MUSSEY GRADE ROAD ALLIANCE DATA REQUEST:
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SDG&E RESPONSE

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GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an

undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding and for no other purpose.

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Process:

QUESTION 1

Please provide copies of all received data requests and responses for all intervenors other than MGRA that are not already posted on SDG&E's website.

RESPONSE 1

SDG&E objects to Question 1 on the grounds set forth in General Objections Nos. 5, 6, 7, and 10. Subject to the foregoing objections, SDG&E responds as follows:

Please see attachment "Response_1_CalAdvocates-SDGE-2022WMP-05". The excel attachment file associated with this data request will not be included as the information is Confidential.

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SDG&E Situational Awareness: On page 2-3 of its Executive Summary, SDG&E states that it has upgraded 43 weather stations to provide readings every 30 seconds rather than every 10 minutes and furthermore that it is deploying AI prediction and AQI particulate sensors.

QUESTION 2

Please provide a list of the stations upgraded to provide 30 second data.

RESPONSE 2

215 of the 221 weather stations are able to provide 30 second data. The stations are:

Ammo Dump
Alpine
Archie Moore
Avocado
Anderson Valley
Border Field
Black Canyon
Blue Sky
Black Mountain Ranch
Buckman Springs
Barona
Bob Owens Canyon
Boulder Creek
Borrego
Barrett Junction
Barona Mesa
Buffalo Bump
Boulevard West
Blossom Valley
Bell Canyon
Carlsbad
Cuca Ranch
Calle De Vista
Country Estates
Cole Grade
Chihuahua Valley
Chollas Lake
Circle R
Creelman
Crestline
Cameron Corners
Cameron
Los Coches
Coronado Hills
Los Coyotes
Campo
Cristianitos
Carveacre
Crest
Corte Madera
Chula Vista
Cool Valley
Crestwood
Morena Dam
Descanso
Del Dios Highway
Del Dios South
Dehesa
Descanso Sub
Deerhorn Valley
Living Coast
De Luz Creek
De Luz Heights
De Luz Road
Deluz
Del Mar Heights
Dye Mountain
Dulzura
El Cajon
Elfin Forest
El Monte Road
Escondido
Eucalyptus Hills
East Warners
East Willows Rd
Fallbrook
Fruitvale
Gavilan Mountain
Goose Valley
Guatay
Guejito Ranch
Green Valley
Harmony Grove
Harbison Canyon
Hauser Mountain
Hodges Dam
Hellhole Canyon
Hideaway Lake
Hidden Meadows
Hoskings Ranch
Harrison Park
High Valley
Highland Valley West
Highland Valley
In Ko Pah
Imperial Valley
Iron Mountain Trail
Jamul
Julian
Japatul Valley Rd

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Keyes Creek
Laguna
Lawson Creek
Lake Cuyamaca
Linea del Cielo
Lucky Five Ranch
Lower Hellhole Canyon
La Jolla Heights
Lake Wohlford
Lilac
Loveland
Longs Gulch
La Posta
Lawson Valley
Maderas
Matics Field
Marion Canyon
Mesa Grande
Mussey Grade
Mataguay
San Miguel
Mt. Laguna
Lake Morena
Camp Elliot
Mt. Soledad
Mission Trails
Mission Valley North
Mt Woodson GC
National City
North Descanso
Nate Harrison Grade
North Miller Road
North Potrero
North Ramona
Narrows Sub
Oak Grove
Old Castle
Olivenhain
Otay Mesa Border
Ortega
Otay Mountain
Otay
Mt. Palomar
Pauma Valley
Pauma Creek
Pacific Crest Trail
Pine Hills
Pine Valley
Pauma
Paradise Mountain
Poomacha
Potrero
Pamo Valley
Poway
Pala Temecula
Peutz Valley
Pine Valley Creek
Palo Verde
Ramona
Rainbow Heights
Rainbow Valley
Rainbow Conservation
Camp
Rincon Central
Ranchita
Rincon Res
Rancho Heights
Rincon
Rios Canyon
Rainbow
Rockwood
Rim of the Valley
Round Potrero
Rancho Penasquitos
Rancho Santa Fe
San Clemente Ridge
San Dieguito River
School House Canyon
Sherilton Valley
Sill Hill
San Marcos
Solana Beach
Simon Open Space
Spangler Peak
San Pasqual Valley
Sequan Truck Trail
Sunrise Hwy
Sunset Oaks
Sunshine Summit
Shockey Truck Trail
Santa Teresa Valley
San Vicente
Skye Valley
Sweetwater River
Sycamore Canyon
Santa Ysabel Ranch
Tavern
Tecolote Canyon
Tierra Del Sol
Talega
Turner Lake
Thundernut
Twins Oaks
Upper Daily Ranch
Valley Center Hilltop
Volcan Mountain
Viejas Grade
Valley Center High Point
Victoria
Vista
Viejas
Valley Center
Viejas Mtn Trail
West Alpine
Warners
Witch Creek
Wisecarver
West Descanso
Winterwarm
West Potrero
West Rancho Bernardo
White Star
West Santa Ysabel
West Wynola
Wynola
Santa Ysabel North

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QUESTION 3

Is the 30 second data available to the public or to intervenors, and if so how is it accessed?

RESPONSE 3

The 30 second data is not publicly available at this time.

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QUESTION 4

How long is the 30 second data generally retained? Does SDG&E retain 30 second data for major windstorms?

RESPONSE 4

SDG&E objects to Question 4 on the grounds set forth in General Objections Nos. 3, 5, 6, 7, and 10. Subject to the foregoing objections, SDG&E responds as follows:

The 30 second data is not currently being retained at this time and is enabled only to support emergency operations. The data is archived at 10-minute intervals and it is used to make strategic decisions, mainly to ascertain if sporadic wind gusts are anomalous or persistent. The 10-minute data collected from these stations is retained indefinitely and is publicly available at: https://mesowest.utah.edu/

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QUESTION 5

Provide a list of the weather stations which currently implement AI forecasting.

RESPONSE 5

Twice daily our supercomputers complete a circuit forecast using AI that provides the maximum gust and time for the next 4 days for each weather station. All 215 stations listed in question 2 are on the output file. However, 31 of those stations were installed since 2020 and have yet to accumulate enough historical data to train machine learning models, so the values listed on the circuit forecast are raw Weather Research and Forecasting (WRF) model output. SDG&E partners with the San Diego Super Computing Center to archive our meteorological data. The circuit forecast using AI forecasting is entitled "SDG&E Daily Weather Station Wind Gust Forecast" and can be found here: https://wifire-data.sdsc.edu/dataset?organization=sdge

The 30 stations yet to be trained with machine learning techniques are:

De Luz Heights (DLH)
Valley Center High Point (VHP)
North Miller Rd (NMR)
Thundernut (TNT)
Harmony Grove (HAG)
Del Dios South (DDS)
De Luz Creek (DLC)
De Luz Rd (DLR)
Cool Valley (CVY)
Matics Field (MAT)
Valley Center Hilltop (VCH)
Tavern (TAV)
Winterwarm (WIN)
Old Castle (OLD)
Longs Gulch (LOG)
Caballo Park (CAB)
Gavilan Mountain (GAV)
Morena Dam (DAM)
Simon Open Space (SOS)
Rainbow Conservation Camp (RCC)
Mt. Woodson Golf Club (MWG)
Rim of the Valley (ROV)
Calle De Vista (CDV)
North Ramona (NRA)
Hauser Mountain (HAU)
Bob Owen's Canyon (BOB)
Green Valley (GVY)
Pine Valley Creek (PVC)
Upper Daley Ranch (UDR)
Descanso (DCO)
Descanso Sub (DES)

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QUESTION 6

Please provide data or analysis covering 2021 Santa Ana weather events quantifying the AI prediction error for all stations for which the system has been deployed.

RESPONSE 6

SDG&E objects to Question 6 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

Per the response provided to Question 5 above, all AI forecasts for 2021 are available at the San Diego Super Computing Center archive created for SDG&E Meteorology and can be accessed here: https://wifire-data.sdsc.edu/dataset?organization=sdge

Additionally, all corresponding weather observations recorded every 10 minutes for 2021 from 221 SDG&E weather stations can be accessed here: https://mesowest.utah.edu/

SDG&E has not yet fully quantified the 2021 AI prediction error for all stations.

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QUESTION 7

On page 90, SDG&E states that "To estimate weather conditions at the asset location, such as wind speed, methods such as closest proximity, linear interpolation, and manual mappings by Meteorology were explored." Please provide the results of this study.

RESPONSE 7

SDG&E objects to Question 7 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E has not conducted a formal study comparing the various methods for weather station to asset associations. For modeling, SDG&E generally uses the associations created by our meteorologist experts from our meteorology team (See Question 8). However, when associations did not exist (e.g., new or historical assets), then we used a closest proximity method.

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QUESTION 8

Please provide the areas mapped to each weather station using the optimal method determined by SDG&E in GIS polygon format.

RESPONSE 8

SDG&E objects to Question 8 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

See attached "Response_8_Vegetation_Risk_Index_(VRI).zip." SDG&E leverages meteorologic expertise as an optimal method for establishing the areas mapped to each weather station. SDG&E internally refers to these areas as Vegetation Risk Index (VRI) polygons.

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QUESTION 9

Regarding satellite fire alerts received from the SDDC, what is the false positive rate?

RESPONSE 9

SDG&E objects to Question 9 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E has not performed a false positive analysis of the satellite fire alerts. Space based fire alerts originate from the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison, a world-class archive of satellite data, receiving, archiving, and redistributing most geostationary weather satellite data produced globally. The SSEC sends the alert data to the San Diego Super Computing Center (SDSC) where they are archived and immediately sent to select SDG&E employees as an alert. The alert includes the location of the fire on the landscape, associated camera images in the area, and a rating of the fire confidence. SSEC, SDSC, and SDG&E have partnered to increase situational awareness of wildfire ignitions in the service territory.

The new series of Geostationary Operational Environmental Satellites (GOES) carry the Advanced Baseline Imager (ABI), a next-generation detector that allows fire detection and characterization at 2 km spatial resolution and temporal resolutions of five minutes and in some circumstances one minute or faster. The ABI Fire/Hot Spot Detection and Characterization (FHS) consists of four product outputs: metadata mask, fire radiative power (FRP), instantaneous fire temperature, and instantaneous fire size. The metadata mask assigns a flag to every earth-navigated pixel that indicates its disposition with respect to the FHS algorithm. It includes six fire categories:

- Processed fire: The highest fire confidence category, includes FRP, size, and temperature estimates
- Saturated fire: Also very high confidence fires, but the pixel was at instrument saturation so no properties could be determined
- Cloudy fire: A high confidence fire that appears to be partially obscured by cloud
- High possibility fire: A likely fire that did not meet the thresholds for the Processed category
- Medium possibility fire: Medium confidence fire category
- Low possibility fire: The lowest confidence class, a large number of false alarms are to be expected, also contains small and/or cooler fires

Each of the fire categories has a temporally filtered equivalent, which is triggered if fire was found within +/-1 pixel in the last 12 hours. Also included in the mask are flags that indicate why

a pixel was excluded from consideration, including due to water, certain surface types, clouds, and bad data.

The FRP, size, and temperature fields represent the properties of a fire that would produce the same detected radiant energy for the pixel. Fires vary throughout their burn area in intensity, but the satellite measurement is a composite signal of the entire pixel. FRP, size, and temperature represent the composite properties of that pixel. A hypothetical fire with those properties would produce the same measured radiances. Due to this mixing of subpixel elements and diffraction in the sensor there are large error bars on these retrievals.

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QUESTION 10

Has the AI smoke detection algorithm used by SDG&E webcams ever detected fires prior to the satellite alert? If so, provide a list of these events.

RESPONSE 10

SDG&E objects to Question 10 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

AI smoke detection algorithm used by SDG&E webcams have detected fires prior to the satellite alert because smoke is often visible by the cameras before the fire can reach a threshold based on Fire Radiative Power, temperature, and size whereby sensors in space are triggered. SDG&E cannot provide a list of events because it doesn't track them. However, we have begun work to see if any synergy can be realized between the disparate systems and we have organized meetings between SSEC, SDSC, and AI Smoke Detection vendor.

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QUESTION 11

Please provide a list of all wildfires detected in 2020 and 2021 by the satellite/AI smoke method, including 1) satellite detection time 2) cam AI detection confirmation time 3) location 4) fire name if applicable 5) latency (from actual fire start time) if known.

RESPONSE 11

SDG&E objects to Question 11 on the grounds set forth in General Objections Nos. 2, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E does not currently track and archive all wildfire activity detected by the satellite/AI smoke method. Fire Agencies do track and archive wildfire activity on significant wildfires in San Diego County. Satellite wildfire alerts and AI Smoke Detection Systems are complimentary systems used to prevent a fire from being missed.

All hotspot alerts detected by satellites can be accessed at the following link. https://wifire-data.sdsc.edu/dataset/sdge-goes-fire-detections

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QUESTION 12

Provide a list of all existing particulate monitors and links to their public data.

RESPONSE 12

SDG&E objects to Question 12 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E does not currently have any operational air quality sensors, though in 2021, SDG&E completed sensor selection and purchased 6 Air Quality Index (AQI) sensors.

In 2022, SDG&E will place Air Quality Index (AQI) sensors at key locations and are planning to make the data publicly available.

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QUESTION 13

Provide a list of all weather stations for which deployment of Air Quality Index (AQI) particulate sensors is planned in 2022.

RESPONSE 13

6 Air Quality Index (AQI) stations are currently planned to be installed by June 1 (they are in proximity but not co-located to weather stations):

AQ Station Name	Closest SDG&E Weather Station	Address
Kearny C&O	Camp Elliot	5488 Overland Ave. San Diego CA92123
Ramona C&O	North Ramona	110 14th St. Ramona, CA 92065
Eastern C&O	El Cajon	904 W Main St. El Cajon, CA 92020
Avocado Sub	Avocado	Behind 427 Industrial Way, Fallbrook 92028
Cameron Sub	Cameron Corners	1888 Buckman Springs Rd. Campo CA 91906
Valley Center Sub	Valley Center	14435 Vesper Rd. Valley Center, 92082

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QUESTION 14

Does SDG&E have partners with whom it consults regarding siting, deployment, and analysis of its particulate monitors, and if so identify them.

RESPONSE 14

SDG&E objects to Question 14 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows:

Western Weather Group Inc is supporting the deployment of AQ stations. We are also consulting with a vendor with established expertise in AQI systems. SDG&E has also reached out to the San Diego County Air Pollution Control District to collaborate on this effort.

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SDG&E in its description of its research program (Section 4.4.2) describes its findings regarding the effect of various mitigations.

QUESTION 15

Regarding SDG&E's study of the effectiveness of recloser protocols (Section 4.4.2.2), SDG&E studied the effect of disabling reclosing on ignition. How did SDG&E adjust the results from this study to adjust for the effect of PSPS events, which eliminate fault events.

RESPONSE 15

SDG&E objects to Question 15 on the grounds set forth in General Objections Nos. 2, 3, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E utilized five-year historical data to study the effectiveness of recloser protocols. This historical data was chosen because it already includes the effect of PSPS events that have occurred over this time period.

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QUESTION 16

Does the study mentioned in the previous question accurately predict what fraction of ignitions would be avoided in the absence of PSPS?

RESPONSE 16

SDG&E objects to Question 16 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

The study utilizes historical information which includes the reduction of ignitions due to PSPS. Because it uses historical information, SDG&E is unable to speculate regarding the number of ignitions avoided if a PSPS had not occurred. Thus, SDG&E did not calculate what fraction of ignitions would be avoided by this mitigation in the absence of PSPS.

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QUESTION 17

If the answer to the previous question is no, what would be the result if SDG&E were to perform the calculation assuming absence of PSPS?

RESPONSE 17

SDG&E objects to Question 17 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E's methodology for these studies is to utilize historical information. The historical information includes PSPS periods where lines are de-energized and potential faults did not occur. Because it uses historical information, SDG&E is unable at this time to speculate regarding the number of ignitions avoided if a PSPS had not occurred. SDG&E does not have a methodology to re-calculate assuming those lines remained energized during PSPS.

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QUESTION 18

SDG&E also studies the effect of distribution hardening on overhead faults (Section 4.4.2.3), and observes a reduction from 13.5 events per 100 miles to 7.5 events per 100 miles correlated with hardening. Were PSPS periods removed from this sample, or was the bias from PSPS events (which will also preferentially reduce faults on hardened systems in higher fire risk districts) removed in some other fashion?

RESPONSE 18

SDG&E objects to Question 18 on the grounds set forth in General Objections Nos. 2, 3, 8 and 9. SDG&E further objects to the characterization of the study as having bias. Subject to the foregoing objections, SDG&E responds as follows

SDG&E utilized historical data to calculate the effect of distribution hardening on overhead faults. PSPS periods were not removed from this sample.

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QUESTION 19

If the hardening study mentioned in the previous question did not account for biases introduced by PSPS, please recalculate the result with PSPS periods removed from the analysis.

RESPONSE 19

SDG&E objects to Question 19 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows

SDG&E's methodology for these studies is to utilize historical information. The historical information includes PSPS periods where lines are de-energized and potential faults did not occur. Because it uses historical information, SDG&E is currently unable to speculate regarding the number of ignitions avoided if a PSPS had not occurred. SDG&E does not have a methodology to re-calculate assuming those lines remained energized during PSPS.

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QUESTION 20

In Section 4.4.2.5, SDG&E presents the results of an analysis of the effect of sensitive relay settings on ignition rates during red flag warning (RFW) events. RFW periods often result in PSPS, which removes high risk events from the sample. Describe whether SDG&E's analysis accounts for the effect of PSPS and if so how.

RESPONSE 20

SDG&E objects to Question 20 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E utilized historical data to study the effectiveness of sensitive relay settings. This historical data was chosen because it already includes the effect of PSPS events that have occurred over this time period.

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QUESTION 21

If the analysis in the previous question does not account for potential bias introduced by PSPS, please provide an alternative "System Analysis" in which all areas subject to PSPS during the study period are removed from the analysis.

RESPONSE 21

SDG&E objects to Question 21 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. SDG&E further objects to characterization of the study as biased. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E's methodology for these studies is to utilize historical information. The historical information includes PSPS periods where lines are de-energized and potential faults did not occur. Because it uses historical information, SDG&E is currently unable to speculate regarding the number of ignitions avoided if a PSPS had not occurred. SDG&E does not have a methodology to re-calculate assuming those lines remained energized during PSPS.

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QUESTION 22

Regarding the Sensitivity Analysis Results presented in Table 4-15, please provide a breakdown of Total Outages by tree species for the 17.5 and 25 trim distances.

RESPONSE 22

SDG&E objects to Question 22 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows

SDG&E has discovered an error in the formula used to calculate the expected outages. The expected outages are corrected from the initial filing and are provided in the table below.

Adjust min line clearance	% of Records Changed	Predicted Outages by Model	Assumed true positive outage ratio	Expected Outage (T)	Non-Risk Trees Identified by Model	Assume False Negative Outage Rate	Expected Outage (F)	Total Outages	Difference
adjust <17.5 to 17.5	92%	235,561	1.92E-04	45	1,276,097	1.11E-05	14	59	(19)
adjust <25 to 25	98%	153,119	1.92E-04	29	1,358,539	1.11E-05	15	44	(34)

Total Outages (2017-2020) for 17.5' Trim Distance

Species	Total Outages
Eucalyptus	20
Palm-Fan	9.4
Pine	7.2
Oak	5.1
Sycamore	1.8
Palm-Feather	2
Pepper (California)	1.8
Willow	1.2
Tamarisk/Salt Cedar	0.8
Brush 5X5 Bamboo	0.7
Cypress	0.5

Pecan	0.5
Silk Oak	0.4
Palm-Date	0.3
Cottonwood	0.4
Ash	0.5
Acacia	0.3
Coral	0.2
Orchid	0.2
Century Plant	0.5
Jacaranda	0.3
Casuarina	0.1
Rubber	0.1
Cedar	0.2
Fir	0.1
Brush Very Fast 5x5	0.2
Deodara Cedar	0.1
Liquidambar	0.2
Elm	0.2
Avocado	0.7
Ailanthus	0.1
Brisbane Box	0.1
Brush Fast 5x5	0.1
Brush Med 5x5	0.2
Brush Slow 5x5	0.1
Camphor-Tree	0.1
Carrot Wood	0.1
Citrus	0.1
Eugenia	0.1
Ficus	0.2
Italian Cypress	0.2
Locust	0.1
Melaleuca	0.1
Mulberry	0.1
Olive	0.2
Other - Medium	0.1
Other - Slow	0.1
Pepper-Brazilian	0.3
Podocarpus	0.1

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Total Outages (2017-2020) for 25' Trim Distance

Species	Total Outages
Eucalyptus	13.9
Palm-Fan	8.4
Pine	4.7
Oak	4
Sycamore	1.3
Palm-Feather	1.3
Pepper (California)	1.2
Willow	0.7
Tamarisk/Salt Cedar	0.6
Brush 5X5 Bamboo	0.5
Cypress	0.3
Pecan	0.3
Silk Oak	0.3
Palm-Date	0.2
Cottonwood	0.2
Ash	0.4
Acacia	0.2
Coral	0.1
Orchid	0.1
Century Plant	0.5
Jacaranda	0.2
Casuarina	0.1
Rubber	0.1
Cedar	0.1
Fir	0.1
Brush Very Fast 5x5	0.2
Deodara Cedar	0.1
Liquidambar	0.2
Elm	0.2
Avocado	0.7
Ailanthus	0.1
Brisbane Box	0.1
Brush Fast 5x5	0.1
Brush Med 5x5	0.2

Brush Slow 5x5	0.1
Camphor-Tree	0.1
Carrot Wood	0.1
Citrus	0.1
Eugenia	0.1
Ficus	0.2
Italian Cypress	0.2
Locust	0.1
Melaleuca	0.1
Mulberry	0.1
Olive	0.2
Other - Medium	0.1
Other - Slow	0.1
Pepper-Brazilian	0.3
Podocarpus	0.1

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SDG&E RESPONSE

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QUESTION 23

Regarding lab tests of covered conductors, what "additional studies will be performed to assess the effectiveness of covered conductor for various modes of failure" that have not been performed yet?

RESPONSE 23

SDG&E objects to Question 23 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows

SDG&E plans to have a third-party contractor to conduct an engineering analysis of the response of covered conductors to high wind. Specifically, the third-party contractor will conduct a computer-based simulation using finite element analysis (FEA) to understand the likelihood and effect of covered conductors clashing in a given wind speed. A similar analysis will be performed for bare conductors, allowing for a comparison of the likelihood of clashing for both bare and covered conductors. Ultimately, it is expected that the results from this study may help to inform the risk reduction associated with covered conductors.

SDG&E plans to have a third-party contractor perform accelerated aging studies on covered conductors to better understand the potential for time-dependent degradation of the polymeric conductor coating over time. Two specific metrics will be analyzed to simulate exposure to a California-like environment: the effect of long-term UV exposure and sustained heat. This accelerated aging will be designed to mimic a 40-year service life. Following accelerated aging exposure, samples will be subjected to tests designed to understand the potential for both mechanical degradation, as well as a reduction in dielectric strength.

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SDG&E RESPONSE

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Modeling Methodology (Section 4.5)

QUESTION 24

Provide additional details and documentation of the conductor failure model, including the estimation of the feature importance for the variables included in the analysis.

RESPONSE 24

SDG&E objects to Question 24 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

The conductor failure model is a linear regression model (log-log), where the annual failure rate per unit length of wire is the dependent variable. To select the independent or explanatory variables (feature selection), we used a hybrid approach combining statistical values with SME feedback, where selected variables are required to have p-values less than 5 percent and approved by engineering experts.

SDG&E is currently reviewing the 2021 observations and plans to update this model in the future. In addition to updating the historical observations, SDG&E plans to revisit all the variables that did not show significance in the 2021 model.

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QUESTION 25

Provide additional detail and documentation regarding the Vegetation PoI/PoF models. Were wind gusts included in the Vegetation PoI/PoF model, and if not why not?

RESPONSE 25

SDG&E objects to Question 25 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

The Vegetation PoF model is a simple linear relationship with the number of trees in proximity with the asset, where "proximity" is determined by discretion of our Vegetation Management team (Powerworkz database). SDG&E explored using this data source in conjunction with asset information and historical weather conditions to incorporate wind gust as a predictor variable for vegetation PoF. SDG&E used methods like what was done for the conductor PoF model (See Question 24). While creating the model and reviewing preliminary results, it was concluded that additional analysis was needed to capture properly the relation between PoF and wind gust. Therefore, SDG&E opted not to include wind gust in the 2021 vegetation PoF model but continues to explore novel methods for including this variable in 2022.

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SDG&E RESPONSE

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QUESTION 26

On p. 96, the WMP states that: "Tree-related outage during all adverse weather conditions were considered during model development, but the final VRI rating for a particular polygon was not filtered based on weather type. This may result in an overprediction of outage risk during a weather event." Should "overprediction" instead be "underprediction"? If the quote as stated is correct, please explain.

RESPONSE 26

SDG&E objects to Question 26 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows:

The majority of weather-related outages occur during winter storms involving significant rainfall. When the VRI is used during Santa Ana events, the outage risk includes past outages that have occurred during heavy rainfall, thus overstating the risk during dry Santa Ana events.

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SDG&E RESPONSE

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QUESTION 27

Why was a cubic polynomial chosen to represent the wind gust response function (p. 95)?

RESPONSE 27

SDG&E objects to Question 27 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E experimented with multiple polynomial functions, such as 2- and 4-degree polynomials, for estimating wind gust response and determined the cubic function to be the best fit for the 2021 models. In addition, the cubic function was found to be monotonic in the wind gust range of interest. These are decisions that will be revisited in 2022 model updates.

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SDG&E RESPONSE

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QUESTION 28

For the overhead conductor failure model, SDG&E's WMP states that "Areas with higher wind speeds influence this failure rate and would be further modified by the location of the asset in the models identified wind corridors" (p. 106). How were these wind corridors identified and quantified?

RESPONSE 28

SDG&E objects to Question 28 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows

The wind corridors were created by SDG&E meteorologists to identify areas of high concern. The process to create the corridors started with peak wind gust data from SDG&E's 30-year Weather Research and Forecasting (WRF) model historical reanalysis dataset. The peak wind gust data was digitized as polygons across the service territory. Minor adjustments were subsequently made to the layer based on meteorological subject matter expertise. Knowledge gained from the SDG&E weather station network was then used to finalize the polygons.

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SDG&E RESPONSE

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QUESTION 29

What is the methodology for applying the wind speed failure rate modification?

RESPONSE 29

SDG&E objects to Question 29 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows:

The wind speed failure rate modification is applied as the wind factor calculation in the Wildfire Risk Reduction Model (WRRM) analysis. The following process comes from the Wildfire Risk Reduction Model FINAL REPORT created for SDG&E by Technosylva:

1. For each asset in the system, we added an attribute called WindFactor. This is attributed from the SDG&E provided FireWindGustPolygons and a look up table. There are 2 WindFactor datasets – one for poles & conductors, and one for everything else.
2. Import FireWindGustPolygons and Reproject to working coordinate system
3. Add field WindFactor to each asset feature class
4. Run a spatial join on each asset feature class with FireWindGustPolygons
5. Drop all new fields except Name and GustSpd
6. Calculate WindFactor according to look up table

WindFactor Look Up Table 10/16/2015		
Gust wind speed (mi/h)	POLES/ CONDUCTORS	ALL OTHER ASSETS
0-55	0.10	0.40
55-65	0.20	0.50
65-75	0.35	0.60
75-85	0.50	0.70
85-95	0.65	0.80
95-105	0.85	0.90
105-111	1.00	1.00

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SDG&E RESPONSE

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QUESTION 30

Please provide any GIS data for identified wind corridors.

RESPONSE 30

SDG&E objects to Question 30 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

To create a robust 50-year wind gust potential map for the SDG&E service territory, SDG&E's Meteorology team took an approach of using the Weather Forecasting and Research (WRF) Atmospheric Model to recreate hourly weather conditions on a 3km grid for the last 30 years. This is possible through using government datasets to initialize WRF to create what is known as a reanalysis dataset. SDG&E chose to re-create 30 years of data for a couple different reasons: the first was that the data quality degrades beyond 30 years due to the lack of satellite data and second, 30 years was also very aggressive given the amount of computing power required. In 2012 and 2013 this reanalysis dataset took close to 1 million computing core hours to process on our company computing cluster.

Once the dataset was created, we were able to take the highest projected wind gusts for each point on the 3-km grid for each year going back to 1984. This provided a set of preliminary WRF model-derived values which were then further refined by applying bias corrections based upon actual physical measurements of wind speeds received from our SDG&E Weather Network. To achieve this, we took two years of data from every station in our weather network and compared it to the output from the WRF Model over the same two-year period. This enabled us to determine model biases for every grid cell on the map, which we were then able to apply to the entire 30-year dataset. Once we had the full 30 years of bias corrected data, we then needed to extend the 30 years of data to create a 50-year wind. This was achieved by determining the peak wind gusts for each year going back to 1984 and then applying a Generalized Extreme Value Probability Distribution Function (GEV PDF) to the data. This enabled our team to extend the 30-year wind to a 50-year wind for each grid cell in the map.

Once this step was complete, our Meteorology team was then able to conduct analysis on the map to make refinements based upon their subject matter expertise. Having an understanding of the model's tendencies resolving winds around certain terrain features, the meteorologists were able to refine details of the wind map to bring added value and accuracy to the final version which exists today. Features were created from isolines and the SDG&E electric service boundary. These isolines are edited versions of the version 1 isolines that were heads-up digitized at 1:50,000 or larger scale from a georeferenced marked up map. The original marked up map was created by photographing the physical map in several pieces, rectifying, and then mosaicking the images. These new isolines incorporate edits made to the existing isolines described above. The areas to be edited were identified by SDG&E meteorologists and marked

up using a Touch Table displaying the version 1 isolines in Google Earth. The edit mark ups were done at various scales and levels of detail. These edit markups were then exported to KML and then imported into GIS for use as a template by GIS personnel to complete the update of version 2. Updated isolines were then turned into polygon features and attributed accordingly. See attached "Response_30" file.

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SDG&E RESPONSE

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QUESTION 31

Is SDG&E's wildfire consequence model still using an 8-hour fire spread period for Technosylva simulations?

RESPONSE 31

Yes, SDG&E's wildfire consequence modeling still uses an 8-hour fire spread period as a simulation time for acquiring base data regarding Fire Size Potential and potential impacts.

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SDG&E RESPONSE

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QUESTION 32

What is the definition of the Normalized Difference Vegetation Index (NDVI)?

RESPONSE 32

Normalized Difference Vegetation Index (NDVI) quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs). Healthy vegetation (rich with chlorophyll) reflects more near-infrared (NIR) and green light compared to other wavelengths, and absorbs more red and blue light. NDVI is a standardized way to measure healthy vegetation. When you have high NDVI values, you have healthier vegetation. When you have low NDVI, you have less or no vegetation. SDG&E utilizes NDVI values in the Fire Potential Index as a measure of grass health within the algorithm.

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QUESTION 33

Do the "urban encroachment" algorithms (p. 112) incorporate the variable of building age? If not, is there any plan to include this variable?

RESPONSE 33

SDG&E objects to Question 33 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

No, the algorithm does not include building age. While calibration is continually occurring, at this time there is no plan to include age as a variable. SDG&E instead has chosen to focus on building density and the surrounding fuel loading along with data from CALFIRE to update the variable as needed.

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QUESTION 34

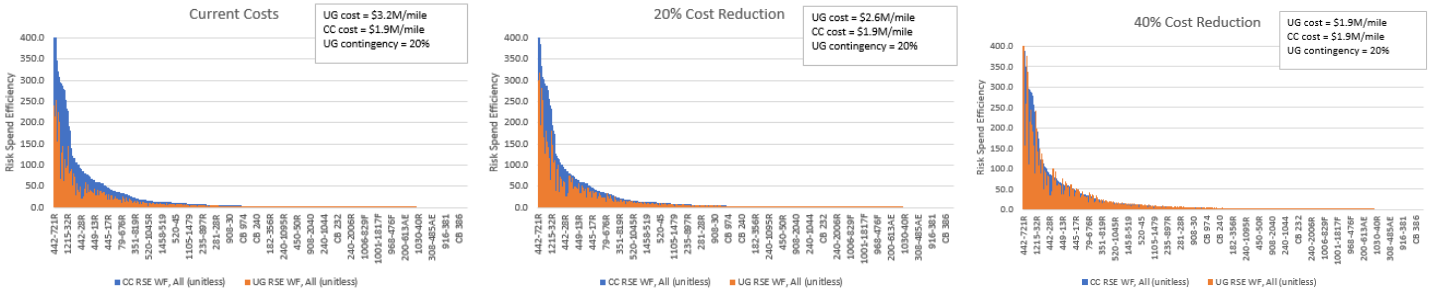
On page 128 of the WMP, SDG&E states that: "A sensitivity analysis is employed to validate the RSE and mitigation sections of the WiNGS-Planning model. In this analysis, constants, including cost per mile estimates and RSE thresholds, are adjusted to see how sensitive the mitigation recommendations are to different size variable adjustments." Please provide the results of this sensitivity analysis.

RESPONSE 34

SDG&E objects to Question 34 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

To better understand the sensitivity around undergrounding cost estimates and RSE thresholds, various sensitivity analyses were pursued on several iterations of the WiNGS-Planning model to see the effect of changes to these variables within the model.

The below three figures show one such analysis, where the WF RSE values of undergrounding and covered conductor mitigations were assessed for the scope of segments within WiNGS-Planning. The analysis compared current undergrounding cost estimates (left figure) to a 20% cost reduction state (middle figure) and a 40% cost reduction state (right figure). The analysis was done to analyze anticipated cost reduction estimates projected for undergrounding mitigation and how that would affect the model outcome. As seen here, the WF RSE values for the undergrounding mitigation starts to converge to be comparable to the same metric for the covered conductor mitigation option, most notably so at the 40% undergrounding cost reduction state. These foreseeable future states of cost reduction for the undergrounding mitigation would see a resulting increase in the number of segments to be recommended for undergrounding mitigation as opposed to covered conductor, specifically an increase from 61 segments (current costs) to 100 segments (40% reduced cost) in this particular analysis, where applicable per construction feasibility and per the RSE threshold utilized to meet the cost and risk reduction objectives/constraints.



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Sensitivity analysis was also done on the RSE threshold utilized within WiNGS-Planning to support prioritization and mitigation selection efforts of the model. One such sensitivity was run on the RSE threshold ranging it from 2 to 80, and the relevant resulting metrics, e.g. WF Risk Reduction and Total Portfolio Cost, were calculated accordingly. Objectives and constraints set around risk reduction goals and maximum portfolio costs can be targeted more accurately through the RSE threshold variability as a result of the analysis, in addition to better understanding the correlation between the RSE threshold constraint and the subsequent model outcomes.

RSE Threshold	WF Risk Reduction %	Portfolio Cost ($k)
2	98.8%	$11,228,760
4	97.2%	$8,882,119
6	95.5%	$7,416,811
8	94.0%	$6,382,780
10	92.5%	$5,669,208
12	91.9%	$5,488,839
14	90.8%	$5,091,759
16	88.9%	$4,489,017
18	87.9%	$4,235,468
20	86.4%	$3,955,696
22	84.7%	$3,602,218
24	82.8%	$3,186,817
26	81.1%	$2,879,965
28	80.0%	$2,681,103
30	78.8%	$2,454,169
32	78.4%	$2,383,835
34	78.0%	$2,344,535
36	77.5%	$2,307,325
38	76.3%	$2,145,969
40	75.7%	$2,109,465
42	75.0%	$2,056,914
44	74.8%	$2,036,353
46	74.2%	$1,974,861
48	73.1%	$1,892,842
50	72.0%	$1,816,470
52	71.4%	$1,779,606

54	71.0%	$1,753,546
56	70.9%	$1,740,338
58	70.0%	$1,671,192
60	69.1%	$1,621,423
62	68.3%	$1,572,519
64	68.1%	$1,565,583
66	67.4%	$1,537,914
68	66.4%	$1,478,398
70	66.4%	$1,478,220
72	64.7%	$1,365,542
74	63.2%	$1,293,508
76	62.0%	$1,253,332
78	60.9%	$1,210,579
80	60.8%	$1,208,858

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QUESTION 35

In the Wildfire Methodology section of Table 4-19, SDG&E states that its WiNGS-Ops analysis will estimate harm from wildfire smoke as "population impacted X smoke fatality fraction". Please provide description and documentation for how SDG&E will estimate the impacted population and the smoke fatality fraction.

RESPONSE 35

SDG&E objects to Question 35 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E uses the Technosylva conditional impact consequence model to estimate population impacted for each potential risk event. Population impacted is a direct output of the Technosylva model. SDG&E estimates the "smoke fatality fraction", which is a quantification of additional significant injuries and fatalities resulting directly or indirectly from smoke, as a fraction of the population impacted. This fraction was determined by SME input. This fatality fraction will be revisited in 2022 model updates.

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QUESTION 36

Provide any references or external partners used to develop SDG&E's smoke impact model.

RESPONSE 36

SDG&E objects to Question 36 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

The following references were reviewed when evaluating the smoke fatality fraction.

- https://www.publish.csiro.au/wf/fulltext/wf19091#R16
- https://ww2.arb.ca.gov/sites/default/files/2021-07/Camp_Fire_report_July2021.pdf
- https://ww2.arb.ca.gov/news/new-analysis-shows-spikes-metal-contaminants-including-lead-2018-camp-fire-wildfire-smoke
- https://www.sciencedirect.com/science/article/abs/pii/S0048969717320223?via%3Dihub

As noted in the previous response, this fatality fraction will be revisited in 2022 model updates.

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QUESTION 37

Describe whether and how smoke hospitalizations would be incorporated into SDG&E's smoke impact model.

RESPONSE 37

SDG&E objects to Question 37 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

Hospitalizations are indirectly considered as part of the estimation explained in Question 35. In future models, SDG&E will consider exploring the applicability of an explicit smoke-related hospitalization quantification for the purposes of PSPS decision-making.

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SDG&E RESPONSE

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QUESTION 38

Please provide the geospatial map files used to create Figures 4-36 and 4-37 showing RFW and HWW days in file 2022_02_05_SDGE_2022_WMP Update_GIS Layer_452_2.zip if not already provided.

RESPONSE 38

See attached "Response_38_WMP_2022_7_3.gdb."

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SDG&E RESPONSE

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Vegetation Management

QUESTION 39

On p. 299, the WMP states that "Hazard tree trimming or removal is prioritized where necessary if failure is determined to be imminent." Describe the conditions that would lead SDG&E arborists to classify a "strike potential" tree as being prone to imminent failure.

RESPONSE 39

SDG&E objects to Question 39 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows

An imminent condition may be described as one where failure has started or is most likely to occur very soon. Observed conditions that might support the determination that a tree's failure may be imminent and where work may be prioritized include, but are not limited to, one or more of the following:

- Dead or dying with shedding branches;
- Excessive or uncorrected lean that appears unsupported by counter-balancing weight from the tree's crown or branches;
- Visible indicator of uplift in the root plate and/or and surrounding soil;
- Major cavity or cracking in trunk or branches that indicates the tree is unsound; or
- Storm-damaged tree.

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PSPS

QUESTION 40

Please provide a version of the analysis of frequently de-energized circuits (pp. 369-373) containing the additional supplemental information:

a. Damage to circuits after inspection for each circuit/outage

b. De-energized customer-days for each circuit/outage

c. Total circuit length for each circuit

RESPONSE 40

SDG&E objects to Question 40 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows

See attached response titled "Response_40a-c_2022 WMP_MGRA_DR02."

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST:
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SDG&E RESPONSE

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10 Year Vision

QUESTION 41

What is the estimated effectiveness for a combination of SDG&E's falling conductor technology and covered conductor for all ignition risk drivers?

RESPONSE 41

SDG&E objects to Question 41 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

SDG&E has not quantified the effectiveness of combining Falling Conductor Protection (FCP) with Covered Conductor technologies, however we do recognize the inherent benefits provided by both technologies that should combine to further reduce wildfire risk.

SDG&E anticipates combining FCP with covered conductor technologies in a layered approach to mitigate overall risk. Covered conductor provides for a more robust and resilient overhead electric system and FCP will still be able to detect broken conductors on covered conductor circuit segments. So, if covered conductors failed causing an open phase condition, SDG&E expects FCP would provide adequate backup protection to de-energize the circuit segment before energized conductors could reach the ground.

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SDG&E RESPONSE

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QUESTION 42

In what scenarios would a combination of SDG&E's falling conductor technology and covered conductor still have significant residual ignition risk?

RESPONSE 42

SDG&E objects to Question 42 on the grounds set forth in General Objections Nos. 2, 3, 5, 8 and 9. Subject to the foregoing objections, SDG&E responds as follows:

It is possible for covered conductors to fall to the ground still intact without the conductor breaking. In these cases, falling conductor protection (FCP) would not detect a broken conductor or open phase condition and would not operate. The covered conductor that fell to the ground may still be a source of ignition because insulation over the conductor may be damaged and exposed. The risk of high impedance fault (HIF) events on covered conductor systems is higher due to the conductor insulation, so a combination of FCP and other Advanced Protection Technologies such as Sensitive Ground Fault (SGF) and Sensitive Relay Profile (SRP) may help to best prevent ignitions on our system.

The following risk drivers are known scenarios where a combination of FCP and covered conductor can still have residual ignition risk:

- Prolonged contact from object – vegetation, balloons, etc.
- Animal contact – animals chewing through insulation
- Equipment failure – lightning arrestor, switch, transformer, capacitor, fuse, connection device
- Wire-down without broken conductor – pole failure or crossarm failure which results in prolonged contact with the ground or other objects (pole/crossarm/vegetation) while conductor remains intact.

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Vegetation Management Impact Analysis

QUESTION 43

In the Machine Learning model used to estimate risk tree scores, please provide the "distribution of risk scores" (p. E-9) that were used to determine a threshold of 0.15 for "risk trees".

RESPONSE 43

SDG&E objects to Question 43 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows

The threshold was established by returning as low a number of activity observations as possible but capturing a high percentage of true outage events. The testing dataset, 753,808 inspection or tree trimming observations from 2019 and 2020, represents two years of work activities on the inventory trees. As shown in distribution Figure 1 below, 22.5% (169,730) of observations have a probability score greater than 0.15. As shown in Figure 2 below, when the probability threshold is set at .15 on this testing dataset, the model captures 82% (32) of the true outages (2019-2020) by identifying 22.5% (169,730) of observations (2019-2020) as associated with trees that are more likely to cause an outage. These 169,730 observations represent 100,537 unique tree IDs.

Figure 1

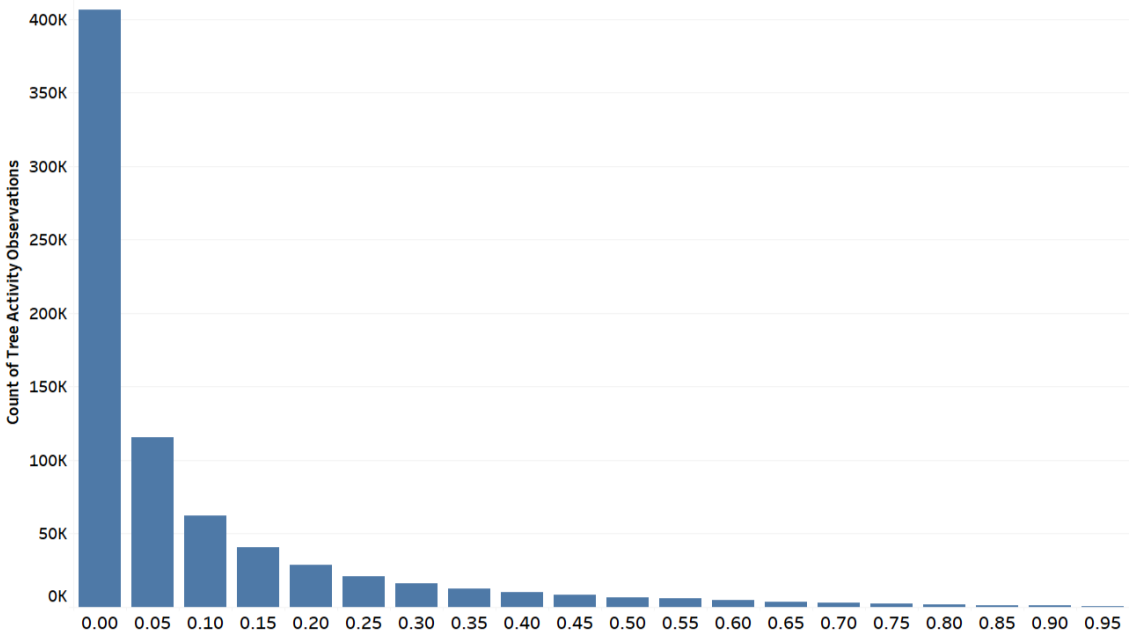

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Figure 2: Testing Data (2019-2020) Outcome Performance (Risk Events)

	(Predicted) No Outage	(Predicted) Outage
(Actual) No Outage	584,071	169,698
(Actual) Outage	7	32

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QUESTION 44

Describe the qualitative considerations that led to the value .15 being chosen for the "risk tree" threshold.

RESPONSE 44

SDG&E objects to Question 44 on the grounds set forth in General Objections Nos. 2, 3, and 5. Subject to the foregoing objections, SDG&E responds as follows:

This preliminary study provided quantitative evidence that the increase in line clearance results in a decrease in risk events. For this study, the following qualitative considerations were applied:

The number of outages caused by inventory trees ranges from 15 to 37 per year (2010-2020), it is a minimal number compared to approximately 480,000 inventory trees in the database. Thus, the probability of an outage on an individual tree is low. To capture a greater number of true positive outcomes (actual outages), a low probability value 0.15 was used as the threshold. Again, the purpose of the model is not to predict the probability of all system wide vegetation outages. This model was used to evaluate the sensitivity and effectiveness of greater line clearance to outage reduction by computing the outage outcome with different line clearance values.

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END OF REQUEST