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I. 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.

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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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III.   RESPONSES

The following data requests are being issued to SDG&E only.

On p. ix of its WMP, SDG&E states: "In addition, in 2020, SDG&E integrated an artificial intelligence (AI) forecasting system for 59 of the circuit segments that serve communities in the highest risk fire areas. SDG&E's ability to implement this technology stems from recording weather observations every 10 minutes for over 10 years, which has given SDG&E nearly one billion observations to train AI."

QUESTION 1:

Provide documentation and description of the AI forecasting system in use by SDG&E, including algorithm, training and testing methodology, and variables used for observations and predictions.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 1:

Please refer to "MGRA-SDGE DR4 Q1.zip," which contains three progress reports on the status and implementation of SDG&E's AI-based forecasting system through 2020. Specifically, SDG&E provides documentation on the Machine Learning Model leveraged, which demonstrates the training and testing methodology as well as the variables studied (also copied and pasted below).

- 1) temp_grad_surf: Vertical temperature gradient near the surface, which is defined as the ratio of the difference in potential temperature between 2 and 100m to the distance between 2 and 100m (i.e., 98m). Unit: K m-1.
- 2) wind_spd_grad_surf: Vertical gradient of wind speed near the surface, which is defined as the ratio of the difference in wind speed between 10 and 100m to the distance between 10 and 100m (i.e., 90m). Unit: s-1.
- 3) Ri_surf: Richardson number near the surface, as defined by eq. (2) in Rob's paper. It is basically a function of temp_grad_surf and wind_spd_grad_surf.
- 4) wind_dir_500mb: Wind direction at 500 mb. Unit: degree.
- 5) u_500m, u_1000m, u_1500m, u_2000m, u_2500m, u_3000m: zonal wind at different heights above ground.
- 6) v_500m, v_1000m, v_1500m, v_2000m, v_2500m, v_3000m: meridional wind at different heights above ground. Unit: m s-1.
- 7) temp_500m, temp_1000m, temp_1500m, temp_2000m, temp_2500m, temp_3000m: temperature at different heights above ground. Unit: K

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QUESTION 2:

Provide benchmarking and testing data that demonstrate any benefits of the AI forecasting system over the previous forecasting system.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 2:

The benchmark and testing data is included in the supported documentation provided in response to Question 1 above. Below is a validation plot for the Valley Center Weather Station demonstrating a significant improvement in forecast accuracy over the previous forecasting system, which is the blue line. The new AI forecast is the red line and the actual wind speed is the black line.
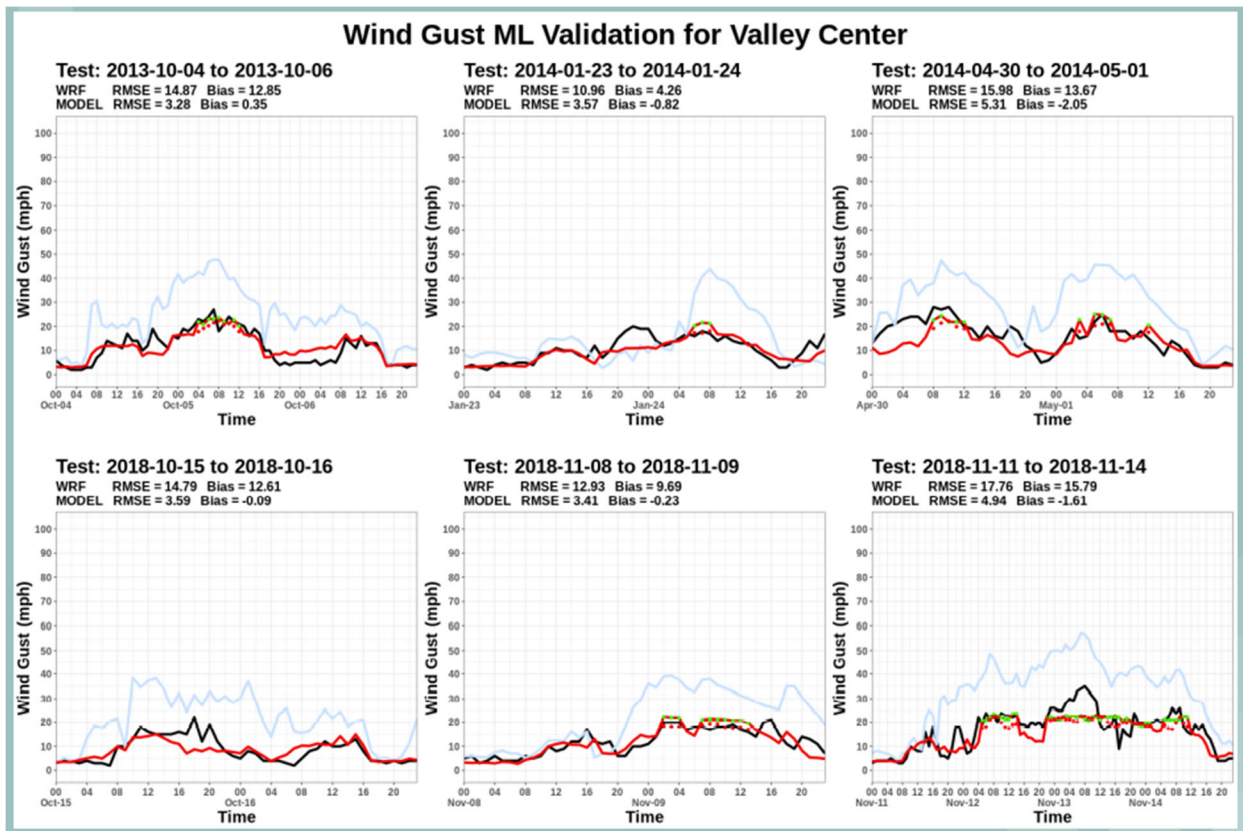
Wind Gust ML Validation for Valley Center

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QUESTION 3:

Describe how the AI forecasting system is currently used, and whether it has completely replaced the previous forecasting system.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 3:

The AI forecasting system has not completely replaced the previous forecasting system, although it has already proven to significantly improve forecasting capability. As of the end of 2020, 59 weather stations have had AI forecast models developed, leaving approximately 160 remaining to be built. The forecasts from the 59 weather stations were directly integrated into the forecasting system that our meteorology team uses to finalize the wind gust forecasts that support PSPS operations.

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QUESTION 4:

How does SDG&E account for a 13% increase in accounts opened in HFTD areas in one year? Do these newly opened accounts correspond to closed accounts elsewhere in SDG&E's service area?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 4:

The 13% increase did not include accounts closed in the HFTD during the same time period. After taking into account both "opened" and "closed" accounts, SDG&E saw a net increase of 2% in number of accounts that opened in HFTD areas.

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QUESTION 5:

How does SDG&E account for a 39% increase in AFN customers in one year?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 5:

The 39% increase did not include AFN accounts closed in the HFTD during the same time period. Upon further review, the 39% increase in AFN customers inadvertently included customer accounts that fell into multiple AFN categories (e.g., an account on both the CARE and FERA programs was counted twice).

After taking into account both "opened" and "closed" accounts, and removing customers that fall into multiple AFN categories, the number of **<u>unique</u>** customers increased by approximately 1%.

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On p. 80 of its WMP, SDG&E states that: "areas with higher wind speeds would influence this failure rate and would be further modified by the location of the asset in the models identified wind corridors.

QUESTION 6:

How does SDG&E model the relationship between failure rate and wind speed? How is wind speed determined for the purposes of this modeling?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 6:

SDG&E leverages the extensive data collected from its weather network when determining relationships between failure rate and wind speed. From this data, subject matter experts devised a simple wind factor that attempted to apply considerations for different speeds of wind. SDG&E used these wind factors to adjust the likelihood of ignitions. Since the time of the first WRRM model, more weather data and wind modeling efforts have been undertaken. Future models will utilize an updated method of applying wind factors that will likely focus on specific relationships of failure rates and wind with various asset classes.

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On p. 89 of its WMP, SDG&E states that WiNGS weights for PSPS "are determined by analyzing the safety, financial, reliability impact of a 12-hour power shutoff event to these customers using industry research."

QUESTION 7:

Please provide details describing what "industry research" is being utilized for determining safety, reliability, and financial impacts of PSPS and how this research is being used to determine weights.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 7:

Industry research refers to studies of blackouts such as the northeast blackout. In order to estimate customer impact values, proxy customer types are utilized to leverage industry research resources. The proxy customer types selected are assumed to be representative of an average customer within a particular customer category. In the case of the critical customer category, a communications tower is used as a proxy customer type to research the impact of a power shutoff. SDG&E leveraged reports on historical extended power outages and power shutoff events for the identified proxy customer types to estimate the expected natural unit consequences per impact category.

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QUESTION 8:

Please show weight calculations for the safety, reliability, and financial PSPS impacts.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 8:

For each impact category, the expected consequence value is estimated, in natural units, for a worst-case scenario. After the expected value of each impact type has been determined in natural units, the following scoring system is used to convert natural unit impacts to a PSPS impact score. These individual attribute scores are then weighted according per the multi-attribute value function (MAVF) guidelines to arrive at a total PSPS impact value per customer type.

Safety	
Score	Metrics (SIFs)*
30	5+
20	3-5
10	0.25-2
0	0

Reliability	
Score	Metrics (Directly Impacted Customers)*
30	1000+
20	501-1000
10	101-500
0	0-100

Financial	
Score	Metrics ($)
30	1M+
20	100K-1M
10	10K-100K
0	<10K

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QUESTION 9:

Describe uncertainties in the assumptions used in the weight calculations and give ranges for what SDG&E considers reasonable values and justifications for these ranges.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 9:

Please refer to the response to Question 8 above for the range of natural unit values that SDG&E considers when determining the scoring parameters for PSPS impact. These ranges were estimated by using non-critical customers as a baseline PSPS impact of 1, whereas a non-critical customer is defined as all customers that do not fall in either the critical or medical baseline categories. The initial scoring ranges are estimated using historical extended power shutoff events; however, an impact multiplier can be used where the expected consequence of a worst-case scenario exceeds the bounds of the scoring table. At the current moment, SDG&E is focusing these efforts to generate an expected value, or average, impact for each of the parameters described. In future improvements to the risk models, it is likely that the notion of uncertainty of assumptions will be utilized in some fashion – whether that be in stochastic methods or in the usage of ranges.

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Regarding SDG&E's Vegetation Risk Index (VRI):

QUESTION 10:

Provide the scoring method that VRI uses to incorporate at-risk species, and give the relative weights or scores used for each at-risk species.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 10:

The tree species component (Ts) is developed by creating four "buckets" which represent the presence of a tree species in a given area that has a history of causing outages. To do this, we first had to rank each tree species with respect to outages. To rank each species, we took the total number of outages attributed to each species (excluding tree trimming) and divided by the total number of trees of that species. For example, there were 11,007 Palm-Fan trees in our database and 260 outages attributed to Palm-Fan trees. $260/11,007 = 2.36\%$. Based on the entire results of all species, we then placed each tree species into one of the four buckets based on where their final calculation fell in the entire range of data… $< 30^{th}$ percentile (S_1), 30th - 75th percentile (S_2), 75th – 95th percentile (S_3), and $> 95^{th}$ percentile (S_4). ADS has a more complete list of tree species, so the numbers below may need to be adjusted after ADS has re-calculated the percent of trees in a given species that is responsible for outages. Below are the buckets currently being used:

- Ts bucket 1 (S_1) = Percentage of low risk trees (Species outage percent $< 0.12\%$)
- Ts bucket 2 (S_2) = Percentage of medium risk trees (Species outage percent 0.12% - 0.47%)
- Ts bucket 3 (S_3) = Percentage of high risk trees (Species outage percent 0.47% - 2.29%)
- Ts Bucket 4 (S_4) = Percentage of extreme risk trees (Species outage percent $> 2.29\%$)

Example: If along Circuit XYZ, 20% of the trees were in bucket 1, 50% were in bucket 2, 30% were in bucket 3, and 0% were in bucket 4, then…

$$Ts = 1(.20)+2(.50)+3(.30)+4(.00) = 2.10$$

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QUESTION 11:

Provide a table for all trees removed by SDG&E from 2018 to 2020, including:
- Year
- Tree Species
- Subspecies / Variety (if available)
- Reason for removal (using SDG&E category classification)
- Distance from tree to SDG&E equipment

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 11:

Please refer to "MGRA-SDGE DR4 Q11.xlsx."

- Tree species – SDG&E records tree species using the common name, not the taxonomic genus and species.

- Reason for removal – SDG&E does not use a categorical classification for trees that are removed. Trees that are removed are recorded in the database by the tree contractor using a condition code. A condition code of "*Completed Removal*" would denote that the tree was live and healthy. A condition code of "*Completed, Green, Reliability Removal*" and "*Completed, Dead or Dying, Reliability Removal*" would denote a tree that was live and had structural deficiencies, and a tree that was dead/dying respectively.

- Distance from tree to SDG&E equipment – SDG&E records tree distance (clearance) as a value in a range of feet. The value represents the estimated distance between the closest portion of the tree canopy and the powerline at the time of inspection prior to the tree's removal.

MUSSEY GRADE ROAD ALLIANCE DATA REQUEST: MGRA-SDGE-04
2021 WILDFIRE MITIGATION PLAN UPDATE
SDG&E RESPONSE

Date Received: March 2, 2021
Date Submitted: March 5, 2021

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On page 185 of its WMP, SDG&E states that: "all FPI information has been made available to researchers through an API web portal".

QUESTION 12:

What data is available through SDG&E's API web portal?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 12:

The following SDG&E data is made available through the web portal:

- **GOES Fire Detections**: Fire detections from GOES16 and GOES17 satellites.

- **SDG&E Operational Ensemble NAM 001 Dead Fuel Moisture NFDRS**: Dead fuel moisture and related variables derived from the National Fire Danger Rating System (NFDRS) algorithms using the SDG&E Operational Ensemble NAM 001 WRF model.

- **HPWREN Cameras**: Imagery from HPWREN cameras.

- **HPWREN Weather Station Measurements**: Archive of HPWREN weather station measurements from 2007-present. Also includes SDG&E weather station measurements until July 2018.

- **SDG&E Fire Potential Index**: The Fire Potential Index (FPI) assists in making operational decisions that will reduce fire threats and risks. This tool converts environmental, statistical, and scientific data to local fire potential.

- **SDG&E Historical Ensemble GFS 003 WRF**: A 2 km historical dataset produced with downscaled reanalysis data across far Southern California. This dataset was optimized for atmospheric river events and winter storms.

- **SDG&E Historical Ensemble NAM 001 WRF**: A 3 km historical dataset produced with downscaled reanalysis data across Southern California. This dataset was optimized for Santa Ana winds and was generated in collaboration with the USFS and UCLA.

- **SDG&E Operational Ensemble GFS 003 WRF**: WRF model initialized with GFS boundary conditions and optimized for atmospheric river events and winter storms. This model is run at a 2 km horizontal resolution with 51 verticle levels.

- **SDG&E Operational Ensemble NAM 001 WRF**: WRF model initialized with NAM boundary conditions and optimized for Santa Ana wind conditions. This model is run at a 2 km horizontal resolution with 52 vertical levels.

- **SDG&E Operational Ensemble GFS 001 WRF**: WRF model initialized with GFS boundary conditions and optimized for Santa Ana wind conditions. This model has a 6 km horizontal resolution with 46 vertical levels up to 100 mb.

- **SDG&E Operational Ensemble GFS 002 WRF**: WRF model initialized with GFS boundary conditions and optimized for summer monsoon/hot and humid events. This model is run at a 2 km horizontal resolution with 51 vertical levels.

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QUESTION 13:

What research institutions are currently able to access SDG&E's API web portal?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 13:

This data is available to any, and all research institutions that have interest in using the data.

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QUESTION 14:

What is the process by which researchers can gain access to the SDG&E web portal? What are requirements for access?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 14:

The SDG&E Meteorology Data Catalog is now publicly hosted at the San Diego Super Computing Center (SDSC): https://wifire-data.sdsc.edu/dataset

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On p. 192 of its WMP, SDG&E states that "animal contact, balloon contact and vegetation contact have an estimated reduction of ~90% while ignitions caused by vehicle contact, have an estimated reduction of ~0%

QUESTION 15:

How is the estimate of 90% for animal and balloon contact determined?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 15:

As reported in the SDG&E Quarterly Report on 2020 WMP dated September 9, 2020 at Appendix A Guidance 5, the 90% effectiveness of covered conductor relates to animal, balloon and vegetation contacts. The effectiveness was determined by looking at all ignition causes and assuming covered conductor would mitigate all foreign object faults with the exception of large vegetation or vehicle contacts.

Once SDG&E installs more covered conductor, effectiveness will be measured by comparing faults on the distribution lines before and after covered conductor installations.

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QUESTION 16:

How is the estimate of 0% for vehicle contact determined?

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 16:

The estimate was determined from subject matter expertise, and the assumption that a vehicle contact would cause the pole to fail and wire to fall to the ground. The insulation for covered conductor is rated for incidental contacts; it is not rated to withstand continuous contact with the ground.

Once SDG&E installs more covered conductor, effectiveness will be measured by comparing faults on the distribution lines before and after covered conductor installations.

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QUESTION 17:

Please provide reasonable scenarios under which animals and balloons can cause ignitions on covered conductor, and any justification that these scenarios make up 10% of animal and balloon contacts.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 17:

As reported in the SDG&E Quarterly Report on 2020 WMP dated September 9, 2020 at Appendix A Guidance 5, the 90% effectiveness of covered conductor relates to animal, balloon and vegetation contacts. The effectiveness was determined by looking at all ignition causes and assuming covered conductor would mitigate all foreign object faults with the exception of large vegetation or vehicle contacts.

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QUESTION 18:

Please provide justification for the claim that an ignition caused by a vehicle collision will never be mitigated by covered conductor.

OBJECTION:

SDG&E objects to this request on the grounds set forth in General Objection Nos. 2, 5, and 9. Subject to the foregoing objections, SDG&E responds as follows.

RESPONSE 18:

The estimate was determined from subject matter expertise, and the assumption that a vehicle contact would cause the pole to fail and wire to fall to the ground. The insulation for covered conductor is rated for incidental contacts; it is not rated to withstand continuous contact with the ground.