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MGRA-DR-003
SDG&E/SOCALGAS 2021 RAMP REPORTS- A.21-05-011/014
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In its estimation of costs from a "significant" fire, SDG&E uses a gamma distribution with a shape parameter (k) of 3 and a scale parameter (θ) of 0.8.
(See for example slide deck 2021 Risk Assessment Mitigation Phase (RAMP); Workshop: SDG&E Wildfire Risk; August 13, 2021 page 19.)

MGRA-4:
Provide the data that was used to obtain these fit parameters.

SDG&E Response MGRA-4:
The fit parameters SDG&E used was based on SDG&E's historical data, specifically the 2007 Witch Fire financial loss, and SME judgement. Based on these parameters, the financial loss is estimated to be $2.4 billion on average and around $5 billion dollars at the 95th percentile.

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MGRA-5:
Please provide any workpapers that show how the data was fit to the distribution and the parameters were obtained.

SDG&E Response MGRA-5:
Please see Response 01.

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MGRA-6:
During the August 13th workshop, SDG&E stated that it had also fit a power law distribution to the financial loss distribution and obtained a similar result to the gamma function. Please provide workpapers showing this work. Include the range of loss sizes (maximum and minimum) and the exponent used for the power law.

SDG&E Response MGRA-6:
SDG&E has not fit a power law distribution to the financial loss distribution.

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In its response to TURN Data Request 2, Question 12, SDG&E provides references as the basis for its MAVF attribute calibration that equates the safety impact from one fatality to be equivalent to 20,000 acres burned (Question 3).

MGRA-7:
Please provide the calculations and workpapers based on SDG&E's cited references showing how the MAVF weighting was obtained.

SDG&E Response MGRA-7:
The table below provides the calculations for how the MAVF weighting was obtained. External sources are denoted; all other sources are SDG&E data.

The formula is: 17,407.27 metric tons * 1.1 ton / metric ton * $63,339 per ton * 1.24 / 273,246 acres = $5503.8 per acre burned, which was rounded to $5,000 per acre burned.

Based on 2021 RAMP MAVF, 1 fatality is equivalent to $100 million. So, 1 fatality is equivalent to 20,000 acres burned.

Description	Value	Unit
PM2.5* from Cedar Fire	17407.27	pollutant mass (metric tons)
US Ton per Metric Ton	1.10	ton
Acres Burned from Cedar Fire	273246	acres
Emission Costs**	63339	2007 USD
Cumulative rate of inflation	1.24	2020 USD
Acres Burned Cost	5000	per acres burned
Acres Burned	20000	per safety unit (one fatality)

* Nicholas E. Clinton, Peng Gong, Klaus Scott, "Quantification of pollutants emitted from very large wildland fires in Southern California, USA", 2006, doi:10.1016/j.atmosenv.2006.02.016
** Transportation Benefit-Cost Analysis, http://bca.transportationeconomics.org/benefits/emissions/methodology

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MGRA 8:
The citations used by SDG&E to justify its weighting are from 2005 and 2006.
Why is SDG&E using these particular citations rather than more recent treatments of the subject of health impacts from wildfire smoke?

SDG&E Response MGRA 8:
SDG&E believes the data from 2005 and 2006 is the best available data that SDG&E was able to find.

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MGRA 9:
In SDG&E's estimation of safety risk from PSPS, are the health effects from smoke inhalation in the absence of filtration/air purification directly or indirectly included in the estimate? If so, how?

SDG&E Response MGRA 9:
SDG&E's estimation of safety risk from PSPS does not explicitly take into consideration the health effects from smoke inhalation. The current estimate assumes one safety unit for every 10 billion customer-minutes of PSPS initiated outage minutes.

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In its response to SPD Data Request 6, Question 5, SDG&E provided information on PSPS impacts on risk scores. SDG&E states that "A combination of industry research and subject matter expertise is used to, by attribute, bucketize the range of impact values and correspond them to an attribute consequence weighting."

MGRA 10:
Please provide citations for the research used as inputs for the impact value calculations.

SDG&E Response MGRA 10:
The citations are as follows:

- "California Blackouts Hit Cellphone Service, Fraying a Lifeline"
  - Pogash, C., & Chen, B. X. (2019, October 31). *California Blackouts Hit Cellphone Service, Fraying a Lifeline*. The New York Times. https://www.nytimes.com/2019/10/28/business/energy-environment/california-cellular-blackout.html
- "Cell phone towers shut off during PG&E power outage"
  - https://www.ktvu.com/news/cell-phone-towers-shut-off-during-pge-power-outage

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MGRA 11:
Please provide workpapers and/or description of how the available research and SME expertise was used to weight attribute consequences.

SDG&E Response MGRA 11:
Please see Response 04.

The four attributes used to determine the consequence impact are safety, financial, reliability, and stakeholder satisfaction. These attributes were selected per the consequence attributes defined in the Multi Attribute Value Function (MAVF) that was developed for the purpose of risk scoring for RAMP. These consequence attributes have the same weighting as the comparable attributes in the MAVF model. For example, the safety attribute is weighted at 60% within the MAVF and is thus weighted at 60% in the critical customer impact scoring weighting.

The available research for PSPS quantification was used subjectively to estimate potential impacts to customers. SDG&E will continue to pursue more advanced approaches to quantifying PSPS in the future and potentially conducting more studies to guide its assessments.

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MGRA 12:
In Figure 1 "Distinguishing Customer Impacts by Type", please explain how the ratio of "Critical" and "Non-Critical" customers was determined. Specifically, explain how this was chosen to be 20 for Safety, 10 for Financial, 30 for Reliability, and 30 for Stakeholder Impact.

SDG&E Response MGRA 12:
The factors used in the 2021 RAMP to distinguish between customer types are subjective and based on SME input. SDG&E is working towards implementing more data-driven and quantitative approaches to evaluating PSPS. For each attribute, an impact scoring scale was developed to model the wide range of potential customer impacts through a systematic process. The scales for each attribute can be seen in the figure below.

Safety	
Score	Metrics (SIFs)*
30	5+
20	3-5
10	0.25-2
1	0

*Impact over a 12 hour outage

Reliability	
Score	Metrics (Directly Impacted Customers)
30	1000+
20	501-1000
10	101-500
1	0-100

Financial	
Score	Metrics ($)
30	1M+
20	250K-1M
10	50K-250K
1	<50K

Stakeholder Satisfaction	
Score	Metrics (unitless)
30	Greater of Safety or Reliability
20	
10	
1	

SDG&E Response MGRA 12:-CONTINUED

For each attribute, the baseline impact / lower bound was determined by the expected impact to a non-critical customer. Once the baseline was set, specific analyses were conducted to determine the expected impact, per attribute, for critical and medical baseline customers.

Given the large range of critical customers, ranging from medical centers to public transportation, a proxy customer type was selected to represent the average impact across different critical customer types. The proxy selected was an outage to a communications tower since this outage was determined to best represent a typical critical customer.

Industry research and SME input were leveraged to determine the expected impact of a communications tower power outage, assuming a lack of backup power, within each attribute type. These expected impacts were determined by examining past communications outages in other power shutoff events and using SME input to assess the potential safety impact from an outage to an individual communications tower. Once the expected impacts were determined in natural units, the corresponding impact score was selected and then weighted per the attribute weighting guidelines identified in the MAVF.

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MGRA has raised the issue that ignition data is biased as a risk proxy if PSPS is in wide usage, as it has become in the SDG&E service area.

MGRA 13:
What attempts to incorporate post-PSPS patrol damage reports as wildfire risk proxy. Please provide any available workpapers.

SDG&E Response MGRA 13:
Data from post-PSPS patrol damage reports were not incorporated in the 2021 RAMP wildfire risk modeling. SDG&E continues to evaluate how to incorporate this data in future modeling efforts.

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MGRA: 14:
How does the fraction of significant wildfires vary with wind speed?

SDG&E Response MGRA 14:

SDG&E objects to this request on the grounds that it is vague, ambiguous, unintelligible, and possibly out of scope. The request appears to be incomplete and/or lacks context, such that it is not understandable as written.

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MGRA 15:
For SDG&E's circuit risk ranking SDG&E states that their ranking includes "high winds" (Chapter 2, p. 2-12). Please provide documentation with regard to how wind speeds are estimated. (Note, SDG&E is still using the 2005-2014 analysis described in SDG&E 2020 WMP; p. 6, 34-35, 66; Tables 8&10 for its maximum wind speed estimates, please state so. In this case, documentation is not required.)

SDG&E Response MGRA 15:

The use of the words "high winds" in the referenced section in Chapter 2, p. 2-12 pertain to a discussion around failure causes on the overheard system and does not pertain to utilizing "high winds" for circuit ranking. In this context, SDG&E utilizes wind data from weather stations to help determine if winds might have been a factor in the failure of the overhead system.

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With regard to SDG&E's covered conductor program:

MGRA 16:
SDG&E estimates that covered conductor is 70% effective in reducing ignitions.
Please provide the workpapers/calculations leading to this estimate.

SDG&E Response MGRA 16:
As stated during the September 2 workshop, the 70% value should have been 62%, and 62% is a SME provided estimate. There is insufficient data (the covered conductor program is less than two years and involves only ~5 miles of conductor) to rely solely on historical data. These assumptions are based on SME judgment with some reference to recent efficacy studies. For example, bare conductor hardening efficacy studies show that prior hardening efforts reduced ignition rate by ~47%. With that data point in mind, SMEs evaluated different causes of ignitions and assumed that an additional 15% reduction could be achieved with covered conductor because it has the potential to reduce ignitions caused by foreign object contacts. For a more detailed breakdown of assumptions, see table below that was provided in a recent response to TURN DR 6, Question 1.f.

Derived from ignition database (2015-2019). Some occurred outside HFTD				
SDGE-SCG RAMP A.21-05-011 TURN DR06				
Mode	***Count of Ignitions before Covered Conductor***	***Count of Ignitions after Covered Conductor***	***Covered Conductor Effect (Residual Risk %)***	***Assumption***
Animal contact	5	0.5	10%	90% reduction in animal contacts
Balloon contact	9	0.9	10%	90% reduction in balloon contacts
Vegetation contact	10	1	10%	90% reduction in vegetation contact
Vehicle contact	13	10.4	80%	20% reduction in vehicle contact
Other	6	5.4	90%	10% reduction in 'other' ignitions
Equipment - All	27	5.4	20%	80% reduction in equipment related ignitions
Unknown	6	5.4	90%	10% reduction in 'unknown' ignitions
TOTAL	*76*	*29*	*62%*	

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MGRA 17:
How does SDG&E quantitatively adjust the PSPS thresholds for covered conductor as opposed to bare wire circuits?

SDG&E Response MGRA 17:
Currently, SDG&E has installed approximately six miles of covered conductor. By the end of 2021, SDG&E plans to have approximately 20 miles of covered conductor installed on the system. Due to the low numbers of mileage installed, SDG&E does not have enough experience with covered conductors' performance in high-wind events to change de-energization thresholds. SDG&E's plan is to evaluate the performance of covered conductor during any PSPS-related events in 2021 and propose changes to the de-energization thresholds of circuit segments with covered conductor installed in 2022.

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MGRA 18:
On page 1-42 of Chapter SDG&E-Risk-1, SDG&E states that they "conducted a research study that measured the effectiveness of bare conductor hardening and found that it reduced risk events by 47%." Please provide this research study.

SDG&E Response MGRA 18:
As mentioned during the September 8 workshop, the 47% is based on the following ratio of data gathered by SDG&E:

Fault rate (per year per 100 miles) of unhardened conductor minus fault rate of hardened conductor (per year per 100 miles) divided by fault rate on unhardened conductor.

SDG&E had a historical rate of 9.24 faults per year per 100 miles for distribution overhead circuits before hardening, and a rate of 4.92 faults per year per 100 miles for distribution overhead circuits after hardening.

(9.24-4.92) / 9.24 = 46.8% reduction in fault rate for hardened circuit segments.

The referenced efficacy study can be found in the 2021 WMP update under section 4.4.2.3 on page 57.

Link provided here: Microsoft Word - SDGE 2021 WMP Update DRAFTv2

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Other questions:

MGRA 19:
Can lightning strikes cause expulsion fuses to blow in a manner that would start a wildfire? Please provide any supporting evidence for or against.

SDG&E Response MGRA 19:
An operation of an expulsion fuse has the potential to emit molten particles that can cause an ignition leading to a wildfire. Lightning strikes can create overvoltage or overcurrent conditions on the distribution system that would lead to the operation of an expulsion fuse.

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MGRA 20:
On page 1-19 of Chapter SDG&E-Risk-1, SDG&E discusses a "delta wind field" calculation that compares observed and measured wind speeds. Please give a full description of how this data is obtained. Also give a full description how the delta wind field is used for planning and operationally.

SDG&E Response MGRA 20:
SDG&E's wildfire behavior modeling system includes a "delta wind" data field that displays the difference between the wind speed forecasted by the SDG&E forecast models and the concurrent actual wind speeds measured from SDG&E's weather network. The SDG&E weather data is automatically downloaded to the fire behavior modeling system nightly and can also be downloaded from the San Diego Supercomputing Center at the following link. <https://sdge.sdsc.edu/data/sdge/ > . The real time measured wind speeds are delivered to the system through a data API which is also publicly available through multiple sources including the National Weather Service and MesoWest.

Below are two examples of how the data is visualized. The map displays a green dot at our weather stations where the forecast wind speed is within 5 miles per hour of the observed value. Areas with blue dots are trending below forecast and areas with red dots are trending above forecast. There is also a table that can help further investigate the forecast trends at any location on the map to see how the forecasts are trending and how the forecast models are performing in a given area.

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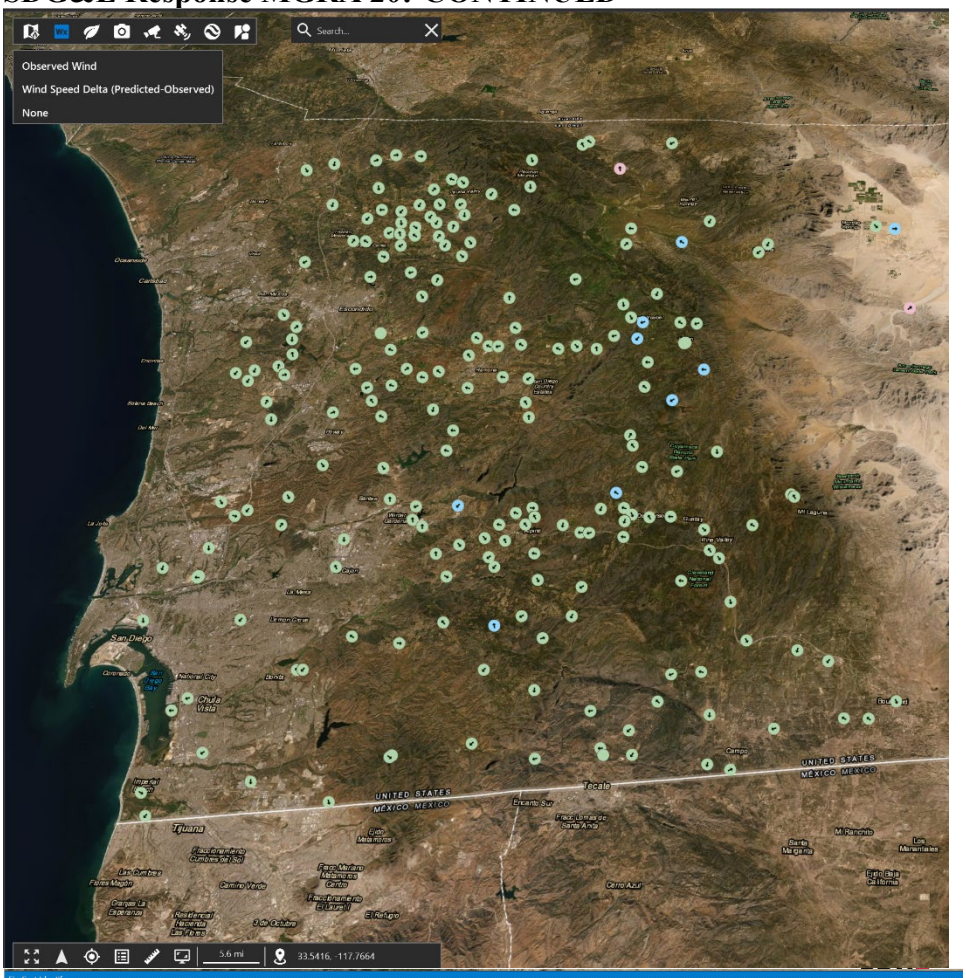
SDG&E Response MGRA 20:-CONTINUED



FireCast Identify

Point & Wx Station Details

Identified Point				Closest Weather Station			
Fuel:	Lat:	Lon:	Elevation:	Name:		Lat:	Lon:
165 (TU5)	32.8776	-116.647	3,248 ft	North Descanso		32.8832	-116.647
CC:	CH:	CBH:	CBD:	Elevation:	Distance:	Type:	Code:
98 %	22.97 ft	22.97 ft	0.0006 lb/ft³	3377 ft	0.39 mi	SDGE	NDCSD

Stop Identify | SDGE - TSYL 2021 - September 2 | Export lab

Weather Charts | Weather Data | Risk Values

Date	Wed, 09/08/2021																						
Hours	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Wind Speed (mph)	4.1	4.2	3.6	2.7	2.6	2.5	2.1	2.1	1.5	2	3	3.8	4.6	5	5.6	5.9	3.9	3	2.4	2.6	3.7	3.2	2.6
Observed Wind Speed (mph)	3.3	4.2	4.4	3.7	3.9		6.4	3.3	5	6.6	6.3	6.8	7.4	8.6	10.2		8.5	3.3	1.7	4.3	2.9		
Wind Speed Delta (+/-)	0.8	0	-0.8	-1	-1.3		-4.3	-1.2	-3.5	-4.6	-3.3	-3	-2.8	-3.6	-4.6		-4.6	-0.3	0.7	-1.7	0.8		
Wind Direction	↘	↓	↓	↓	↓	↓	↓	↙	↓	↘	→	→	↘	↘	↘	↘	→	→	↑	↖	←	↙	↙
Observed Wind Direction	←	←	←	←	←	↓	↖	←	↘	→	→	→	→	→	→	↓	→	→	→	↘	↙	↓	↓
Observed Wind Gust (mph)	6.1	5.5	6.6	5	5.3		8.3	4.9	6.8	11	9.3	10	11.5	13.7	15.2		11.2	8.4	4.4	7.2	6		

SDG&E Response MGRA 20:-CONTINUED

The delta wind field is not leveraged during planning. During this phase of preparing, we use the output from our forecast models, with input from our team of meteorologists and subject matter experts. After an event has started to materialize, this tool is leveraged operationally by our subject matter experts to quickly determine model performance for a given event.

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MGRA 21:
What is the usable life of SDG&E's weather stations?

SDG&E Response MGRA 21:
The usable life of the SDG&E weather stations has varied across the weather network, though most of the sensors need to be replaced after 5-10 years, depending upon various factors, including the climate.

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MGRA 22:
On page 1-20 of Chapter SDG&E-Risk-1, SDG&E states that it will "include the integration of high-resolution modeling to determine where unmeasured strong winds may be occurring". Is this modeling WRF based or based on other models?
What resolution does SDG&E foresee achieving?

SDG&E Response to MGRA 22:
This forecast modeling is WRF based and, through the optimization studies that were done with UCLA when establishing the program, SDG&E found through validation against the SDG&E weather that the WRF model performed best at a 2km resolution. That said, SDG&E leveraged WRF runs below 1km resolution as shown below and we continue to work with academic partners to try to advance the modeling technology and capabilities.