, and SCE-20 included in WSD-004 (referred to as SCE deficiencies and apply only to SCE). SCE's five ongoing QR responses provide additional information and status updates, as applicable. SCE's updated response to Guidance-10 continues to include a description of the data SCE is providing pursuant to the Draft WSD GIS Data Reporting Requirements and Schema for California Electric Corporations (Draft GIS Data Schema). SCE is unable to provide all requested

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[1] *See* WSD-011, Attachment 3.

data at this time.[2] SCE appreciates the WSD acknowledging how utilities are at different stages of their data journey and how the Draft GIS Data Schema is intended to be a phased approach. As further described in our Guidance-10 response, SCE is committed to incrementally providing more data and details in subsequent QR submissions to meet the Draft GIS Data Schema requirements.

SCE looks forward to the WSD's review of our second QR and welcomes a meeting to discuss our responses if the WSD would find that useful. If you have any questions, or require additional information, please contact me at carla.peterman@sce.com.

Sincerely,

//s//
Carla Peterman
Senior Vice President, Strategy and Regulatory
Affairs Southern California Edison

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[2] *See* SCE's response to Guidance-10 and the accompanying Geodatabase and Status Report template that explain the data SCE is providing and the data SCE is not providing at this time, as well as SCE's expectations to incrementally provide more data with subsequent QR submissions.

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Southern California Edison Second Quarterly Report on 2020-2022 Wildfire Mitigation Plan for Ongoing Class B Deficiencies

December 9, 2020

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GUIDANCE-9
INSUFFICIENT DISCUSSION
OF PILOT PROGRAMS

Southern California Edison Company
2020-2022 WMP - SCE Deficiency
Guidance -9

Name: Insufficient discussion of pilot programs
Category: Alternative Technology
Class: B

Deficiency:

Electrical corporations do not describe how they will evaluate and expand the use of successfully piloted technology or which piloted technology has proven ineffective. To ensure pilots that are successful result in expansion, if warranted and justified with quantitative data, electrical corporations must evaluate each pilot or demonstration and describe how it will expand use of successful pilots.

Condition:

In its quarterly report, each electrical corporation shall detail:

i. all pilot programs or demonstrations identified in its WMP;
ii. status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption;
iii. results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits; and
iv. How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices;
v. a proposal for how to expand use of the technology if it reduces ignition risk materially.

Response:

SCE has outlined a response for each of its alternative technology items pursuant to the requested conditions. This document has been developed with the intention that it will also be used for quarterly status updates. As such, some information will remain relatively static (e.g., pilot objective/summary), while some will be dynamic (e.g., pilot status and pilot status description). SCE has also collaborated with the other IOUs to ensure format and terminology alignment to the extent possible.

Condition i: The following is a list of SCE's alternative technology pilots:

- AT-1 - Meter Alarming for Down Energized Conductor (MADEC)
- AT-2.1 - Distribution Fault Anticipation (DFA)
- AT-2.2 - Advanced Unmanned Aerial Systems
- AT-3.1 - REFCL - Ground Fault Neutralizer (GFN)
- AT-3.2 - REFCL - Arc Suppression Coil
- AT-3.3 - REFCL - Isolation Transformer
- AT-3.4 - Distribution Open Phase Detection
- AT-4 - Vibration Dampers
- AT-5 - Asset Defect Detection using Machine Learning
- AT-6 - Assessment of Partial Discharge for Transmission Facilities
- AT-7 - Early Fault Detection (EFD)
- AT-8 - High Impedance Fault Relays

The 12 activities listed above cover five primary areas SCE is investigating which are (1.) incipient fault detection, (2.) fault/wire-down detection, (3.) fault energy reduction/limiter, (4.) inspection improvements, and (5.) system hardening. Incipient fault detection technologies involve activities that can identify impending equipment failure before the fault occurs and allow for preventative response or maintenance, which include pilots AT-2.1, AT-5, AT-6, AT-7. Wire-down detection activities such as AT-1, AT-3.4, and AT-8 involve technologies that can detect a wire-down event in real-time, typically known as high-impedance (Hi-Z) fault, potentially providing the necessary data to manually trigger a protection scheme. Fault energy reduction/elimination technologies consist of the family of Rapid Earth Fault Current Limiter systems in AT-3.1 to AT-3.3. These technologies focus on quickly limiting fault energy (i.e. reduced to a very low energy level) and isolating the fault to prevent an ignition based on rapid response of the protection equipment. There are several activities in each of these fault mitigating categories due to variation in the method, speed, and confidence of detecting and mitigating the fault ignition risk. The AT-2.2 activity targets swifter PSPS pre and post patrols through the use of Beyond Visual Line of Sight (BVLOS) drone missions with the longer-term goals of improving the safety of air crews, increasing drone inspection/patrol throughput, and reducing outage duration. Lastly, AT-4 is an early system hardening activity that will determine the efficacy of vibration dampeners for covered conductors for improved wind resistance.

For Condition ii: SCE will be providing the following details for each item: Project Objective / Summary, Pilot Status phase, Pilot Status Description, Pilot Location, and Pilot Project Milestones.

For additional clarity, SCE has included a description of each project status phase in Table 1 below. Additional information can be found in each activity section that follows.

Table 1 - Guidance-9
Project Status Descriptions

SCE – Alternative Technology – Project Status Phase Descriptions	
Initiation Phase	Project purpose and benefits defined Initial scope, schedule, budget Sponsor, stakeholders, project team defined
Planning / Design Phase	Plan including refined scope, schedule, budget Benchmarking with other utilities to avoid project duplication, lessons learned, and industry best practices Detailed design, technical requirements, coordination Contracting
Build / Test Phase	Build, test and demonstrate Evaluation of defined metrics
Closeout Phase	Path to production revised Lessons learned documented Decommissioning completed Final report
Continuous Improvement	Optional phase that some projects progress to when there is project-related continuous improvement activity post Closeout.

As of 9/30/20, SCE plans to continue executing on all Alternative Technology items. There are currently one item in Initiation, five items in Planning/Design, five items in Build/Test, and one item in Continuous Improvement. Activities AT-2.2 and AT-4 have transitioned to Build/Test phase.

Condition iii: In most cases, these are active projects in varying phases per the table above, and results are not typically known and substantiated until the closeout phase. However, SCE is providing any key, useful learnings as of 9/30/20 if available. Additionally, quantitative performance metrics and quantitative risk reduction benefits are often not known during the pilot stage; these may be developed as part of the closeout phase or subsequent planning activities if the technology proves effective and there is a desire to operationalize. That said, SCE is providing any qualitative or quantitative metrics, if defined, as part of the pilot project, in addition to anticipated or realized wildfire risk reduction benefits.

Condition iv: For each activity, SCE is providing the general fault detection strategy, including any information about the types of faults that are detected or mitigated, if known, and any resulting remediation if that data is available during the pilot. Data that may lead to establishing new or revised operational practices are typically available towards the end of the project as part of lessons learned and/or recommendations. However, should immediate operational insights be identified during the pilot, SCE will note them accordingly.

Condition v: For each activity, SCE is providing the envisioned pilot operationalization strategy based on our most current understanding of the technology and how it may be deployed for operations, assuming the pilot proves successful. However, some projects are in the early stages of technology development and an operational strategy may not yet be clear, while some projects are in the continuous improvement stage and have already been operationalized.

WMP Activity ID: AT-1	2020-2022 WMP Section: 5.3.3.2.2
Activity Name:	**AT-1 - Meter Alarming for Down Energized Conductor (MADEC)**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: This project is an evaluation of possible improvements to SCE's existing MADEC system for specifically detecting downed energized *covered* conductors through SCE's Advanced Metering Infrastructure network. The goal is to evaluate algorithm improvements for covered conductors, which are expected to exhibit different electrical transient signals than bare conductor. To be clear, the MADEC algorithm is not the pilot project, as the MADEC system is operational today, where action is taken upon receiving an output from the algorithm. SCE continues to operate MADEC across the distribution system for bare and covered wire systems. This AT-1 pilot will specifically study *covered* conductor application to understand if specific improvements to the algorithm are practical on predominantly covered conductor systems.

Pilot Status: Continuous Improvement

Pilot Status Description: Machine learning (ML) algorithms require data for training. There is minimal data on downed covered conductors since SCE has been accelerating its installation since 2018, so a process has been implemented to capture the data associated with downed energized covered conductor events, should they occur. While all event data is valuable, algorithm improvements will require significantly more data on downed energized covered conductor before the algorithm to detect them automatically can be implemented.

Project Location: The existing active MADEC algorithm runs across the SCE distribution system utilizing data from SCE smart meters and other systems, which includes circuits and circuit segments with covered conductor.

Pilot Project Milestones: SCE will provide quarterly updates on any known covered conductor failures in Q3 2020, Q4 2020, Q1 2021, and Q2 2021.

Pilot Project Milestones (as of 9/30/20):

- There have been no changes to milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, SCE has only experienced three downed energized conductor events. The first event on Jordan 12kV on 3/7/20 resulted in fluctuating voltage but not enough sustained low voltage conditions from the real-time meter data for detection. The second event on Capanero 2.4kV on 7/5/20 resulted in no real-time meter data. The third event on Thacher

16kV on 7/24/20 resulted in no real-time meter data as the covered conductor was intact but suspended in vegetation.

The MADEC algorithm will continue to analyze data for both bare and covered conductors as SCE operates its system to aid in de-energizing downed conductor situations.

Pilot Progress (as of 9/30/20):

- The 7/24/20 event on the Thacher 16 kV circuit was further evaluated. This down covered conductor occurred when a car hit pole, where a single transformer was affected. No other circuitry was affected as all primary conductor was electrically intact. Smart meters did not generate low voltage exceptions as there was no path to ground. As MADEC requires at a minimum a low voltage exception, this event was not able to be used to improve MADEC for covered conductors.

Pilot Lessons Learned: No lessons learned for updates to the MADEC system in relation to detection of downed covered conductor events have been determined yet. The pilot will require much more data from actual downed energized covered conductor events in the field in order to document lessons learned and substantiate algorithm revisions. Of the three energized events, only one instance provided voltage exception data that was outside the normal bounds, which was minimal and could be mistaken for normal minor system fluctuations. The MADEC algorithm will continue to analyze data for both bare wire and covered conductor as SCE operates its system to aid in de-energizing downed conductor situations.

Pilot Lessons Learned (as of 9/30/20):

- No relevant information was gained from the most recent event.

Project Performance Metrics: Success of the AT-1 MADEC project is determined by several factors focused primarily on the number of downed covered conductor events that can be captured and whether the captured dataset offers actionable attributes. The dataset to be evaluated includes, but is not limited to, smart meter exception, reviewing repair/trouble orders for each down covered conductor, and switching records to identify potential actionable attributes for MADEC improvements.

Project Performance Metrics (as of 9/30/20):

- All four energized downed covered conductor events have been evaluated, but more actionable data is required before MADEC improvements can be made for covered conductor.

Wildfire Risk Reduction Benefits: Detection and prevention of downed energized covered conductor is an important aspect of public safety and of wildfire risk reduction. The MADEC system can limit the total time a downed energized covered conductor is energized after falling to earth, clearly providing improvement to public safety. Application of covered conductor is expected to greatly reduce the quantity of fault events and in turn also greatly reduce electric system related ignition events and other associated hazards. While the MADEC system may offer wildfire reduction benefits in other unique cases, the existing MADEC system (including potential improvements to the algorithm for covered conductor specifically) is considered an electric enhancement and support system to the deployment of covered conductor with the goal of mitigating downed energized cover conductor events.

<u>Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices</u>

Fault Detection Strategy: When the MADEC system alarm is generated indicating a potential energized downed wire, a notification is sent to our operations and dispatch center to take appropriate action, such as de-energizing the circuit or dispatching a troubleshooter immediately to a predicted location.

<u>Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially</u>

Envisioned Pilot Operationalization Strategy: The machine learning algorithm continues to be updated and improved through present operational practices. Improvements that may be identified as part of this assessment may be incorporated into the algorithm following these established system updates. The assessment may have other outcomes such as the potential to changes in data collection to enable improvements to the system or alternately the assessment may not result in any substantial changes to the MADEC system. The operationalization strategy will be formulated based on the findings of the assessment.

WMP Activity ID: AT-2.1	2020-2022 WMP Section: 5.3.3.2.1
Activity Name:	**AT-2.1 - Distribution Fault Anticipation (DFA)**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: DFA technology uses electrical system measurements to identify pending equipment failures using a proprietary algorithm developed by Texas A&M that is built upon analysis of incipient event data gathered from multiple utilities. The DFA technology is used by several Texas electric cooperatives as part of their wildfire mitigation. SCE adapted and installed DFA devices in substations, which transmit circuit data, such as voltage and current measurements, along with grid event alarms. The data captured by DFA will be used to detect, locate, and categorize events as such as incipient faults, traditional faults, and normal circuit operations. An example of an incipient fault would be an internal connection on a capacitor switch that is gradually failing, but not detectable during an inspection and has not yet progressed into a fault. A capacitor switch that failed and faulted would be an example of a traditional fault, which is normally detected by conventional protection. Lastly, an example of normal operation detected by DFA would be switching a capacitor. SCE is evaluating the technical performance of the DFA system in this pilot and will continue the partnership with Texas A&M to help refine their algorithm to adapt to SCE circuit topology and equipment characteristics.

Pilot Status: Build / Test Phase

Pilot Status Description: SCE has installed 60 DFA monitoring systems at SCE substations across its service area to monitor 60 High Fire Risk Area (HFRA) circuits. The grid events and electric system data captured by the DFA systems are evaluated on an on-going basis. Most hardware installations for the 60 DFA systems were completed in 2019 and commissioned in January 2020. An additional 150 deployments are planned for the pilot in 2021 which is further detailed in the *Pilot Progress*.

Project Location: DFA systems were deployed on circuits that transverse through HFRA in different districts for a sample representation of our HFRA territory. Deployment locations factored other considerations such as low constructability impacts to substations. These substations are in the following SCE Districts:

- Kernville
- Thousand Oaks
- Monrovia
- Menifee
- Wildomar

Pilot Project Milestones:

1. Collect and analyze DFA grid events (Q1 2020 and ongoing)

2. Initiate/finalize selection of candidate circuits for 2021 (Complete)
3. Finalize Technology Assessment document on 60 DFA units (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, this technology assessment is based on 60 DFA units with limited data collected from January to June 2020. The assessment resulted in a recommendation to expand the pilot deployment with an additional 150 DFA installations in 2021 to increase collection of data points to better assess DFA performance. Sites have been selected for the 2021 pilot expansion with planning and design for the selected candidates expected to initiate in Q3-Q4 in 2020.

Pilot Progress (as of 9/30/20):

- Since the initial filing, the 2nd milestone was completed with all candidate circuits for 2021.
- SCE continues to collect and analyze grid events data identified by the DFAs installed as part of the pilot. Target locations for the 2021 pilot expansion have been identified and planning/design for the selected candidates has been initiated.

Pilot Lessons Learned:

- DFA provides awareness for normal or incipient type of grid events. The lesson learned from analyzing each event is that there are classifications related to incipient events and other classifications that are not.
- While interacting with Texas A&M, there are some situations that have not been studied by Texas A&M, which requires the Texas A&M team to learn more about SCE's configurations / networks to make additions or modifications to their proprietary algorithm. The DFA algorithm continues to improve as it collects additional grid event data. These efforts will be ongoing to improve the DFA anticipation model.
- DFA consolidates circuit data and activities that presently require manual collection and interpretation.
- Communication impacts with utilizing 4G LTE continue beyond installation challenges found in 2019. The challenge comes from the poor LTE connectivity availability of the cellular systems in remote substation locations.
- SCE did not have a way to track fault induced conductor motion easily with our own tools and analysis process. DFA provides awareness for these types of events on a web portal.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned.

Project Performance Metrics:

- **Incipient Event Detection:** Project will track and analyze incipient events. Scenarios will be analyzed, including determining potential for ignition risk, that will lead to improved identification and location of incipient faults.
- **Other Event Types:** Project will track and analyze unique event notifications not readily available with existing tools. This will lead to identification and location of grid events such as other fault and non-fault related events that are not classified as incipient faults.
- **Operational Awareness**: Project will track DFA Grid Event notifications where DFA provides additional circuit conditions/awareness not typically found with other engineering/operational tools. This allows SCE Operations to proactively configure the system or reactively confirm issue is resolved.
- **Equipment Failure Ratio:** Track DFA device failure ratio. SCE expects equipment received should be free of damage, defects, and in-service failures. SCE is working with the DFA vendor to bring this ratio to less than 1% failure upon equipment commissioning.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: DFA provides increased awareness of incipient faults on circuits which will minimize ignition risk with remediation. DFA aids in locating fault events not previously identified allowing inspection and potential repair actions to prevent future fault re-occurrences. DFA also measures electrical disturbances where the alerts may also inform circuit operational decisions during elevated risk conditions.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: DFA provides an alert based on the detection algorithm for identifying anomalies on a distribution circuit and provides remote access to fault recorder data which can be used in investigating significant events and fault locating. Furthermore, the process would require categorizing if an anomaly is an incipient fault, a traditional fault, or a normal operation. Of these three categories of anomalies, detecting and responding to an incipient fault would prevent a potential failure and ignition. For traditional faults where detected by other means of protective devices, mitigation is by means of replacement with grid-hardening equipment/material and by other types of technologies such as open phase protection and Rapid Earth Fault Current Limiting (REFCL) for reducing ignition risks. Lastly, normal operations, such as a capacitor switching, are not causes of ignition.

SCE receives DFA event notifications in real-time. The established process, depending on event severity, is to review/analyze high priority events as soon as possible (i.e. Incipient Event Detection). Non-priority events are queued/reviewed per resource availability (i.e. Other Events Types & Operational Awareness).

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy:

Based on event analysis, field operations may be contacted for further field investigation and depending on findings appropriate mitigation actions are initiated.

Prioritization of installations for wildfire risk reduction would inform the installation schedule of DFA assets. Circuitry with these continuous monitoring devices would have maintenance governed by events in addition to other inspection programs. DFA data recorder information would be used for post event analysis, including improved fault locating capabilities beyond today's systems.

Further pilot expansion of 150 units for the pilot was deemed necessary to continue evaluation of the pilot due to need to capture more data for analysis and refining the algorithm. Upon successful evaluation of the pilot, remaining deployment of 600 units would commence over the next two years as described in 2021 GRC.

WMP Activity ID: AT-2.2	2020-2022 WMP Section: 5.3.4.9.2.1
Activity Name:	**AT-2.2 - Advanced Unmanned Aerial Systems**

<u>Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption</u>

Pilot Objective / Summary: Conduct additional Beyond Visual Line of Sight (BVLOS) demonstration Unmanned Aerial System (UAS) flights using lessons learned from 2019 study and validate aerial patrol findings via truck, foot, or helicopter.

Pilot Status: Build / Test Phase

Pilot Status Description: SCE is currently conducting the necessary procurement and planning activities prior to commencing demonstration drone flights.

Project Location: These pilot demonstration flights are planned to be conducted over five distribution circuits in High Fire Risk Areas (HFRA) that have experienced PSPS events in the past and are frequently on the monitoring list. FAA Airspace classification was also a key consideration.

- Energy (Bell Canyon, Ventura County)
- Bootlegger (Acton, Los Angeles County)
- Tahquitz (Mountain Center, Riverside County)
- Anton (Moorpark, Ventura County)
- Guitar (Santa Clarita, Los Angeles County)

Project Location (as of 9/30/20):

- A non-HFRA circuit, the Kenworth 12 kV in Adelanto, San Bernardino County, was selected to conduct the simulated PSPS demonstration flights (and evaluation/testing of very advanced aircraft) due to concerns with very dry fuel conditions and wildfire response resource constraints in all the original locations. This circuit was chosen because it traverses rugged and undulating high desert terrain that presented similar communication and command-control challenges as the other HFRA circuits noted.

Pilot Project Milestones:

1. Align workstream & milestones with broader UAS Program development; Define location, technical, and safety requirements for 2nd demonstration by (Complete)
2. Conduct PSPS-focused Technical & Safety Qualification flights with vendors; Establish SGI waiver process and templates to be utilized for future PSPS events by (Complete)
3. Obtain BVLOS waiver for limited scope PSPS and/or emergent events by (Complete)
4. Conduct 2nd round of demonstration flights for simulated PSPS event by 10/30/20
5. Develop first draft of demonstration report and socialize with key stakeholders by 12/31/2020

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, a Statement of Work (SOW) for the demonstration flights was finalized, a Request for Proposal (RFP) was issued, bids were subsequently collected, and the project team is selecting a small subset of vendors with whom a technical and safety qualification test will be conducted. Following the technical and safety qualification, a few successful vendors will be invited to conduct demonstration flights on circuits with a history of pre-emptive de-energizations in a simulated PSPS event. These simulated events are expected to be conducted in the Fall.

Pilot Progress (as of 9/30/20):

- SCE conducted technical and safety qualification evaluations of six vendors, three of whom met SCE's technical and safety criteria and have been invited back to participate in simulated PSPS patrol missions. As part of the technical and safety evaluations—which required the vendors to fly a simulated PSPS patrol BVLOS mission on a small segment of overhead distribution circuit—SCE secured FAA Special Government Interest (SGI) Temporary Flight Restrictions (TFR) on all missions, which permitted SCE to conduct BVLOS missions in a safe and compliant manner. In Q4 2020, SCE plans to conduct additional simulated PSPS demonstration flights with the three selected vendors using the SGI TFR waiver process and will finish the year with a final technical report on the study.

Pilot Lessons Learned:

- Regulatory barriers exist that make BVLOS drone flights difficult to achieve, particularly in populated areas with congested and restricted airspace.
- Southern California has some of the most diverse topography and geography in the United States, much of which is served by SCE. This diversity, particularly extreme elevation changes and heavily forested, remote areas, present challenges for live streaming video and aircraft control. Drone mission endurance also needs to improve for UAS patrols to be conducted effectively and efficiently in these difficult environments.
- Video quality and zoom, combined with shooting angles and distance above structures, needs to be further tested and optimized for inspectors to feel confident when conducting remote aerial patrols and making an 'all-clear' decision from a desktop vantage point.
- Additional demonstration flights are needed to not only prove the viability and effectiveness of using UAS compared to traditional patrolling methods, but also to advance aircraft detect-and-avoid and communication technologies that are prerequisites for BVLOS missions.

*Pilot Lessons Learned (*as of 9/30/20):

- Although regulatory barriers still exist, close collaboration and communication with the FAA and a measured 'crawl, walk, run' approach to BVLOS waivers is critical to successfully navigating the regulatory environment and ensuring the safety of the crew and public. Securing BVLOS waivers for these limited PSPS events via the FAA SGI process is a significant result of this pilot.

- While 'good' LTE mobile signal strength is needed to stream video back to remote locations, locating the control station too close to cellular antenna infrastructure, or other radio and microwave communication towers, may adversely impact streaming and/or command-control communications.
- Vendors who used two operators—one to fly the aircraft and one to operate the camera sensor—were able to quickly adapt to inspector feedback to ensure the optimal zoom, angle, altitude, and aircraft speed and placement. Planned and clear communication between the inspector, sensor operator, and pilot are critical.
- Some vendors planned their missions as detailed 'stop and hover' structure inspections, versus a 'fly-by' patrol, despite clear instructions in the statement of work. The objective will be clarified and reinforced for future missions.
- Careful attention must be paid by mission planners to adequately plan for aircraft terrain/elevation following protocols, both when operating the aircraft and under normal conditions (whether manually or automated) and during emergency procedures.

Project Performance Metrics: Forward Looking Metrics (when data becomes available):

- Video quality and streaming consistency high enough for inspectors to render all clear designation
- Time to deploy/mobilize to subject location
- Time to complete patrol and render all clear designation
- Ability to secure necessary FAA waivers and/or permits to conduct patrol operations
- Ability to maintain command-control of the aircraft and maintain consistent streaming of video

Project Performance Metrics (as of 9/30/20):

- During vendor technical and safety qualification evaluations, three of the vendors were able to maintain consistent and high-quality video streaming throughout the flights, sufficient for an 'all-clear' designation from the inspector.
- During vendor technical and safety qualification evaluations, the time to complete the aerial patrol and render an all-clear designation of the inspector (of the three successful vendors) took 1.2 to 9 times the amount of time it took the inspector to patrol the circuit via their truck. This was primarily attributable to poor mission planning, misunderstanding of the objective, and poor imaging sensor choice. However, we are confident this can be further improved in the missions being conducted in Q4 2020.
- During vendor technical and safety qualification evaluations, SCE successfully secured FAA Special Government Interest (SGI) Temporary Flight Restrictions (TFR) on all missions, which permitted SCE to conduct BVLOS missions in a safe and compliant manner.
- During vendor technical and safety qualification evaluations, although all vendors were able to maintain command and control of their aircraft during their missions, some

executed a 'return to landing' protocol for causes that were unclear. SCE will be further evaluating the UAV telemetry data to determine the cause.

Wildfire Risk Reduction Benefits:

- Reduced potential for ignition during pre-event circuit patrols and circuit re-energization/restoration after conditions have subsided.
- Reduction in outage duration or customer minutes of interruption associated with PSPS events.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: As with any circuit patrol, the objective is to locate any conditions that could cause a fault and subsequent ignition, whether as part of a pre-event PSPS patrol or upon re-energization of the circuit. If abnormal conditions are found during the course of the simulated PSPS patrol missions, Troublemen that are part of the project team will either effect repairs in the field or issue the appropriate notification to have the condition repaired.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: If the pilot proves technically feasible, is an efficient means to patrol circuits, and offers flexibility for field crews to optimize resources to perform pre or post-event circuit patrols, then the next step would be to conduct an analysis of whether this activity could be performed in-house and/or with vendors and to assess the cost effectiveness of each method. It is likely that an assessment of each circuit that may require aerial support have a unique flight plan (i.e. 'aerial patrol playbook') drafted so as to ensure the safe and efficient aerial operations may be conducted on individual circuits or circuit segments. SCE's UAS standards and policies should be updated accordingly, personnel should be trained, RFP issued (if vendor support is desired), and IMT and Field Worker training should be revised to include processes and procedures on UAS-based aerial patrols and their appropriate/safe application and use.

WMP Activity ID: AT-3.1	2020-2022 WMP Section: 5.3.3.2.3.1
Activity Name:	**AT-3.1 - REFCL - Ground Fault Neutralizer (GFN)**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: The objective of the Ground Fault Neutralizer (GFN) is to detect a phase-to-ground fault, quickly reduce the fault energy below the ignition point, and isolate/disconnect the fault by means of switching operation. The GFN consists of an arc suppression coil and a residual current compensating inverter on the neutral of a grounding transformer. It can reduce the voltage on a phase to below 250 volts within a few cycles whenever a single phase to ground fault occurs. This technology has been used in Australia for detecting and acting on faults as low as 0.5 amperes. The advantages of the GFN for fire mitigation is that it reduces the energy released at the point of the failure faster and more completely than any other available technology. Another benefit of the GFN is that it is a detection/energy reduction operation. This operation is expected to be completed without a sustained power interruption to customers when the fault is temporary in nature. The advantages for fire mitigation are that it reduces the energy released at the point of the failure faster and more completely than any other available technology. There are technical reasons that make the GFN and other REFCL design variants the most effective for mitigating phase-to-ground faults (but not phase-to-phase or three-phase faults) and three-wire system (but not four-wire system). This limitation behooves SCE to test and deploy other technologies to complement GFN and other REFCL designs for mitigating phase faults and 4-wire system.

Pilot Status: Planning / Design Phase

Pilot Status Description: Equipment specifications and project scope finalized. Equipment received and project design is in progress.

Project Location: Currently not field deployed

Pilot Project Milestones:

1. Finalize pilot location, equipment specification and contract award (Complete)
2. Real Time Digital Simulation (RTDS) Testing and protection requirements (Complete)
3. Phase measurements and Distribution scope development (Complete)
4. GFN equipment receipt (Complete)
5. Substation engineering and design (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, equipment specifications and protection requirements are completed, substation scoping has been completed, and project design is currently in progress. Factory acceptance testing of the ground fault neutralizer was also completed, and equipment is now in transit to SCE and expected to arrive in 3rd quarter of 2020.

Pilot Progress (as of 9/30/20):

- Four of the five project milestones have been completed. Protection requirements, substation scoping, phase measurements, and required CYME modeling for circuit balancing have been completed. In mid-August 2020, SCE received the GFN equipment after completing factory acceptance testing. The engineering & project design is on-going. Target installation locations for the GFN have been identified. Additional GFN equipment such as current transformers with the required accuracy for the application have been received and are undergoing testing. A vendor for the capacitive balancing units has been selected and the material order has been placed.

Pilot Lessons Learned: The supplier of the Ground Fault Neutralizer was able to successfully supply the equipment with six months lead time during a pandemic. A supplier was found for a circuit breaker rated for use as a bypass breaker to close back into the ground grid and revert to solid grounding when the Ground Fault Neutralizer is out of service. Current transformers were identified which have the required accuracy for this application.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned

Project Performance Metrics:

- SCE Distribution and Substation equipment able to withstand the overvoltage caused by the GFN.
- Ability to detect ground faults down to 0.5 amps.
- The GFN meets the following criteria which have been shown to reduce the risk of ignition from a ground fault from a down wire or tree contact by at least 90%:
    - When tested with a low impedance phase to ground fault, the voltage on the faulted phase is reduced to 1900 volts within 85 milliseconds, 750 volts within 500 milliseconds, and 250 volts within 2 seconds.
    - When tested with a high impedance phase to ground fault, the voltage on the faulted phase is reduced to 250 volts within 2 seconds. When determining if the fault is still present on the phase the total i^2t (ampere-squared-seconds) of the fault must be less than 0.1 A^2s
- Validation of cost versus benefit.
- Validate feasibility of broad deployment while still maintaining operational reliability.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: Extensive testing in Australia suggests this system produces at least a 90% reduction in probability of ignition from ground faults. The most relevant test reports explaining this information are the 2015 studies titled "REFCL Technologies Test Program Final Report" and "Vegetation Conduction Ignition Tests" which highlight the system' ability to detect downed conductors that are not detectable using conventional protection. Based on the Australian experience it is believed that half ampere faults can be detected.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: The GFN monitors circuit conditions and can detect faults down to 0.5 amps. When a fault is detected, the system rapidly de-energizes the conductor with the fault, reducing the energy released at the fault location with the goal to prevent an ignition of present fuels. The reduction of fault energy means a reduction in quantity and temperature of incandescent particles during a wire-down contact with dry field. The location of a fault will be identified down to the circuit level. However, Automatic Reclosers, fuses and other protection devices deployed on the faulted circuit will no longer detect or interrupt the faults because the Ground Fault Neutralizer blocks the fault current which these devices use to detect a fault. Therefore, the circuit breaker at the substation will be used to de-energize the line and field workers will patrol the line to clear permanent faults. Although the entire circuit must be shut off to clear permanent faults (versus opening a downstream RAR, for instance), the reliability impact of this will be somewhat mitigated by the fact that the arc can be extinguished on temporary faults without de-energizing customers.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: Due to the high cost and complexity of REFCL technologies, SCE will confirm this system works as expected and better understand the cost to deploy before planning an expansion of the REFCL technologies. Expansion will be done according to system configuration to balance the risk reduction and cost of each deployment. The lead time on materials for a project is about 8 months. In some cases that means a complete project can be performed in 18 months or less. However, if a substation requires rebuilding or reconfigurations to make space or incompatible equipment must be replaced, projects may require three years or more to complete.

WMP Activity ID: AT-3.2	2020-2022 WMP Section: 5.3.3.2.3.2
Activity Name:	**AT-3.2 - REFCL - Arc Suppression Coil**

<u>Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption</u>

Pilot Objective / Summary: Initiate engineering design to convert a typical substation to resonant grounding. This involves installing an arc suppression coil (ASC) on the neutral of the substation transformer. The arc suppression coil will redirect most of the current away from single phase to ground faults anywhere on the distribution circuit on which it is deployed and redirect it to the substation ground grid where it can be safely discharged. When completed, single phase to ground fault currents will be reduced to around three amperes. In order to detect and locate faults, a new protection system is being installed along with new high sensitivity current transformers. The benefit of the ASC is that this technology can be used on smaller substations in outlying areas and would require minimal system re-configuration.

Pilot Status: Planning / Design Phase

Pilot Status Description: Currently, the team is finalizing equipment specifications, developing the project design/scope, and defining requirements for a successful pilot.

Project Location: Currently not field deployed

Pilot Project Milestones:

1. Finalize pilot location, equipment specification and contract award (Complete)
2. RTDS Testing and protection requirements (Complete)
3. Substation engineering and design (Q4 2020)
4. ASC material receipt (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

<u>Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits</u>

Pilot Progress: As of 7/31/2020, equipment specifications have been completed and protection equipment requirements have been defined. Real Time Digital Simulations (RTDS) are being used in the development of protection settings, substation scoping has been completed, and project design is currently in progress.

Pilot Progress (as of 09/30/20):

- RTDS Testing and protection requirements has been completed.
- Pilot development is still in process and as such there are no results at this time.

Pilot Lessons Learned:

- Identified material supplier was determined to be able to supply the Arc Suppression Coil in 6 months instead of the expected 8 months.
- Identified supplier for a circuit breaker rated for use as a bypass breaker to close the ground grid and revert to resistance grounding when the ASC is out of service.
- Four protection elements--Admittance, Incremental Conductance, Wattmetric and Transient--were identified as being important elements to test as part of this technical application.
- Identified required high accuracy current transformers for use detecting low magnitude faults.

Pilot Lessons Learned (as of 9/30/20):

- RTDS testing showed that some of the protection schemes being investigated are extremely promising below the 1 amp sensitivity level. A portion of these results were published with GE in the Western Protective Relay Conference and CIGRE Canada.[1]

Project Performance Metrics:

- SCE Distribution and Substation equipment able to withstand the overvoltage caused by resonant grounding.
- Ability to detect ground faults down to 0.5 amps.
- Resonant grounding at the substation is sufficient to meet the following criteria which have been shown to reduce the risk of ignition from a ground fault from a down wire or tree contact by at least 90%:
  - When tested with a low impedance phase to ground fault, the voltage on the faulted phase is reduced to 1900 volts within 85milliseconds, 750 volts within 500 milliseconds, and 250 volts within 2 seconds.
  - When tested with a high impedance phase to ground fault, the voltage on the faulted phase is reduced to 250 volts within 2 seconds. When determining if the fault is still present on the phase the total i2t of the fault must be less than 0.1 A2s
- Determining implementation costs for feasibility of broad scale deployment.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: Simulations suggest this system will be able to meet the same REFCL criteria which were tested and shown to provide a 90% reduction in probability of ignition from ground faults.

Ability to detect downed conductors that are not detectable using conventional protection.

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[1] https://cigreconference.ca/papers/2020/B3/311/rapid-ground-fault-detection-on-compensated-grounded-systems-design-and-testing-126-paper.pdf.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: There are several different protection elements which are marketed for resonant grounded systems. It is unclear which are best suited to detect low magnitude faults so several different elements such as Admittance, Incremental Conductance, Transient, and Wattmetric are being evaluated. However, Automatic Reclosers, fuses and other protection devices deployed on the faulted circuit will no longer detect or interrupt the faults because resonant grounding will reduce the fault current which these devices use to detect a fault. Temporary faults can be cleared without opening a protective device since the fault current will be no more than a few amperes. If the protection is shown to be able to reliably detect the faults the circuit breaker at the substation might be used to de-energize the line and field workers will patrol the line to find and repair permanent faults. Until that point the arc suppression coil will only be used to reduce the energy of temporary faults and will be bypassed on permanent faults.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: The ASC variant design of REFCL technology can be deployed for smaller substations located in outlying area and require minimal circuit re-configuration work. Due to the high cost and complexity of REFCL technologies, SCE will confirm this system works as expected before planning an expansion of the REFCL technologies according to system configuration to balance the risk reduction and cost of each deployment. The lead time on materials for a project is about 8 months. In some cases that means a complete project can be performed in 18 months or less. However, if a substation requires rebuilding or reconfigurations to make space or equipment which is incompatible must be replaced, then a project may require three years or more to complete.

WMP Activity ID: AT-3.3	2020-2022 WMP Section: 5.3.3.2.3.3
Activity Name:	**AT-3.3 - REFCL - Isolation Transformer**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: Install one Rapid Earth Fault Current Limiter - Isolation Transformer. The REFCL operational requirements developed in Australia have been identified to reduce ignitions from single line to ground fault events by up to 90%. This includes ignitions related to down wire. Identified REFCL systems available for application on SCEs distribution systems require 3-wire load connections. Isolation Transformer application provides the unique ability to convert a section of a distribution circuit to 3-wire on an otherwise 4-wire system. This conversion allows targeted application of the REFCL scheme to the HFRA circuit sections and avoids considerable costs related to conversion of existing SCE systems.

Pilot Status: Build / Test Phase

Pilot Status Description: The 2020 pilot focuses on overhead pole-top substation installations. SCE intends to further pilot pad mounted materials in 2021. Based on these two construction methods, further deployments may be practical to extend the REFCL operational benefits across SCE distribution system circuits.

Project Location:

- Field deployed in SCE Redlands District.

Pilot Project Milestones:

1. Finalize pilot location and pilot standard (Complete)
2. Work order design and construction pre-requisites (Complete)
3. Develop and socialize operating criteria (Complete)
4. Develop commissioning criteria (Complete)
5. Field install of hardware (Complete)
6. Apparatus commissioning of installation (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, material is currently being consolidated for field installation. Site installation is scheduled for early Q3, and the commissioning schedule is currently being developed.

Pilot Progress (as of 9/30/20):

- SCE has completed five of six milestones. Site installation is complete. Training material is being developed, and commissioning schedule is being finalized.

Pilot Lessons Learned: Design and constructability concerns have been found early in the process. The transformer connection utilized for the initial pilot installation allowed rapid installation due to availability of materials, but larger expansion would be limited with this type of configuration. The total custom loading beyond the isolation bank are limited due to restrictions for weights of overhead equipment and the configuration also creates operational complications. Additionally, operational concerns are created due to a phase angle shift that is created with the transformer isolation bank connections. The phase angle shift restricts parallel circuit operation as well as backfeed or bypass switching of the isolation bank. Development of alternate transformer winding configurations may resolve these limitations and would best be constructed in a pad mounted transformer design. This pad mounted designs simplifies localized grounding requirements in addition to the mentioned operational benefits.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned.

Project Performance Metrics: SCEs WMP goal is to install one pilot location with a REFCL technology isolation transformer in 2020. This installation is targeted using existing design and available transformer equipment while gaining experience with construction and operational requirements for the REFCL isolation transformer system.

- SCE Distribution equipment design able to withstand the overvoltage caused during a ground fault
- Ability to detect ground faults down to 0.5 amps.
- Isolation bank does not create operational impacts that cannot be resolved
- Determine implementation costs for feasibility of broad scale deployment to support Risk Spend Efficiency evaluation

The longer-term project performance metric for the REFCL isolation transformer pilot is to develop the support material requirements for an operationalization strategy.

The system operations of interest mainly focus on these areas:

- How to configure the protection system during operational situations
- How to respond following a fault event

Additionally, studying related fault events and system reliability impacts are important aspects of this project.

Wildfire Risk Reduction Benefits: If the same voltage reduction targets can be met as the Ground Fault Neutralizer, this system is anticipated to produce the same 90% reduction in probability of ignition from ground faults through the ability to detect downed conductors that are not detectable using conventional protection. Single line to ground fault energy is dramatically reduced compared to existing protection systems.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: REFCL technology reduces ignition risk caused by single-line-to-ground (SLG) faults. It does so by limiting the SLG fault current energy to a level below the threshold required to self-ignite and by tripping the faulted section of circuitry in a timely manner. In a non-REFCL circuit design, a SLG fault would typically result in a fault current magnitude greater that what is known to promote self-ignition but lower than can be sensed and tripped by a traditional overcurrent relay. This undesirable combination results in the faulted line staying energized and has the potential to lead to an ignition. The REFCL isolation bank system is specifically designed to be installed in high fire risk areas; it converts downstream circuitry from traditional overcurrent protection to REFCL protection (trips on phase-to-ground voltage). When a single-line-to-ground fault occurs downstream of a REFCL isolation bank, fault current is designed to stay at or below 0.5A and is designed to trip within 2 seconds or less. With automatic reclosing at the isolation bank system blocked, downstream circuitry needs to be patrolled before the system can be re-energized. All these steps – reducing fault current, tripping quickly, blocking automatic reclosing--significantly reduce SCE's exposure to self-ignition as it relates to SLG faults in high-fire risk areas.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: Isolation transformers maybe used to convert circuit segments to a REFCL operating strategy versus an entire circuit. A prioritization system would be developed to rank candidate installations. An operationalization strategy that is also considerate of the other two REFCL technologies will be explored. The REFCL isolation transformer may be applied at the circuit segment level where costs associated with substation application of REFCL (e.g. ASC or GFN) or 4-wire circuit reconfigurations may be cost prohibitive.

WMP Activity ID: AT-3.4	2020-2022 WMP Section: 5.3.3.2.4
Activity Name:	**AT-3.4 - Distribution Open Phase Detection**

<u>Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption</u>

Pilot Objective / Summary: SCE is investigating a distribution Open Phase Detection (OPD) scheme to determine open conductor conditions. This will allow the protection system to isolate a separated conductor (wire-down) prior to the wire contacting the ground, while leveraging existing distribution hardware in HFRA.

The pilot objectives for 2020 are to complete pilot installations of distribution open phase detection systems at five locations. Data collection on performance of the system will commence following the completed installation at each unique site. The broader pilot objectives over future years includes accurately detecting open phase conditions, avoiding false detections, assessing the detection technology applicability for larger deployment, installation project costs, creation of operational requirements, and potential activation of the system to automatically isolate for detection events. As previously discussed, distribution OPD has the capability to detect phase and ground faults, is compatible with 3-wire and 4-wire systems, and most importantly, is able to isolate a wire-down before it becomes an ignition. However, unlike a REFCL technology, the distribution OPD does not reduce fault energy when a contact is made. This leaves the benefit of reducing contact energy (incandescent particles) to a complementary REFCL technology.

Pilot Status: Planning / Design Phase

Pilot Status Description: SCE is currently monitoring alarm events with our existing radio network at a collection of devices which have been updated with the open phase detection logic. The logic was developed based on system models and thousands of interaction scenarios to create the logic configuration to both attempt to accurately detect open phase conditions, but also avoid false detections from other system events. The alarm monitoring effort is focused on tuning the detection algorithm for real world circuit conditions from the configuration settings developed through modeling. Concurrently, SCE is scheduling plans for installation of the radio system hardware updates to communicate the system commands for the high-speed communication requirements for the detection system.

Project Location:

- Pilot installs completed for five circuits (five device pairs) in the San Joaquin District

Pilot Project Milestones:

1. Determine/finalize system hardware criteria requirements (Complete)
2. Cybersecurity review and approval (Complete)
3. Order material for installations, based on lead times and availability (Complete)

4. Develop/refine and publish pilot standard for hardware construction requirements (Complete)
5. Finalize pilot locations (Complete)
6. Conduct field installations (Complete)
7. Monitor pilot installs (2021)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, significant progress has been made in the development of the open phase detection algorithm including field assessment installations to study the potential for false indications. The next large task is installation of new radio hardware for field testing the performance of the devices at the five pilot locations. Radio hardware setup and site selection was to be supported by the vendor to support the involved system changes for this pilot effort. COVID-19 travel restrictions for the radio manufacturer have been identified and are currently being evaluated.

Pilot Progress (as of 9/30/20):

- Field installations were completed with finalized open phase detection algorithm settings. High speed radios have been commissioned between an end-point-monitoring device and an upstream isolating device. The radio system, measurement hardware, and detection algorithm performance will be monitored as part of the evaluation phase.

Pilot Lessons Learned: The simulation studies show a close relationship will exist between false and accurate detections. It is unlikely that 100% of potential open phase conditions can be identified accurately, and with the additional circuit isolating system some outages from either false detections or operational related errors may occur. The balance between false and accurate event selectivity as well as the complexity for operating the system will be a part of evaluating the pilot installation performance. Changes to the system and continuous improvement is likely as the pilot progresses to field installations. Continued challenges and complexities are likely to occur during development of the open phase detection system as the system in integrated onto distribution circuits.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned.

Project Performance Metrics: SCE identified five locations for pilot installations of distribution open phase detection systems in 2020. Completion of these installations will be tracked as part of SCEs work order process. Success criteria of the larger longer-term pilot includes:

- With field conditions and impacts to radio communication, the design can identify and isolate an open phase condition within 1.2 seconds

- Assessment of system reliability impacts from false detections with an operational OPD scheme
- Costs for deployment of OPD system
- Number of accurately detected wire down events

Additional actions beyond the installations are expected to be driven from the monitoring and assessment of the existing installations as well as technology advances over the course of the project. The project will inform cost estimates and options to consider, if successful, that can influence the speed to operationalize this detection system. This effort for OPD is inherently focused on possible options for minimal cost deployment scenarios to allow wide scale application of this detection system. The focus of the project requires the use of existing field devices to limit substantial expenses with deployment of new hardware. At a high-level, true success of the OPD effort is a system with a beneficial RSE without concern for impacts to customer electric service reliability, which can be directly applied to overhead conductor system protection approaches. The five installations planned for 2020 is part of the process towards achieving the larger goals and finding a system that offer protection from down wire related ignition events.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: The OPD pilot is an effort to develop a scheme to detect wire separation events to then de-energize circuitry to avoid energized wire down faults. The project is focused around the capability to detect a wire separation while the wire is falling towards earth and de-energize the circuit or circuit segment before it comes into contact with the ground or other structures, thus preventing any arcs that would have otherwise accompanied a live conductor fault and possible ignition. A de-energized wire falling to ground essentially eliminates the wildfire risk related to a downed energized wire contacting earth.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: Open Phase detection is intended to identify situations where continuity of the grid is compromised indicating an abnormal condition such as a separated conductor. The system is designed to detect and isolate the impacted circuitry within the time it takes a wire to fall from the supported position to earth. Once operational, system operators would be notified of an OPD interruption and a crew would be dispatched to patrol the line for the separated conductor and subsequent repair.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: Radio technology dependencies (e.g. communication system connectivity and latency) will inform future deployment strategy and the timelines associated with operationalizing this technology. The potential operationalization approaches are expected to be better known in 2021. However, technology continues to progress in the communication industry and the operational approaches may be dynamic with this technology and availability/maturity of new or advanced communication options.

WMP Activity ID: AT-4	2020-2022 WMP Section: 5.3.3.3.3
Activity Name:	**AT-4 - Vibration Dampers**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: Evaluate damper technologies and develop standards for both small and large diameter covered conductor applications.

Pilot Status: Build/Test Phase

Pilot Status Description: Lab testing completed and results analyzed. Field evaluation of vibration dampers completed. Standards for design and the field install of vibration dampers completed and presented at the standards review committee.

Project Location: Currently not field deployed

Pilot Project Milestones:

1. Testing for small conductor vibration dampers (Complete)
2. Testing for large conductor vibration dampers (Complete)
3. Supplier development of vibration damper design (Complete)
4. Develop standards for small and large diameter covered conductors (Complete)
5. Publish standards for dampers for covered conductor (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, the vendor has designed and developed prototype dampers for covered conductor. SCE has completed lab testing of the vibration dampers for Covered Conductor application and completed field testing of the vibration dampers for covered conductor applications. Standards are in development and will be published in Q4 2020.

Pilot Progress (as of 9/30/20):

- Four of five milestones have been completed. Standard development completed and routed to the standard review committee for review. Standard anticipated to be published in Q4 2020.

Pilot Lessons Learned:

- Two vibration designs, the spiral vibration damper and Stockbridge damper, will be required for covered conductor to account for the conductor diameters.
- Both vibration damper designs will not damage the covered conductor covering.

- Testing illustrated that the vibration damper was effective in reducing Aeolian vibration. Instances of high frequency and low amplitude vibration were reduced. Additionally, strains above 150 microstrains were reduced by the vibration damper.
- Vibration dampers are easy to install in bucket truck-accessible areas. Installation that requires pole climbing and the use of hot-sticks will be more challenging and will be studied further as vibration damper design will have to account for hot-stick installation.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned.

Project Performance Metrics:

Vibration dampers shall be developed for covered conductor application. The damper design shall meet the following criteria:

- Span analysis shall not be required to determine damper placement.
- Dampers shall be effective for a minimum span length of 500 ft.
- The damper shall not damage the covered conductor covering.

Additionally, SCE will assess the effectiveness of dampers developed for covered conductor through lab and field testing. Lab testing will measure the energy dissipated by the damper. Field testing will involve monitoring the frequency and amplitude of vibration in a damped and undamped span. The following are success criteria for damper effectiveness:

- Lab testing shall illustrate that the power dissipated by the vibration damper is higher than the Wind Input Power.
- Field testing shall illustrate that the vibration damper will significantly reduce high frequency (above 5 Hz), low amplitude vibrations.
- Field testing shall illustrate that the vibration damper will significantly reduce strains higher than the 150 microstrain peak-peak value.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: Reduces the effects of aeolian vibrations that may lead to conductor fatigue failure or abrasion damage, therefore preventing in-service failure/downed wires.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: Vibration dampers are not applied to detect fault events but rather to minimize damages to the system to avoid fault events particularly with conductor degradation and failure/separation.

<u>Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially</u>

Envisioned Pilot Operationalization Strategy: Vibration dampers are currently a part of SCE standards for bare wire installations, and this pilot will enable SCE to assess industry offerings for damping options for covered conductor applications.

On approval of damper application for Covered Conductor through SCE's internal standards review committee, standards are expected to be published Q4/2020. Dampers shall be applied to new Covered Conductor installations after the standard is published. Retrofits to existing Covered Conductor installations would require additional planning, standards development, and approval.

WMP Activity ID: AT-5	2020-2022 WMP Section: 5.3.4.9.1.1
Activity Name:	**AT-5 - Asset Defect Detection using Machine Learning**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: A proof of concept for future Machine Learning (ML) related to overhead asset inspection activities by standardizing data collection and developing ML tools and processes to evaluate use cases which support objective evaluation of inspection assets. This project aims to improve the prioritization of inspection resource allocation, expedite identification some types of defects, and improve defect identification rates.

Pilot Status: Planning / Design Phase

Pilot Status Description: The pilot has established access to large inspection datasets to apply advanced inspection methods such as Machine Learning.

Project Location: Currently not field deployed

Pilot Project Milestones:

1. Explore operationalizing SCE tools & processes for ML data collection (Complete)
2. Explore operationalizing SCE tools & processes for ML data tagging (Complete)
3. Explore developing SCE ML models for object detection (Q4 2020)
4. Evaluate collaboration with ML vendors to advance defect detection (Q4 2020)
5. Deliver status report on the success of above initiatives (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, SCE Information Technology built an Unstructured Data Description Repository (UDDR) to act as the centralized index for all the Aerial and Ground inspection imagery for future ML efforts. Efforts around creating a data labeling process and tools is still on-going. The additional time it takes to annotate has not shown positive or negative impact to the inspections and have not been made a part of the inspection process. This would need further evaluation without impacting current inspection processes. Initial prototyping of in-house SCE ML models has begun.

Pilot Progress (as of 9/30/20):

- ML object detection models are currently still being developed.
- Integration of models with inspection software has started and incorporated user feedback for predicted defects. This feedback is used to improve models as well as capture findings regarding images.

Pilot Lessons Learned:

- Initial high value AI models have been identified such as providing additional QA/QC from aerial inspection images (blurry, over-exposed, etc.). Other AI/ML models of value were identified as high value include detection of cross-arm failure, vegetation encroachment, and ability to read pole tags (Optical Character Recognition).
- Creating an image defect library is the main item required to initiate this activity as it would allow training of new models and the ability to evaluate performance of vendor processes/models. Developing the tools/processes to label the defect library and a common taxonomy for labeling is critical to creating the image defect library.
- Defining a common taxonomy for categorizing equipment and defects types is a challenge due to the variety of types of equipment and failure modes as well as varied interpretation on a failure mode/type. Without a common taxonomy, labeling the large dataset captured from aerial inspection imagery would require future rework and continuous improvement. As a result, this work is being prioritized before mass labeling can be started.

Pilot Lessons Learned (as of 9/30/20):

- Existing vendor offerings are black box solutions that will be costly to maintain over the years as the context and environment changes and the ML codes must be updated accordingly.
- Experienced challenges relating to processing images due to poor quality. Image quality to be emphasized going forward as it is the foundational component to tagging and detection.

IT processes are not currently mature to accommodate requests to address AI/ML needs. Therefore, resolution from IT to address capability needs have been slower than expected
Project Performance Metrics:

- For data collection efforts, the effectiveness metric will be determined by whether or not all inspection imagery is accessible for developing the machine learning algorithms.
- The ability of AI/ML to detect defects in utility assets inspections will be judged by the number of false positives relative to true positives in the dataset. A good computer vision engine is typically considered to have a successful detection rate of 90% or greater but this ability and its value will have to be judged based on the quality of the input data and be refined over time.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics

Wildfire Risk Reduction Benefits: SCE will be able to prioritize inspection of assets with well-known failure modes rapidly with the objective to remediate the condition before equipment failure or a fault occurs.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: All aerial and ground-based inspection imagery will be accessible for ML models through an application programming interface (API). When imagery is loaded, a computer vision ML model will identify potential defects to prioritize imagery for human inspection and ultimate remediation. This computer-aided process is expected to be more efficient than human identification alone, thus reducing the time it takes to become aware of a problem on our system and to effect repairs.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: Operational strategy would be to integrate ML model analytics into existing inspection management tools and desktop inspector tools to create a seamless, efficient process that quickly identifies problem areas for remediation.

Continued feedback between inspectors and the ML team is key to successful evaluation of the model. ML models are expected to be valuable in prioritizing work for human inspectors by shortening the time between image capture and review and subsequent issue remediation.

Scaling will take place by expanding defect use cases and refining the ML model/process via inspector feedback/calibration and continuous improvement of the model.

WMP Activity ID: AT-6	2020-2022 WMP Section: 5.3.4.10.2.1
Activity Name:	**AT-6 - Assessment of Partial Discharge for Transmission Facilities**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: As equipment deteriorates, it may produce partial discharge either in the form of arcing, leaking, or tracking. SCE has identified a radio frequency (RF) detection technology that has the potential to determine the health of transmission assets by remotely detecting partial discharge. The partial discharge can be detected via RF emissions allowing SCE to investigate and respond to failing equipment prior to an in-service failure. SCE is assessing use of the remote Partial Discharge technology to assess the health of in-service transmission assets.

Pilot Status: Initiation Phase

Pilot Status Description: Engaging with vendor and gathering information for technology evaluation.

Project Location: Currently not field deployed

Pilot Project Milestones:

1. Identify vendor(s) and assess technology (Complete)
2. Gather benchmarking data (Completed)
3. Document findings and proposed next steps (Q4 2020)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, SCE has completed initial vendor assessment and is in the process of gathering benchmarking data from other utilities to share their experiences with partial discharge detection.

Pilot Progress (as of 9/30/20):

- SCE completed two of the three milestones including initial vendor assessment and has gathered benchmarking data from other utilities to understand their experiences with partial discharge detection. Benchmarking data and vendor literature is being reviewed for an assessment/recommendation.

Pilot Lessons Learned: There are no lesson learned at this time. The final deliverable will be a summary of SCE findings, recommendations, and next steps. If there are lessons learned via the desktop assessment, they will be included in the summary.

Pilot Lessons Learned (9/30/20):

- No additional lessons learned.

Project Performance Metrics: Presently there is only one vendor that can perform RF-based remote partial discharge detection for transmission facilities that SCE is aware of. As the benchmarking data is still being captured from other utilities, quantitative performance metrics are not available at this time but will be provided in future updates as more information is obtained.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: This technology has a potential to assess asset/hardware health allowing for proactive remediation of failing equipment prior to in-service failure and possible ignition.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: This technology does not detect faults, but rather mitigates the risk of a fault occurring in the first place by scanning for RF signals that may be indicative of pending equipment failure and effecting necessary repairs or component replacement.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: Based on the findings from the desktop assessment, SCE will determine whether to expand this technology into a field pilot.

WMP Activity ID: AT-7	2020-2022 WMP Section: 5.3.2.2.2
Activity Name:	**AT-7 - Early Fault Detection (EFD)**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: The pilot objectives are to develop installation standards, install, and commission at least 10 EFD sensors with up to an additional 90 sensors for evaluation. The EFD technology shows significant promise in detection capabilities from a review of the available vendor literature. Field detection capabilities, integration with SCE systems/practices, along with installation costs and risk reduction benefits are all part of this pilot effort. In parallel to the pilot, SCE continues to explore additional capabilities the technology may offer beyond the presently identified use cases. Additionally, EFD is expected to complement other distribution system incipient fault detection strategies discussed herein, such as DFA (which directly measures current and voltage transients), since EFD relies on the radio frequency signals emitted during conductor or component degradation. Additionally, EFD, which is currently focused on the distribution system, may complement AT-6 (Assessment of Partial Discharge for Transmission Facilities) which seeks to detect incipient stage faults on transmission system components.

Pilot Status: Build / Test Phase

Pilot Status Description: SCE has completed development of the installation standards as well as the construction and commissioning of at least 10 EFD sensing systems (locations). The total project objective includes an additional 90 locations to be completed by the end of 2021. To complete the total 100 installations identified, SCE will be installing sensors in up to 4 Districts. Currently SCE is focused on development of installation schedules for the next batch of installations. These installations require training on how to identify appropriate sensor and equipment mounting locations, how to install the hardware, as well education on the system performance for each additional District.

Project Location: EFD sensors are applied on Distribution circuits approximately every three circuit miles.

Deployment installations are currently occurring in SCEs Wildomar District. Further installations have been identified potentially for SCEs Menifee District, Ventura District, and Kernville District

Pilot Project Milestones:

1. Identify target locations and develop pilot standard (Complete)
2. Mock install in training yard (Complete)
3. Work order design and construction prerequisites (Complete)
4. Complete field install of 10 units, continue pilot installation efforts beyond initial scope with identification of locations, work order development, and construction efforts. (Complete)

Pilot Project Milestones (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, SCE has commissioned 11 locations on distribution circuits and developed training material and incorporated answers to frequently asked questions on the new system. The training material from the initial installations continues to be refined and will be used to help with next steps for education on the system as well as SCE internal process for the workers in the next SCE district(s) for targeted installations.

Pilot Progress (as of 9/30/20):

- SCE has commissioned 17 locations on distribution circuits.

Pilot Lessons Learned:

- Take the arcing pattern detected by EFD and then make a presumption as to the type of issue, such as broken conductor strands, internal transformer arcing, or a squatting insulator. We have learned more about the EFD alerts. The EFD system provides "risk" scores for structures attempting to provide a confidence level that an issue exists at a particular location. This score is more precise as time progresses and the manufacturer continues to build from utility experiences for development of a library of patterns.
- Avoid false signals from other radio frequency emitting phenomenon. We received false issue indication from a FM radio antenna tower in close proximity to a circuit. The detection system since been modified by the manufacturer to ignore this type of radio interference. This is an example of how the technology is improving due to our pilot installs.
- Evaluate the coax cable design and feasibility to scale. Coax cable installation methods and specifications may need particular attention in broader installations where crew training is not as closely managed as with a pilot effort. Although we have yet to identify any issues related to our installations with damages or interference on the coax cable between the sensors and the control box, the vendor has expressed the delicate nature of coax cable must drive installation technique and methods. We are continuing to look into this concern, as linemen do not normally have experience with coax cable. Our primary approach is to work to specify a more robust coax cable design, though we are also exploring items in the construction space to limit the potential for issues.
- Evaluate construction standards and impacts on structure. A collection of construction items have been collected from the small pilot population. In summary, crossarm brackets, crossarm movement (over time), varying existing insulator heights, and low voltage connections appear to be small items to address as we progress. We are continuing to refine the installation specifics for the EFD equipment to best overcome these items.

Pilot Lessons Learned (as of 9/30/20):

- EFD events not only provide circuit locations but also provide insight into the type of condition being detected. As an example, the detection macros have shown to provide unique signatures between a detection associated with a transformer versus damaged strands on a conductor. These signatures are not common to other utility operated systems and requires focused training or user expertise to benefit from these differentiations.
- A service interruption related to fuse operation in a new transformation installation resulted in a detection event. Analysis of the transformation has identified a cause for the fuse operation; however, fuses were not retained for evaluation. Transformer detections, particularly with new transformers, may present discharges that decrease over time. It is not clear if this event was due to internal discharge in the transformer or a fusing related issue. Fuses should also be retained for evaluation for conditions found with adjoining assets like transformers or capacitors.
- The EFD "risk" score can be supplemented by closer examination of detailed macro reports from the EFD user interface. For example, a recent set of energy burst detections suggested conductor damage. Upon closer examination of the sensor path, additional activity (and possibly other conductor damage locations) were flagged for further examination. Detailed site evaluations are planned for early October for these locations.
- The EFD user interface requires detailed understanding of the EFD system and is not as intuitive as the "risk" score detection interface which is easily understood. Expertise in the EFD macro interpretation may provide additional benefits in using the system to locate issues and identify potential causes prior to site evaluations.

Project Performance Metrics: SCE planned to complete ten EFD sensor installations as part of the 2020 goals as identified in the 2020-2022 Wildfire Mitigation Plan. The broader objective for supporting additional installations towards the goal for 100 installations appears positive, based on currently available information.

- Total installation costs and operational resource requirements
- Assessment of detection events from pilot installation equipment
- Absence of maintenance actions to EFD sensors which are considered cost prohibitive or unacceptable for a sensor asset
- Cellular data backhaul evaluation focused on connectivity concerns with broader deployment
- Lack of product or performance issues which cannot be resolved
- EFD System should not introduce appreciable customer electric service impacts
- EFD shall not cause interference with SCE or other utility communication systems that cannot be resolved

Beyond the immediate installation efforts, EFD offers a new approach towards electric system maintenance. The system provides notification information based on electric system signatures to information inspection and maintenance practices. Much like SCE's use of smart meter data that has developed in the past years to inform needs for replacement failing transformers, EFD offers the capability to monitor many electric system assets to potentially avoid fault events. With fault event avoidance, consequences of faults such as additional facility damages and wildfires, may be prevented allowing more rapid repair activities. Scheduled maintenance actions may also help minimize repair costs and outage duration by allowing work activities to be scheduled rather than responding to emergencies following system failure events. The EFD system technology is one of the few technological advancements applied in a completely new way to the electric system, and the new technology may also bring additional benefits as system installations continue to collect valuable system data from the electric grid.

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: EFD sensors help to detect undesirable circuit conditions allowing repair/replacement actions to be proactively completed prior to component or conductor failure. Detections during high risk operating conditions may also inform PSPS operational decisions.

Condition iv: How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices

Fault Detection Strategy: The Early Fault Detection system uses Radio Frequency (RF) detections to identify and locate issues on the electric system. The RF emissions are identified by installation of sensitive detection equipment located approximately every three circuit miles. The detection equipment collects data from the installation location and transmits the information using radio (cellular for the pilot) technology to a host server. The data from each sensor is analyzed in various forms to provide alerts of anomaly detection on the monitored circuitry. In general, the monitored circuitry is located between two sensors. However, detections are also possible outside of this bound area. SCE uses the system alerts for determining steps for evaluation and potential electric system repairs based on those evaluation efforts. The continuous monitoring provided by the sensors allow not only the detection of existing issues on the electric system, but also can detect issues as they develop allowing rapid response to targeted areas of concern.

Condition v: A proposal for how to expand use of the technology if it reduces ignition risk materially

Envisioned Pilot Operationalization Strategy: The EFD project is primarily focused on monitoring circuits in high fire risk areas. This initial pilot explores how the technology operates and helps inform the steps of integration required for adoption of the system on a larger scale. The system may also be practical at sub-transmission voltages beyond the piloted distribution voltages, though installation challenges are compounded at higher voltages and further review would be required at the higher voltages before a deployment effort was developed. The flexibility of sensors which work as pairs allows for very targeted monitoring of circuit sections. Although an operationalization strategy has not been solidified yet, it is clear this type of technology has benefits in locating and identifying issues based on the shared experiences from other utilities. As part of SCEs pilot efforts, circuit sections of underground cable, bare wire, and covered conductor will all be monitored. The manufacturer has shared that little experience exists for monitoring of underground cable systems as well as potential variations in 4-wire systems and look forward to the results. In the near-term bare wire monitoring, particularly for existing system issues, is the focal project effort. Overhead conductor, including covered conductor can suffer damages from lightning strikes and damages to conductor strands during the arcing created during a fault. EFD offers capabilities to detect these conditions and may enable SCE to remediate these types of issues before they progress to larger issues, such as wire down events that may result in wildfire ignitions.

WMP Activity ID: AT-8	2020-2022 WMP Section: 5.3.3.2.5
Activity Name:	**AT-8 - High Impedance Fault Relays**

Condition ii: Status of the pilot, including where pilots have been initiated and whether the pilot is progressing toward broader adoption

Pilot Objective / Summary: SCE is aiming to develop a layered protection scheme to minimize wildfire ignition risks. Legacy protection schemes (phase and ground overcurrent) are extremely effective in clearing non-HFRA faults. Recent incorporation of fast-curve settings to existing protection schemes for HFRA are enhancing the ability to quickly isolate faults. High Impedance (Hi-Z) relating schemes can be added to distribution protection schemes to detect and isolate low magnitude arcing conditions in HFRA. SCE will deploy two pilot controllers/relays with Hi-Z elements to monitor and evaluate for desired and non-desired operations.

Pilot Status: Planning / Design Phase

Pilot Status Description: Pilot device installations at two locations on SCE system completed.

Project Location: Yellowtail 12 kV out of Bayside Substation and Driftwood 12 kV out of Wave Substation in the Orange County. Non-HFRA circuits were selected for the early stages of this pilot project as the Hi-Z/Arcing element is only available on the SEL-651RA controllers which are only installed on these circuits at this time. Additionally, only field crews in this region have been appropriately trained for these relays and are based near the installed devices. As the effectiveness of the Hi-Z/Arcing element is proven, the relay/Hi-Z elements will be piloted on an HFRA circuit to further validate the technology's effectiveness to mitigate ignitions.

Pilot Project Milestones:

1. Investigate/develop relay settings (Complete)
2. Identify pilot locations (upgrade relay settings to SEL651RA) (Complete)
3. RTDS Testing and validation of settings (Complete)
4. Install relay/controller settings for pilot locations (Complete)
5. Field performance evaluation of settings (Q1 2021)

Pilot Project Milestone (as of 9/30/20):

- No changes to project milestones.

Condition iii: Results of the pilot, including quantitative performance metrics and quantitative risk reduction benefits

Pilot Progress: As of 7/31/2020, installations are targeted in Q3 2020.

Pilot Progress (as of 9/30/20):

- Two pilot locations were installed in the Huntington Beach District.

Pilot Lessons Learned: Based on pre-pilot activities, we determined that a minimum of 5% of nominal loading is required for the controller to initially tune to the circuit. Minimal protection setting adjustments are required to implement Hi-Z.

Pilot Lessons Learned (as of 9/30/20):

- No additional lessons learned.

Project Performance Metrics: SCE identified two locations for pilots in 2020. We anticipate increasing field deployment installations in 2021 based on assessments of 2020 installations, as diversifying installation of field locations may increase the possibility of capturing/detecting Hi-Z and/or arcing conditions with the Hi-Z elements.

- Test the Hi-Z element at the SCE Equipment Demonstration and Evaluation Facility (EDEF) test site or external testing facility to expedite the validation and performance of the Hi-Z elements.
- Review relay event data and determine if the relay alarmed correctly for Hi-Z events.
- Review relay event data and determine ratio of detected Hi-Z events versus non-detected events

Project Performance Metrics (as of 9/30/20):

- No changes to project performance metrics.

Wildfire Risk Reduction Benefits: This pilot is an effort to develop a protection scheme to detect high impedance faults (such as downed energized conductors) that may not be detected by conventional protection and to rapidly open a circuit for de-energization to minimize the risk of ignition.

<u>**Condition iv:** How the electrical corporation remedies ignitions or faults revealed during the pilot on a schedule that promptly mitigates the risk of such ignition or fault, and incorporates such mitigation into its operational practices</u>

Fault Detection Strategy: High impedance relay elements incorporate schemes to identify high impedance fault conditions beyond the installation location. The elements monitor the voltage and current conditions at the device to detect non-integer fundamental frequency harmonics (90Hz and 150Hz) and low magnitude arcing conditions at the fundamental frequency. For the initial effort SCE expects to investigate alerts to identify causes and appropriate remediation.

<u>**Condition v:** A proposal for how to expand use of the technology if it reduces ignition risk materially</u>

Envisioned Pilot Operationalization Strategy: If piloted units respond appropriately in case of high impedance events or if there are no events, we would look to expand the pilot and install additional units. Investigation into causes of detected events may be performed on energized or de-energized circuitry depending on operational strategies with this relay technology.

GUIDANCE-10
DATA ISSUES – GENERAL

Southern California Edison Company
2020 WMP - SCE Deficiency
Guidance -10

Name: Data issues – general
Category (SCE defined): Grid Hardening / Vegetation Management / Inspections / GIS
Class: B

Deficiency:

Although the availability of data, including GIS data, provides unprecedented insight into utility infrastructure and operations, inconsistencies and gaps in the data present a number of challenges and hurdles. As it relates to GIS data, electrical corporation submissions often had inconsistent file formats and naming conventions, contained little to no metadata, were incomplete or missing many data attributes and utilized varying schema. These deficiencies rendered cross-utility comparisons impossible without substantive, resource and time-consuming manipulation of the data. Additional data challenges included varying interpretations of WMP Guideline data requirements, leading to inconsistency of data submitted.

Condition:

Electrical corporations shall ensure that all future data submissions to the WSD adhere to the forthcoming data taxonomy and schema currently being developed by the WSD. Additionally, each electrical corporation shall file a quarterly report providing that details:

i. locations where grid hardening, vegetation management, and asset inspections were completed over the prior reporting period, clearly identifying each initiative and supported with GIS data,

ii. the type of hardening, vegetation management and asset inspection work done, and the number of circuit miles covered, supported with GIS data

iii. the analysis that led it to target that specific area and hardening, vegetation management or asset inspection initiative, and

iv. hardening, vegetation management, and asset inspection work scheduled for the following reporting period, with the detail in (i) – (iii).

Response:
SCE supports the WSD's focus on advancing data standardization, transparency, and sharing of data with other stakeholders. Since the submittal of its first QR on September 9, 2020, SCE has continued to focus on incrementally providing more data pursuant to the data requirements in the Draft WSD GIS Data Reporting Requirements and Schema for California Electric Corporations (Draft GIS Data Schema). For this QR, SCE has focused on adding datasets that were not provided in the first QR, i.e., the PSPS Event and Risk Event datasets. As such, SCE's second

QR includes the Initiative,[2] Asset Point, Asset Line, PSPS Event, Risk Event, and Other Required Data datasets. SCE's submission does not have a complete set of all Draft GIS Data Schema requirements due to the volume of data and the fact that SCE does not currently capture some data elements, but has made significant progress. SCE appreciates the WSD acknowledging comments from the IOUs regarding the volume and scope of quarterly data reporting requirements and how WSD plans to continue to work with stakeholders to ensure the Draft GIS Data Schema requirements can be met. The data in SCE's submission is still undergoing review. As such, to the extent SCE finds errors in the data being submitted, these will be corrected in subsequent QR submittals. SCE is also not providing metadata in this submission. Additionally, some data elements within the datasets SCE is providing are not available due to either our inability to correlate data from multiple systems within the available times or that SCE does not currently capture the requested data. Also, SCE is not providing employee confidential data as further described below. SCE is committed to incrementally provide more data and details in subsequent QR submissions.

SCE appreciates that the WSD, through its comprehensive Draft GIS Data Schema, intended to obtain and standardize significant amounts of wildfire-related data. SCE also understands WSD's desire to understand our current systems and data availability. To this end, SCE provides updated responses in the Status Report template that generally describe the status of the requested data fields, actions we plan to take if the data field is not being provided at this time, the timeline for completing those actions, and whether the data is confidential or not. SCE describes its approach to the Status Report template below.

As SCE has discussed with WSD, we continue to have reservations regarding confidentiality of data. Data is confidential when it is in the public interest that the information not be disseminated publicly. Release of the precise location, age, and other attributes of SCE's assets alongside the precise location of critical facilities may significantly increase safety risk to the public. For example, knowledge of underground line routes and electrical equipment serving a critical facility could facilitate an attack on that critical facility's power supply. Also, knowledge of the location of specific SCE assets in areas with historical high fire weather could make them vulnerable to attack during the worst possible time. Further, the precise locations of SCE's high voltage transmission lines and substations alongside the abovementioned confidential information, as well as the non-confidential information requested increases risk to the bulk power transmission system. The Commission recognizes the importance of safeguarding critical energy infrastructure information and although maps of varying detail of SCE's transmission system may be publicly available from other sources, SCE does not believe it is prudent to

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[2] The Initiative dataset includes grid hardening, vegetation management, and asset inspections initiatives where work was performed and/or projected to be performed in HFRA over the reporting periods and does not include SH-2, Undergrounding Overhead Conductor because no work was or is anticipated to be performed for this initiative over the reporting periods, IN-7, Failure Modes and Effects Analysis and SH-9, Transmission Overhead Standards Review because these initiatives are studies and standards (not work to be completed in field locations), and IN-2, Quality Oversight / Quality Control due to focus on the PSPS and Risk Event datasets.

further propagate that information, in this level of detail, accompanying other information that, taken together, could prove to be useful to a bad actor. For these reasons, SCE applies confidentiality at the feature class level for each provided dataset as opposed to the data field level. Additionally, SCE does not believe confidential employee information for every inpsection, project, etc. is necessary to assess wildfire risk. SCE raised this issue in its Comments on the August 2020 Workshops and respectfully requests these employee data fields be removed in subsequent Draft GIS Data Schema iterations.

SCE also notes that it still does not capture several new data elements which will require time for our teams and subject matter experts to assess the labor, operational, system and technical requirements and ensure these new data requirements could advance advance wildfire risk reduction prior to changing work methods, processes, tools and systems. SCE is still in process of assessing these data requirements and will provide updates in subsequent QRs. SCE provides a general response in the Status Report templates that informs of this assessment.

Similar to its 1st QR, SCE's response to this deficiency and the requested dataset information pursuant to the Draft GIS Data Schema is being provided in the Geodatabase. Additionally, SCE is submitting an updated Status Report template based on the included datasets, described above. SCE notes that it continues to take a phased approach to incrementally improve the data being provided. SCE looks forward to continued collaboration with the WSD, utilities, and stakeholders to refine and improve the Draft GIS Data Schema to further reduce wildfire risk. Below, SCE responds to the conditions.

i. locations where grid hardening, vegetation management, and asset inspections were completed over the prior reporting period, clearly identifying each initiative and supported with GIS data

Please see the Geodatabase that includes grid hardening, vegetation management and asset inspection initiatives' data completed in HFRA from July through September 2020. Additionally, and as noted above, SCE also provides in the Geodatabase other feature class datasets, not required as part of this deficiency but in support of WSD's direction to provide as much information as practicable and is readily available. The additional datasets include Asset Line, Asset Point, PSPS Event, Risk Event, and Other Required Data.

ii. the type of hardening, vegetation management and asset inspection work done, and the number of circuit miles covered, supported with GIS data

SCE is providing data associated with its system hardening, vegetatation management, and asset inspection intiatives described in our 2020-2022 WMP. The specific WMP initiatives are shown in the table in Appendix A of this deficiency. Most wildfire iniatives are not planned, managed, nor executed based on the number of circuit miles (or miles) and thus line geometry for these initiatives is not available. This is consistent with the WSD's WSD-011 Resolution, Attachments 2.1 and 2.3 that describes how the number of circuit miles unit of measurement is not applicable for certain types of work. The limited initiatives that do have line geometry, circuit miles or miles are available in the Geodatabase. SCE notes that line geometry for covered conductor is available at the project scoping level, which has been replicated for each of the resulting work orders (which is the lower level at which dates are managed and the level of detail provided in this GIS submission) and shows that SCE has completed approximately 300 circuit miles of covered conductor from July through September 2020. For circuit-based distribution and transmission inspections, the entire circuit geometry has been included, not just partial geometry of the circuit based on completed work within the time duration.

iii. the analysis that led it to target that specific area and hardening, vegetation management or asset inspection initiative, and

SCE provided its risk-based analyses for how it determines and targets deployment for its wildfire-related initiatives in its July 27, 2020 Remedial Compliance Plan (RCP) to Guidance-3. The Guidance-3 RCP explains how we analyze and prioritize work for grid hardening, vegetation management, and asset inspection initiatives. In the table in Appendix A of this deficiency, SCE summarizes the analysis that led it to target the areas where its system hardening, vegetation management and asset inspection initiatives were completed from July through September 2020.

iv. hardening, vegetation management, and asset inspection work scheduled for the following reporting period, with the detail in (i) – (iii).

Please see the Geodatabase that includes grid hardening, vegetation management and asset inspection initiatives planned in HFRA from October through December 2020 pursuant to the Draft GIS Data Schema. Similar to part (ii) above, limited initiatives have line geometry (i.e., circuit miles or miles). Initiatives with line geometry are available in the Geodatabase. SCE notes that line geometry for covered conductor is available at the project scoping level, which shows approximately 220 circuit miles planned for August through November 2020. Also, line geometry for planned circuit-based distribution and transmission inspections includes the entire circuit geometry, not just partial geometry of the circuit. Please see the table in Appendix A of this deficiency with the detail for condition (iii).

Guidance-10 Appendix A

Guidance-10 Appendix A
Analysis That Led SCE To Target Specific Areas For Initiatives

#	Initiative ID	Initiative / Activity	Analysis that Led to Target Specific Area	Cite to RCP for Guidance-3
1	IN-1.1	High Fire Risk Informed Inspections of Distribution Electric Lines and Equipment	Beginning in inspection year 2020, SCE embarked on an effort to reimage it's asset inspection programs, moving from a strictly compliance-based program to one that prioritizes the inspection of the highest risk assets throughout the service territory without sacrificing any regulatory compliance obligations. Specifically, in the Overhead Detailed Inspection (ODI) space, SCE implemented a risk characterization and prioritization schema to ensure that the highest risk assets in SCE's High-Fire Risk Areas (HFRA) were inspected earlier in the inspection cycle and on a more frequent basis. The primary objective of this program being to identify and mitigate any potential system issues prior to peak fire season. The risk model SCE deployed to prioritize asset inspections was based on the probability of asset failure and the potential consequence of destruction if that particular asset failure were to occur. Utilizing this risk model, the HFRA inspection scope was identified and prioritized for operational execution. The structures that were identified as the highest risk were individually identified, plotted, and scheduled for inspection. As opposed to inspecting entire grids as was the practice under the normal compliance-driven program, individual structures were prioritized for inspection based on their risk characteristics, thus allowing the company to inspect the highest risk assets throughout the entire service territory before peak fire season. The objective of this inspection methodology was to reduce the overall system risk in the most vulnerable areas by clustering the highest risk poles together in individual Work Orders for our Electrical System Inspectors (ESIs) to perform detailed inspections. Additionally, during the 2020 fire season, SCE identified 17 Areas of Concern (AOCs) in its HFRA, primarily driven by elevated dry fuel levels that pose increased fuel-driven and wind-driven fire risk. This threat is magnified during periods of high wind, high temperatures and low humidity, as forecasts predicted for Fall 2020 in Southern California. In order to mitigate this emergent risk, SCE accelerated inspections, remediation and vegetation trimming in the identified AOCs. The methodology to identify the AOCs was based on several factors including fire history, weather conditions, fuel type, exposure to wind, egress, etc. The methodologies described above were used to target the recorded and projected areas provided in the Geodatabase.	Section 3 - Asset Management - A / pp. 10-11
2	IN-1.2	High Fire Risk Informed Inspections of Transmission Electric Lines and Equipment	The Transmission High Fire Risk Informed Inspection program utilizes the same approach as the Distribution High Fire Risk Informed Inspection program (IN-1.1) for prioritizing work based on consequence risk score with one exception. At the time of scoping Transmission (and Subtransmission) inspections, the WRM probability of ignition models were not completed for Transmission and Subtransmission assets. Therefore, consequence risk (REAX) was aggregated at a circuit level and voltage class was used as a proxy for probability of ignition. Each circuit was categorized as high, medium or low risk. In 2020, SCE is inspecting all high and medium risk Transmission circuits. Additionally, during the 2020 fire season, SCE identified 17 AOCs in its HFRA, primarily driven by elevated dry fuel levels that pose increased fuel-driven and wind-driven fire risk. This threat is magnified during periods of high wind, high temperatures and low humidity, as forecasts predicted for Fall 2020 in Southern California. In order to mitigate this emergent risk, SCE accelerated inspections, remediation and vegetation trimming in the identified AOCs. The methodology to identify the AOCs was based on several factors including fire history, weather conditions, fuel type, exposure to wind, egress, etc. The methodologies described above were used to target the recorded and projected areas provided in the Geodatabase.	Section 3 - Asset Management - B / pp. 11-12
3	IN-3	Infrared Inspection of energized overhead Distribution facilities and equipment	The Distribution Infrared Scanning (DIRS) program targets inspecting / scanning 50% of aggregate HFRA each calendar year and 100% of overhead structures in HFRA every two calendar years. The 2019 and 2020 infrared inspection scope was based on Tier 2 and Tier 3 HFRA. The prioritization scheme for 2019-2020 DIRS scope was designed to ensure high-risk structures are inspected first based on the SCE consequence risk model. Utilizing the consequence prioritization method, DIRS scope was clustered into 124 clusters and each cluster is approximately 120 linear circuit miles. The total sum of structure consequence risk scores within each cluster determines the cluster risk score (#1 cluster represents the highest consequence risk score). The inspection execution objective was to reduce risk based on the cluster method; however, to ensure operational efficiency, e.g., minimizing travel, SCE also inspects some structures in close proximity of high consequence risk clusters where applicable. The recorded and projected areas included in the Geodatabase are based on the methodology described above. Please also note that the prioritization / targeting approach for this initiative described in SCE's RCP for Guidance-3 was unintentionally misidentified as deployment of this initiative is prioritized based on risk, as described above.	Section 3 - Asset Management - D / pp. 13-14
4	IN-4	Infrared Inspection, Corona Scanning, and High Definition imagery of energized overhead Transmission facilities and equipment	SCE risk-ranked all Transmission and Subtransmission circuits by REAX consequence scores. The recorded and projected areas included in the Geodatabase are based on this risk-ranking sequenced by the highest risk circuits and operational constraints such as weather, e.g., because high ambient temperature can make it difficult to detect temperature differentials, inspections are scheduled and performed during cooler days of the year.	Section 3 - Asset Management - E / pp. 14-15

#	Initiative ID	Initiative / Activity	Analysis that Led to Target Specific Area	Cite to RCP for Guidance-3
5	IN-5	Inspections of Generation Assets in HFRA	In 2020, SCE adopted a two-year cycle (2020-2021) where 50% of the assets targeted for inspections in 2020 are higher priority facilities in Tier 3 HFRA. Operational efficiencies and constraints are factored into the scheduling and execution of the work. Additionally, during the 2020 fire season, SCE identified 17 Areas of Concern (AOCs) in its HFRA, primarily driven by elevated dry fuel levels that pose increased fuel-driven and wind-driven fire risk. This threat is magnified during periods of high wind, high temperatures and low humidity, as forecasts predicted for Fall 2020 in Southern California. In order to mitigate this emergent risk, SCE accelerated inspections, remediation and vegetation trimming in the identified AOCs. The methodology to identify the AOCs was based on several factors including fire history, weather conditions, fuel type, exposure to wind, egress, etc. The methodologies described above were used to target the recorded and projected areas provided in the Geodatabase.	Section 3 - Asset Management - F / p. 15
6	IN-6.1 & IN-6.2	Aerial Inspections – Distribution Aerial Inspections – Transmission	SCE completed Aerial asset inspections on a portion of targeted structures for both Distribution and Transmission. The targeted structures reside within Tier 2 and Tier 2 HFRA. The completed and projected structures included in the Geodatabase were identified for inspection using risk modeling to assess high and medium risk structures. The data sources and predictive models SCE uses to understand the risk of its assets are described in its Guidance-3 RCP, Section III, IN-6.1 & 6.2. Aerial inspections involve the capture of high-quality photos of electrical structures by Helicopters and Unmanned Aerial Systems (UAS). The imagery captured by these Aerial platforms are delivered to SCE with associated metadata and inspected by a team of qualified contractor workers (inspectors). The inspectors assess each delivered structure using a standardized assessment form designed to identify and generate notifications for potential ignition risks, contact from objects, and equipment failures. The form also enables the collection of detailed structure data for future use. SCE also utilizes GIS tools to scope and plan work and conduct assessments. Work status and inspection results are recorded and tracked in GIS layers. All inspection work is tracked using structure point data (i.e., each point in GIS is a unique structure). Along with assessment form data, SCE also records the flight completion and inspection dates for record keeping. The Aerial asset inspection contributes to a 360-degree view of structures and equipment. SCE will continue to complete Aerial asset inspections in the following reporting period for structures remaining in the target structure lists described above. The inspections will continue to occur throughout HFRA as our Aerial capture vendors develop schedules in accordance with scope demands and airspace deconfliction requirements.	Section 3 - Asset Management - G / pp. 15-16
7	VM-1	Hazard Tree Management Program	SCE determines the trees to mitigate based on a two-step process, first selecting higher risk locations and then selecting higher risk trees within these locations. SCE prioritized higher risk locations based on HFRA tier, Tree Caused Circuit Outages (TCCI), and density of vegetation surrounding SCE's facilities, combined with REAX consequence scores. SCE also takes into account operational constraints such as permitting, access and weather conditions in scheduling and executing work. Hazard Trees were also mitigated as a result of the AOCs study described above. These methodologies were used for the recorded and projected areas included in the Geodatabase.	Section 3 - Vegetation Management - A / pp. 17-19
8	VM-2	Expanded Pole Brushing	The recorded and projected areas included in the Geodatabase are based on a geographical grid approach and prioritizing poles subject to PRC 4292 taking into account operational efficiencies and constraints.	Section 3 - Vegetation Management - B / pp. 19-20
9	VM-3	Expanded Clearances for Legacy Facilities	Inspections: For Generation's vegetation field inspections, we identified 155 sites and have prioritized sites based on location, focusing on Tier 3 HFRA. A desktop analysis was performed to prioritize 2020 work scope based on risk. Once the inspection is complete, we may change priorities based on any inspection findings that appear to need remediation sooner. Vegetation inspections were also conducted as a result of the AOCs study described above. Projects: Generation's vegetation projects (treatment of VM-3 sites) are prioritized based on the desktop analysis and field inspection results. Sites that have been treated so far are the locations in the most densely forested areas of our territory. Vegetation management was also conducted as a result of the AOCs study described above. The methodologies described above were used for the recorded and projected areas included in the Geodatabase.	Section 3 - Vegetation Management - C / pp. 20-21
10	VM-4	Drought Relief Initiative (DRI) Inspections and Mitigations	DRI and associated mitigations cover SCE's full HFRA each year. SCE schedules and executes this work based on operational and resource efficiency and constraints. SCE does prioritize and mitigate hazards posed by dead trees or those that are identified as significantly compromised upon brief visual inspection taking into account constraints such as permitting, access and weather conditions. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Vegetation Management - D / pp. 21
11	VM-5	Vegetation Management Quality Control	Vegetation Management QC uses REAX consequence scores to segment the total vegetation population into risk tranches. 100% of the line miles with the top 20% of REAX consequence of ignition scores (highest risk) are inspected. For the remaining areas, line miles are sampled to achieve a 99% confidence level and 1.7% margin of error. For the line miles selected, all trees along overhead lines are inspected. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Vegetation Management - E / pp. 21-22
12	Table 25 / Section 5.3.5	Vegetation management to achieve clearances around electric lines and equipment	SCE used a grid-based approach for distribution lines and circuit-based approach for transmission lines. Supplemental and midcycle patrols are prioritized based on locations where the vegetation growth cycle, conditions, and/or REAX score drive the need for additional assurance. Vegetation Management was also conducted as a result of the AOCs study described above. These methodologies were used to target the recorded and projected areas provided in the Geodatabase. Please also see SCE's RCP for deficiency SCE-12, condition ii for additional details.	Section 3 - Vegetation Management - F / pp. 22-23

#	Initiative ID	Initiative / Activity	Analysis that Led to Target Specific Area	Cite to RCP for Guidance-3
13	SH-1	Covered Conductor	Beginning in 2019, SCE used the risk scores from the WRM to prioritize the circuit segments for replacing bare conductor with covered conductor. The underlying Potential of Ignition (POI) and consequence score models have undergone several refinements and SCE continues to incorporate these enhanced risk scores into its deployment strategy to the extent practicable. In scheduling and executing covered conductor, SCE also considers crew efficiencies and constraints. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Grid Hardening - A / pp. 23-24
14	SH-3	WCCP Fire Resistant Poles	The locations for fire-resistant (FR) pole installation follow the prioritization of the initiative through which the poles are replaced in HFRA (e.g., WCCP) and SCE's Distribution Design Standards. The recorded and projected areas included in the Geodatabase are thus based on other initiative prioritization methods.	Section 3 - Grid Hardening - C / pp. 25-26
15	SH-4	Branch Line Protection Strategy	For 2020, SCE is first targeting expulsion fusing in conventional cutouts and liquid fuses as these are considered higher risk. SCE will then replace, where appropriate, the remaining Cal Fire "Exempt" fusing focusing on reduced energy with current limiting fusing. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Grid Hardening - D / pp. 26-27
16	SH-5	Installation of System Automation Equipment – RAR/RCS	The recorded and projected areas included in the Geodatabase were generally prioritized based operational and crew efficiencies and constraints.	Section 3 - Grid Hardening - E / pp. 27-28
17	SH-6	Circuit Breaker Relay Hardware for Fast Curve	The program identified electrical circuits in HFRA that had old mechanical relays or could reduce risk through relay upgrades and/or fast curve settings. While scoping the projects via job walks and desk top reviews, the locations were evaluated for scope complexity and grouped accordingly. To facilitate successful execution and provide the greatest opportunity for the fastest and most impactful risk reduction, the group of projects with multiple relays and least complexity was released first. This approach also allows engineering sufficient time to address the groups with more complex scopes and provide quality engineering for future year execution. In the construction space, projects are being executed in a first in first out manner with consideration being given to locations that have operational constraints. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Grid Hardening - F / p. 28
18	SH-8	Transmission Open Phase Detection	The Transmission Open Phase Detection (TOPD) effort targeted Transmission lines in HFRA. To minimize the complexity for a pilot, we targeted lines with two terminals and single conductor (wire) per phase. The Transmission lines selected were within a geographical area to avoid impacting multiple locations across SCE's service territory. Pilot locations also needed to have existing Protection devices (Relays) with the ability to harness open phase detection settings/logic files as developed. This methodology was used for the recorded and projected areas included in the Geodatabase.	Section 3 - Grid Hardening - G / pp. 29-30
19	SH-10	Tree Attachment Remediation	The recorded and projected areas included in the Geodatabase used a risk-informed method to prioritize tree attachment relocations by circuit based on REAX scores, conductor type (primary voltages were considered higher risk compared to secondary), potential to damage structures (the greater the number of structures, the higher the priority) and tree mortality (the more severe the condition, the higher the priority). Additionally, tree attachment remediation over the reporting periods was also prioritized due to fires that caused damage to SCE facilities.	Section 3 - Grid Hardening - J / pp. 31-32
20	SH-11	Legacy Facilities	The recorded and projected areas included in the Geodatabase are based on the assets that have the highest potential of wildfire risk and where remediation would provide the most risk reduction possibilities than any other options. SCE used REAX consequence scores, the legacy asset's age, last major overhaul date, and operating voltage and other factors such as HFRA Tier and years since last assessment as part of its risk ranking assessment.	Section 3 - Grid Hardening - K / pp. 32-33
21	SH-12.1	Remediations – Distribution	Inspection results (from IN-1.1) are prioritized based on expected risks (including risks identified in AOCs study described above) and in accordance with SCE's Inspection and Maintenance program standards and GO 95 guidelines.	Section 3 - Grid Hardening - L / pp. 33-34
22	SH-12.2	Remediations – Transmission	Inspection results (from IN-1.2) are prioritized based on expected risks (including risks identified in AOCs study described above) and in accordance with SCE's Inspection and Maintenance program standards and GO 95 guidelines.	
23	SH-12.3	Remediations – Generation	Inspection results (from IN-5) are prioritized based on expected risks (including risks identified in AOCs study described above) and in accordance with SCE's Inspection and Maintenance program standards and GO 95 guidelines.	

SCE-5
DETAILED TIMELINE OF WRRM IMPLEMENTATION NOT PROVIDED

Southern California Edison Company
2020-2022 WMP - SCE Deficiency
SCE-5

Name: Detailed timeline of WRRM implementation not provided.
Category: Risk Management
Class: B

Deficiency:

SCE does not provide a detailed timeline of WRRM implementation. SCE states that it will provide more information upon implementation of WRRM in 2020 but does not provide a specific timeline of what additional information or details it will provide.

Condition:

In its quarterly report, SCE shall provide:

i. the status of implementation of WRRM,
ii. a description of how it plans to use WRRM to evaluate its 2020 WMP initiatives, including how it will make future decisions based on this model,
iii. all factors it will consider in this evaluation,
iv. changes to 2020 WMP initiative type, scope, or priority being considered as a result of WRRM implementation and resultant outputs,
v. a description of whether information from the evaluation of 2020 WMP initiatives will be used to inform scoping of those initiatives or adjustments to those initiatives in 2021 and beyond, and if yes, a description if the criteria (including quantitative metrics) used to inform those adjustments and provision of those metrics.

Response:

SCE's 2nd QR includes an update on the status of the WRRM implementation as well as further descriptions of how SCE plans to use the WRRM to evaluate 2020 WMP initiatives.

As described in SCE's 2020-2022 WMP and RCP[3] for Guidance-3, Technosylva's Wildfire Risk Reduction Module (WRRM) provides advanced wildfire simulation and risk modeling capabilities which quantifies risk through integration of climate data, topography, and ground fuels, as well as the location of SCE overhead assets, and the potential for fire propagation and impact to population and building structures. The WRRM, when fully implemented, will apply

[3] *See* SCE's response to Class A Deficiency Guidance-3 in SCE's 2020-2022 WMP Remedial Compliance Plan (RCP), filed July 27, 2020.

an improved fire propagation technique and include updated data to simulate and develop wildfire consequences.

The WRRM tool enhances SCE's ability to develop asset risk and territory-wide[4] risk analyses throughout SCE's HFRA. The asset risk analysis involves simulation of individual ignitions associated with individual SCE overhead assets. Combined with SCE's probability of ignition (POI) estimates, this analysis will improve the prioritization of mitigation activities, as well as enable SCE to quantify the potential risk reduction from mitigation and hardening projects. SCE responds to this deficiency's conditions below.

i. the status of implementation of WRRM

The status and targeted completion dates of WRRM milestones is provided in Table 2 below.

Table 2 - SCE-5
WRRM Milestone Status and Targeted Completion Dates

Milestone	Target Completion Date	Status
• Develop fire consequence model and QC model output • Incorporate WRRM POI data and calculate fire risk scores across all electrical topologies (Distribution, Sub-transmission, and Transmission) • Evaluate in-flight inspection and mitigation scope using new risk scores	Q3 2020	Completed
• Test model and software • Develop documentation: WRRM documentation will describe the model and tool capabilities, data input, processing and calculations, and output of the model • Conduct WRRM end-user training: Technosylva will train users on the tool and its functions to obtain user acceptance	Q4 2020	On track
• Modify risk-based prioritization approaches used by WMP initiatives as described in SCE's RCP for Guidance-3 • Develop transition plans for REAX+ to WRRM for future scoping • Adjust mitigation and inspection scope, as needed, based on WRRM outputs • Complete full transition to WRRM	Q1 2021	On track

[4] For the purposes of the WRRM, territory is defined as SCE's HFRA with a 20-mile buffer.

ii. a description of how it plans to use WRRM to evaluate its 2020 WMP initiatives, including how it will make future decisions based on this model

The WRRM will provide asset-level risk scores that can be aggregated at the circuit-segment, circuit, or other user-defined geographies. This allows SCE the flexibility to apply these values in a variety of ways, depending on the specific use case, to make prioritization decisions. For example, an asset-specific ranking of risk can be used for replacing assets that are replaced one at a time such as switches, or an aggregated ranking by segment can be produced for assets that are replaced in sections such as overhead wire.

The WRRM model is in production and SCE completed the model output testing and validation. The WRRM will inform all future scope but will not impact in-flight work scope in 2020 or early 2021. SCE has started transitioning to using the results from the WRRM to develop future work scope as described below for all new scope releases.

As discussed in SCE's RCP for Guidance-3, SCE will apply the WRRM to advance its ability to prioritize and modify, if necessary, its WMP initiative deployment. In some cases where SCE currently uses the Wildfire Risk Model (WRM) and REAX Engineering[5] based ignition consequence scores to make risk-informed decisions, such as for covered conductor and distribution inspection programs, the WRRM will improve our decision-making capabilities by providing updated consequence values. For these initiatives, SCE completed a desktop analysis to identify the high-risk scope from using WRRM consequence modeling that was not included in the prior REAX consequence modeling driven scope. The newly identified high-risk scope was prioritized and added to the mitigation plan. SCE is continuing to evaluate and re-prioritize work based on WRRM risk scores when possible depending on the stage of the planning and construction process the work packages are in.

In addition, SCE completed the development of Transmission and Sub-transmission POI models and is working on integrating these POI values into the WRRM. Future work in this area will also benefit from the WRRM-generated consequence scores. Previously, these voltage-class assets were limited to using only REAX scores for risk prioritization.

iii. all factors it will consider in this evaluation

Technosylva improves upon REAX by utilizing improved data for weather, ground fuel, and population to quantify the fire consequences. Its outputs will include fire size, structures impacted, safety, reliability, and financial impacts. As discussed in SCE's RCP for Guidance-3, WRRM improves upon REAX in several ways: this tool will integrate with SCE's weather forecast model, using a customized version of the Weather Research and Forecasting model calibrated to two-kilometer by two-kilometer wind and weather conditions. SCE intends to re-run this simulation on an annual, or semi-annual basis based on updated and calibrated

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[5] *See* 2021 GRC SCE-01, Vol 2 Workpaper "Reax Fire Risk from Overhead Electrical Facilities" for more detail.

information from previous fire weather seasons. The WRRM will also rely on updated and more granular vegetation, structure, and population data than currently used in REAX to estimate potential consequences. The ability to run multiple scenarios in a myriad of weather and wind conditions along with improved population, structure, weather, and vegetation datasets will improve SCE's ability to target mitigations to high risk areas. SCE has developed a review process that will cross check WRRM outputs with those of the REAX based WRM to evaluate how much impact these differences have on in-flight and pending scope, including the following:

- Quantitative measure of how the WRRM consequence values align with REAX consequence values
- Comparison of the current segment and structure risk ranking using the WRM to the risk ranking using WRRM
- Identification of circuit-segment scoped for covered conductor ranked as high priority by the WRRM not currently included in in-flight scope based on WRM (and vice versa)

If the WRRM analysis indicates changes should be assessed to any initiative design or deployment, an operationally feasible assessment will be conducted to transition from the current prioritization to the new prioritization. For example, the current deployment of covered conductor is prioritized using WRM (POI and REAX) scores. If WRRM determines a different risk ranking, SCE will evaluate the implications of replacing lower WRRM ranked locations with higher ones, as existing work orders may be close to construction dates and difficult or not appropriate to pull back while new work orders are initiated for design and planning.

As another example, ground and aerial inspections in HFRA currently use REAX consequence scores to determine frequency of inspections. If WRRM consequence scores categorize significantly higher number of structures and assets needing more frequent inspections, SCE will develop a revised ramp up and resource reallocation plan. On the other hand, if WRRM outputs result in fewer but different structures and assets requiring more frequent inspections, SCE will make changes in the work management systems to appropriately assign work.

iv. changes to 2020 WMP initiative type, scope, or priority being considered as a result of WRRM implementation and resultant outputs

At this time, SCE is in the process of evaluating and assessing the potential changes to WMP initiatives or implementation priority within initiatives as a result of WRRM. The WRRM will not impact in-flight work in scope in 2020 or early 2021. Changes to our 2020-2022 WMP initiatives' scope or priority as a result of WRRM implementation and resultant outputs will be discussed in the 2021 WMP Update, if available.

v. a description of whether information from the evaluation of 2020 WMP initiatives will be used to inform scoping of those initiatives or adjustments to those initiatives in 2021 and beyond, and if yes, a description of the criteria (including quantitative metrics) used to inform those adjustments and provision of those metrics

SCE's RCP for Guidance-3 described how SCE will use the WRRM to inform decisions on each of the applicable initiatives listed in its 2020-2022 WMP. In prior sections of this document, SCE also describes how it will evaluate the risk scores generated in the WRRM using the updated consequence scores with the previous values and the decisions that were made using the WRM with REAX.

Any modifications to existing in-flight or pending mitigation scope will be considered based on the risk score metric including both POI and consequence, or equivalently the risk buy-down which is derived by estimating how an asset's risk score declines post mitigation. If the estimated risk reduction from WRRM warrants scope reevaluation, the operational feasibility and costs associated with the changing scope of work (e.g., pulling back current scope and infusing new scope) will be evaluated prior to making changes.

SCE-9
LACK OF DETAIL REGARDING
POLE LOADING ASSESSMENT PROGRAM

Southern California Edison Company
2020-2022 WMP - SCE Deficiency
SCE-9

Name: Lack of detail regarding Pole Loading Assessment Program.
Category: Asset Management and Inspections
Class: B

Deficiency:

In its WMP, SCE indicates the goal of its Pole Loading Assessment Program (PLP) is to assess the structural integrity of approximately 1.4 million poles by 2021. SCE's WMP did not include any detail regarding it's PLP. SCE's WMP did not include any detail regarding how much of this work is complete nor how, when and where SCE intends to complete this work during this plan period. This lack of detail impedes WSD's ability to evaluate the program's feasibility or audit its progress and likelihood of completion.

Condition:

In a quarterly report, SCE shall submit GIS files detailing:

i. areas where PLP assessments have been completed during the prior reporting period, and
ii. areas where PLP assessments are planned for the following quarter.

Response:

For purposes of the 2nd QR, SCE is providing information related to PLP assessments in HFRA given that these areas constitute the Commission's direction for wildfire mitigation efforts. Please see the Geodatabase that includes the PLP assessments completed in HFRA from July through September 2020 and forecast PLP assessments in HFRA from October through December 2020, pursuant to the Draft GIS Data Schema. SCE also responds to each condition below.

SCE's Pole Loading Program (PLP) predates WMPs by several years. SCE initiated its PLP in 2013 and included it in its 2015 GRC request. It was subsequently authorized in Decision (D.) 15-11-021, and re-authorized in its 2018 GRC in D.19-05-020. As described in Section 5.3.4.13 of our 2020-2022 WMP, the PLP is a comprehensive program to assess pole loading of all poles in SCE's service area (HFRA and non-HFRA) for General Order 95 safety compliance, and repair, remediate or replace poles that do not meet the adequate safety factors. A pole can be overloaded due to, for example, added electrical equipment, degradation over time or added load from third-party attachments such as telecommunication lines. Though PLP improves safety and reliability including reducing ignition risks associated with pole failure from overloading, PLP is primarily a compliance program and not one driven by wildfire risk reduction or one of SCE's wildfire mitigation initiatives included in our 2020-2022 WMP. However, SCE prioritized pole assessments in high-fire and high-wind areas when PLP was initiated in 2014. SCE has completed over 1.3 million pole assessments since 2014 and expects to complete assessments on the entire system in 2021 at which time this program will cease. For purposes of this deficiency, SCE is providing information related to PLP assessments in HFRA given that these areas constitute the Commission's direction for wildfire mitigation efforts. Please see the Geodatabase (SCE-9 Appendix A) that includes the PLP assessments completed in HFRA from May through July 2020 and forecast PLP assessments in HFRA from August through November 2020, pursuant to the draft WSD's GIS Data Reporting Requirements and Schema for California Electric Corporations. SCE also responds narratively to each condition below.

i. areas where PLP assessments have been completed during the prior reporting period

SCE completed 288 pole assessments in HFRA between July 1 and September 30, 2020.

ii. areas where PLP assessments are planned for the following quarter

SCE forecasts to assess approximately 1,190 pole assessments in HFRA between August 1 and November 30, 2020 but notes this 120-day plan may not be fully executed due to operational constraints. As SCE nears the end of PLP assessments, the remaining poles present customer and other access challenges along with data cleanup on structures and locations, which increase scheduling and planning uncertainty. SCE is actively resolving these challenges. Customers sometimes deny admission to their properties where poles are located or are not available when needed, requiring additional process steps to negotiate access or resolve disputes, sometimes through litigation. SCE has also experienced access issues due to customer COVID-19 concerns and anticipates these concerns will continue to manifest until the pandemic has subsided. Additionally, hard-to-access poles that are unsafe to patrol by foot require an aerial assessment. The PLP team has collaborated with SCE's Aerial Operations team to develop a schedule to conduct these aerial assessments but notes that aerial operations can be diverted to higher priority work that can require re-scheduling these PLP assessments.

SCE-20
POTENTIAL NOTIFICATION FATIGUE FROM FREQUENCY OF PSPS COMMUNICATIONS

Southern California Edison Company
2020-2022 WMP - SCE Deficiency
SCE-20

Name: Potential notification fatigue from frequency of PSPS communications.
Category: Emergency Planning and Preparedness
Class: B

Deficiency:

SCE's rapid expansion of PSPS implementation and the associated decision-making to "call" a PSPS, led to constant and persistent PSPS events in the summer of 2019. Given PSPS notification requirements, this led SCE's customers and public safety partners to experience notification fatigue, which could potentially reduce the effectiveness of SCE's notifications. Striking the right balance for timely and accurate notifications is paramount to effective emergency planning and preparedness. SCE's PSPS notifications in 2019 were criticized for being overwhelming, inaccurate or confusing.

Condition:

In its quarterly report, SCE shall detail:

i. its plans for ensuring PSPS notifications are both timely and accurate,
ii. the number of PSPS events initiated during the prior quarter,
iii. the number of pre-event notifications sent for each event, and
iv. the number of false-positive pre-event notifications (i.e. a customer was notified of an impending PSPS event that did not occur) for each event.

Response:

The reasoning and methodology related to SCE's PSPS event notifications in response to condition i. has not changed since submittal of the 1st QR on September 9, 2020. The response is included below for convenience. SCE also included a description of the newly formed PSPS Working Groups.

In response to conditions ii. – iv., the Tables below have been updated with customer notification counts and Liaison Officer Notifications from July 2020 to September 2020, respectively.

Condition i:

In 2020, SCE has taken several steps to help ensure timely and accurate PSPS notifications as described below:

<u>Reducing probability of circuits being in scope:</u> Based on analysis of its 2019 PSPS events, SCE has identified 85 distribution circuits that were frequently in scope for PSPS events because the

forecasted wind speeds breached PSPS activation thresholds, but rarely they materialized in localized wind speeds high enough to exceed their de-energization triggers. SCE has adjusted circuit-specific thresholds for these 85 circuits based on historical weather patterns, which should lead to fewer PSPS events and notifications for them. A retrospective analysis validated that if the same weather was to occur in 2020, those circuits would be in consideration for PSPS de-energization 50-60% less and would not prompt notifications.

<u>PSPS notification system automation:</u> Since the 2019 fire season, SCE has automated large portions of its notification system that eliminates several manual processes and is expected to result in quicker and more accurate preparation of customer notifications.

<u>Improved FPI and weather forecasting:</u> Refining fuel moisture parameters, and the calibration against nearly 20 years of historical weather, fuels and fire data means that SCE's forecasting will continue to provide the most accurate FPI and weather forecasts which help to inform accurate and appropriate PSPS activations and notifications.

<u>Notification message alignment:</u> SCE has aligned all notification messaging with the California Alerting and Warning Guidelines and has worked in advance of the 2020 fire season with County Offices of Emergency Services in the SCE service territory when crafting notification messaging.

<u>Enhanced customer outreach:</u> SCE has instituted additional steps for its medical baseline and critical care customers, including in-person notifications if SCE is unable to reach a critical care customer through standard notification methods.

Conditions ii. – iv.: Based on regulatory requirements, SCE sends several kinds of PSPS notifications, broadly categorized as customer service notifications and liaison officer notifications. Once circuits are forecast to breach thresholds and an SCE Incident Management Team is activated to manage the upcoming event, notifications are sent to potentially affected customers and agencies, at the intervals specified in the PSPS compliance requirements.

Customer service notifications begin with "in-scope" notifications three days in advance, two days in advance and on the day of a forecast event, when possible. These notifications are designed to inform customers that SCE is exploring a potential Public Safety Power Shutoff of electrical lines in their area, that they are in scope if such an event were to occur, and that the conditions may result in SCE de-energizing their circuits. "Update notifications" are also sent noting any changes in weather forecasts, so that customers and key emergency partners have the most up to date information regarding the projected timing of concerning conditions. SCE interprets all these customer notifications to be "pre-event" notifications. Should conditions not materialize, or if they remain below pre-defined concerning levels, SCE will not de-energize that circuit. SCE considers these in-scope notifications to be a prudent step meant to give customers and public safety partners an advance warning of a potential de-energization and the ability to put into action their emergency plans.

Should a de-energization be deemed necessary because of the real-time risk to a circuit, SCE sends "imminent de-energization notifications," which are delivered 1-4 hours before a PSPS de-energization, when possible. On the customer notification side, these notifications are sent only to affected parties on the targeted circuit or circuit section. Liaison Officer (LNO) Notifications provide event-specific notifications to all stakeholders in the impacted area(s). Once de-energization is undertaken, SCE sends a de-energization confirmation notification to affected customers and LNO stakeholders letting them know that they have indeed been interrupted because of PSPS. Next, customers and LNO stakeholders are sent an imminent re-energization notice when power is expected to be restored in the near future, when possible. Customers receive a confirmation notice once re-energization is completed. Lastly, SCE sends an "all clear" notification once a PSPS event has ended.

WSD defined the number of false-positive pre-event notifications as a customer being notified of an impending PSPS event that did not occur. "Impending" can be reasonably interpreted to mean "imminent" or customers who were noticed 1-4 hours before the PSPS de-energization. However, in the spirit of transparency, SCE has provided all the notification information along with the actual de-energization information.

SCE notes that "false positives" typically refer to decisions made, or actions taken based on erroneous information. Differences between notifications and actual de-energizations, however, do not stem from incorrect data, but rather from actual ground conditions varying from forecast conditions. This variance is inherent in every weather forecast application because of the constantly changing nature of emergent weather. SCE hopes that the Commission will take this into consideration when clarifying the definition of false positives going forward.

SCE recognizes the impact of notifications and potential notification fatigue and makes every effort to avoid sending unnecessary communications during PSPS events. However, SCE must balance the risk of notifying customers too frequently with the risk of inadequate or late notification of PSPS events, which can leave customers unprepared for severe weather and service interruptions for extended hours. SCE's decision-making process for PSPS events relies heavily on several uncontrollable and rapidly changing factors, primarily weather conditions. The risk of late notifications leading to under-preparation significantly outweighs the risks associated with notifications of potential PSPS de-energizations that do not materialize and potential over-preparation.

SCE's Liaison Officer also sends notifications to its affected stakeholders including city, county and tribal government officials, public safety partners, specifically identified community choice aggregator administrators, state and federal legislative offices, key contacts at independent living centers, 211 operators, and the American Red Cross. The main difference between customer service and LNO notifications is that LNO "in-scope" notifications are sent starting at the three-day mark – one day prior to general Customer Service notifications, and then in a twice-daily cadence through the lifetime of the incident as well as in real time during PSPS events. LNO notifications are provided to share situational information as SCE knows it. The LNO distribution list is based on contact information provided by each organization. To reduce notification fatigue while continuing to provide stakeholders with timely information about possible future PSPS events, SCE has worked individually with customers that have a large number of potentially impacted service accounts on improved processes such as leveraging their own group email address and control frequency and distribution on their side so the appropriate people are receiving the level of information they require while not overwhelming others. SCE will continue to work with customers on actions that can be taken by both parties to find the right balance of notifications for each situation. The PSPS Working Groups recently established in D.20-05-051 are a more suitable venue in which to discuss this topic with relevant stakeholders. In fact, the topics of "communication strategy" and "information sharing" are already on the agendas for the quarterly working group meetings, and SCE will explore the best way to incorporate discussion of event notifications into these topics.

Table 3 – SCE-20 Customer Notifications provides the event notification summary for the PSPS events initiated during the prior quarter (July 2020 to September 2020), in which SCE initiated two PSPS events. Customer notifications are counted by individual recipients who have opted in to receive notifications, regardless of the method used to receive that message (e.g., call, text, email). If a customer is signed up to receive the same notification through multiple avenues, that notification would only be counted once.

Table 3 – SCE-20 Customer Notifications
PSPS Events (July 2020 – September 2020)

	PSPS Events Initiated[6]	
Category	**July 31, 2020**	**September 4, 2020**
Pre-event (In-Scope) notifications sent	1,019	150,753
Imminent De-Energization notifications sent	182	2,177
De-energize confirmations notification sent	11	246
Imminent Re-Energization notifications	14	198
Re-energize confirmations notification sent	11	199
All Clear notifications sent	367	81,519

Table 32 – SCE-20 Liaison Officer Notifications provides the event notification summary for the PSPS events initiated from July 2020 to September 2020. Because the contact list of recipients for an agency is provided to SCE by that agency and can vary greatly in size, Liaison Officer notifications (LNO) are counted by notification campaigns not the number of individual contacts that were sent notifications (i.e., if a county office of emergency services chooses to have five or 50 employees on its distribution list, that notification will still be counted once). Because SCE employs circuit segmentation when possible, it can be the case that SCE sends LNO notifications multiple times to only one circuit, based on a potential de-energization to a new portion of that circuit. When restoring, SCE may re-energize the circuit all at once, leading to fewer all-clear notices than de-energization notices for that circuit.

Table 4 – SCE-20 Liaison Officer Notifications

[6] "PSPS Events Initiated" date indicates starting date of a specific activation. Initiation of a PSPS event does not necessarily mean de-energization occurred.

PSPS Events (May 2020 – July 2020)

	PSPS Events Initiated[7]	
Category	**July 31, 2020**	**September 4, 2020**
Pre-event (In-Scope) notifications sent	17	62
Imminent De-Energization notifications sent	5	17
De-energize confirmations notification sent	3	6
Imminent Re-Energization notifications	5	9
Re-energize confirmations notification sent	2	8
All Clear notifications sent	3	9

[7] Id.