BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018)	R.18-10-007 (Issued October 25, 2018)

SAN DIEGO GAS & ELECTRIC COMPANY'S (U 902-E) DATA COLLECTION FOR WILDFIRE MITIGATION PLANS REPORT PURSUANT TO DECISION 19-05-036, ORDERING PARAGRAPH 2

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July 30, 2019

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San Diego Gas & Electric Company ("SDG&E") timely submits its Data Collection for Wildfire Mitigation Plans Report ("Report") pursuant to the California Public Utilities Commission's Decision 19-05-036, Ordering Paragraph 2. SDG&E's Report is included as Attachment 1 to this filing.

Respectfully submitted,

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Attachment 1

San Diego Gas & Electric Company's
Data Collection for
Wildfire Mitigation Plans Report
July 30, 2019

San Diego Gas & Electric Company's Data Collection for Wildfire Mitigation Plans Report

July 30, 2019

Introduction

Pursuant to Ordering Paragraph 2 of California Public Utilities Commission (Commission or CPUC) Decision (D.) 19-05-036, all electrical corporation respondents to Rulemaking (R.) 18-10-007 shall, by July 30, 2019, file and serve on the service list for this proceeding a report entitled "Data Collection for Wildfire Mitigation Plans" (Report). The Report must:

> a) include a "Data and Map Product Catalogue" that lists, identifies, and describes all datasets and map productions the electrical corporation possesses, collects and maintains that could be useful in assessing the effectiveness of its Wildfire Mitigation Plan (WMP) in reducing catastrophic wildfire risk;
>
> b) provide a "Data Dictionary" detailing the data tables, attribute column headers, sample attributes, alias, description, and metadata about the datasets and map products identified in (a);
>
> c) propose metrics to assess whether the Wildfire Mitigation Plans are having or will have the desired result (i.e. – a reduction in the risk of catastrophic wildfire);
>
> d) suggest new areas of data collection that could assist in assessing WMP effectiveness and align utility data collection efforts;
>
> e) propose a schedule for collecting and using the data for future wildfire mitigation efforts; and
>
> f) propose a manner of making the data available to third party researchers for the purposes of improving wildfire mitigation.[1]

San Diego Gas & Electric Company (SDG&E) provides the required information below.

[1] D.19-05-036, Ordering Paragraph 2 also notes that: "Before making this filing, the electrical corporations shall consult experts in data analysis, including, if relevant, presenters at the Wildfire Technology Innovation Summit co-sponsored by this Commission on March 20-21, 2019, to ensure they gather the data in a manner that allows assessment, including using common data gathering methods across all respondent electrical corporations. The filing shall include the results of this consultation."

A. Data and Map Product Catalogue

Report Requirement: Include a "Data and Map Product Catalogue" that lists, identifies, and describes all datasets and map productions the electrical corporation possesses, collects and maintains that could be useful in assessing the effectiveness of its Wildfire Mitigation Plan (WMP) in reducing catastrophic wildfire risk.

SDG&E's efforts to mitigate the risk of catastrophic wildfire began over a decade ago after San Diego experienced some of the most destructive wildfires in the county's history. SDG&E has developed and implemented various programs, which have increased its understanding of the wildfire environment. This level of understanding led to changes in SDG&E's operational procedures to reduce the potential for ignitions associated with its infrastructure during periods of elevated fire potential.

To support this knowledge and in an effort for continuous improvement, SDG&E collects and maintains several databases/datasets that are useful in assessing the effectiveness of the activities and programs set forth in its WMP in reducing the risk of catastrophic wildfires.

Table 1 below provides an overview of databases/datasets and the subsections that follow describe the type of information contained in these databases/datasets.

Table 1: Overview of Relevant Databases/Datasets

Database/Dataset	Area
Electric Reliability	Operations & Engineering
Transmission Outages	Operations & Engineering
Ignitions	Operations & Engineering
Wire Downs	Operations & Engineering
CMP/Intrusive Inspections	Operations & Engineering
Weather	Situational Awareness
PowerworkZ	Vegetation Management

Electric Reliability

SDG&E tracks and maintains customer outage impact data for CPUC annual reporting, other internal and external reporting, and to analyze causes of electric system outages in order to use that information to optimize electric system reliability investments. The data tracked includes any outages in the primary voltage (i.e., 4kV, 12kV, 69kV, 138kV, 230kV, 500kV) electric systems that leads to customer impact. Planned outages and secondary voltage related outages are not tracked within this database. The database tabulates results in terms of industry measurements such as Customers Impacted (CI), Customer Minutes interrupted (CMI), System Average Interruption Duration Index (SAIDI), and System Average Interruption Frequency Index (SAIFI).

Transmission Outages

SDG&E tracks and maintains outage data for its electric transmission system within a Microsoft (MS) Access database. This database includes the pertinent data for each forced outage on the electric transmission system so that trends can be identified. The type of data included in this database are: the outage element(s), time stamps from the transmission Energy Management System (EMS), outage cause codes (primary and secondary), and description of the outage cause.

Ignitions

SDG&E collects ignition data on all fire ignitions that meet the CPUC reporting requirements per D.14-02-015.[2] CPUC reportable ignitions (as defined in D.14-02-015) are: electric in origin; self-propagating (i.e., do not go out when the power is turned off); leave the electric facility and travel more than one meter. Ignition information is collected into an excel spreadsheet provided by the CPUC. The following data is included in this spreadsheet: date and time of fire; location of fire; size of fire; description of utility facilities involved or impacted; outages associated with fire; suspected cause of fire. This data is converted into a Geographic Information System (GIS) so that geospatial trends can be spotted, clusters of ignitions identified, and effective mitigations can be employed to reduce their occurrence.

[2] D.14-02-015 requires the investor-owned utilities (IOUs) to record and report certain data annually starting on January 1, 2014.

Wire Down Database

SDG&E maintains an MS Access database, which stores data collected from the review of wire down events. This data supports engineering evaluations of overhead distribution equipment failures. The following data is included in this database: date and location associated with the outage and/or wire down event; circuits affected by outage and/or wire down event; conductor size, type, and material; external force and equipment that failed.

Corrective Maintenance Program/Intrusive Inspections

SDG&E's Corrective Maintenance Program (CMP) is an inspection program which consists of six different inspection categories with various, corresponding inspection cycle intervals per program. SDG&E records all CMP inspection and maintenance activities for Electric Distribution in SAP. SDG&E records all CMP inspection and maintenance activities for Electric Transmission in Powerworkz/TCMData. Data includes dates of inspections, results of inspections, dates of repairs, structure IDs, work order numbers, etc. This data supports SDG&E's compliance with General Order (GO) 165.

Weather

Weather Network – SDG&E has developed one of the largest utility-owned weather networks in the nation with 177 weather stations strategically located on, or in close proximity to, every circuit in SDG&E's High Fire Threat District (HFTD). Each weather station is physically located on poles and provides 10-minute reads (i.e., collects data) of temperature, humidity, and winds, which delivers superior situational awareness of potential weather threats on SDG&E's electric system. There are multiple databases, both internal and external to the SDG&E, that archive this weather data, making it available to SDG&E, fire agencies, and the public.

Weather Research and Forecasting Data – The size and density of the SDG&E weather network provides a unique opportunity to pull-in actual data for the verification and calibration of weather models. Understanding the value these models play in operations, SDG&E partnered with the University of California system to develop and operate customized weather models to support daily and emergency operations. In 2012, SDG&E launched its first internal high-performance computer cluster to integrate weather data directly into operations. This program has grown over the last five years and today SDG&E operates close to 2,000 compute core hours of high performance computing a day, coupled with advanced analytical techniques to generate new forecasting products. This provides SDG&E with gridded weather data daily to support operational decision making. SDG&E also ran these models back to 1984, creating a comprehensive historical weather data set to assist with the development of analytical tools to anticipate extreme fire weather conditions.

Fire Potential Index – The Fire Potential Index (FPI) is a tool that was developed by SDG&E's subject matter experts to communicate the wildfire potential on any given day to promote safe and reliable operations. This seven-day forecast product, produced daily, classifies the fire potential within each of SDG&E's eight operating districts based on weather and fuels conditions. This is also shared with local fire agencies, emergency responders, and the National Weather Service. SDG&E has archived the FPI rating daily since the forecast tool was developed in 2012 and also developed the FPI daily back to 2002 using historical data.

PowerworkZ

SDG&E developed an electronic database called PowerworkZ (PWZ) to track and manage trees in close proximity to its electric infrastructure. The application is built upon a foundation of CityWorks software, which includes embedded applications from I-Water and ESRI's ARC-GIS. The application consists of a server database and mapping interface for the mobile environment.

PWZ contains records for over 460,000 specific trees located near its electric power lines. Inventory trees are defined as those with the potential of impacting the power lines by encroachment and/or tree failure within three years of inspection date. All trees in PWZ are monitored using known species growth rates, with additional consideration given to the amount of rainfall occurring during periods affecting overall tree growth, and past pruning practices. Each inventory tree is assigned a unique alpha-numeric identification number within the electronic database which allows the activity history of each tree to be tracked. All inventory tree records are updated annually to reflect their condition at time of inspection. All tree records that require work during the annual trim cycle are subsequently updated by the tree contractor during the tree trim activity. SDG&E Vegetation Management also uses PWZ to record tree-related outages that occur within its system. The outage information that is tracked includes the tree species and characteristics, location, electrical infrastructure, details of tree failure, etc.

B. Data Dictionary

Report Requirement: Provide a "Data Dictionary" detailing the data tables, attribute column headers, sample attributes, alias, description, and metadata about the datasets and map products identified in (A).

The data dictionaries for the databases/datasets identified in Section A above are provided in Appendices A through G. Table 2 below summarizes the data dictionaries.

Table 2: Overview of Data Dictionaries

Database/Dataset	Reference
Electric Reliability	Appendix A
Transmission Outages	Appendix B
Ignitions	Appendix C
Wire Downs	Appendix D
CMP/Intrusive Inspections	Appendix E
Weather	Appendix F
PowerworkZ	Appendix G

C. Proposed Metrics

Report Requirement: Propose metrics to assess whether the WMPs are having or will have the desired result (i.e., a reduction in the risk of catastrophic wildfire).

Pursuant to Ordering Paragraph 2(c) of D.19-05-036, the electric corporations must propose metrics to assess whether the Wildfire Mitigation Plans are having or will have the desired result (i.e. – a reduction in the risk of catastrophic wildfire).

There are many metric-related efforts currently underway or evolving in various proceedings before the Commission.[3] D.19-05-036 identified a number of metrics the Commission found appropriate to develop in Phase 2 of R.18-10-007.[4] For future WMPs (post-2020), the California Wildfire Safety Advisory Board will, among other things, make recommendations on appropriate performance metrics for the electric corporations' WMPs.

[3] For example, per D.19-04-020 there is a Safety Model Assessment Phase (S-MAP) Technical Working Group led by the Commission's Safety and Enforcement Division (SED), which is currently assessing proposals for Electric Overhead Conductor metrics. SDG&E will incorporate metrics from other proceedings as necessary and appropriate. The IOUs also have an annual metrics report that is due every March 31 that will include wildfire-related metrics.

[4] SDG&E notes it is required to work with SED on a template for reporting each of the data points set forth in D.19-05-039 (at p. 23) in a format consistent with the other IOUs.

With this in mind, SDG&E developed the following proposed interim metrics to assess whether its WMP reduces or will reduce catastrophic wildfire risk. Fire science points to weather, vegetation or fuels, and terrain (or specified areas) as the main factors to catastrophic wildfire risk. Aligning with fire science, SDG&E is proposing parameters for its proposed metrics to be focused on events within HFTD and on days when the FPI is rated Elevated or higher. Metrics taken from events in the HFTD and days when the FPI is Elevated or higher allows for the metrics to be unclouded by data that can distract from fire risk. The HFTD and the FPI were developed through much collaboration and coordination in order to provide focus on high fire risk areas and high fire risk days. The HFTD defines the geographical area of focus. Similarly, the FPI defines the weather days of most significance. As compared to the Red Flag Warning days, it offers more days for fire risk focus and thus higher sampling for relevant metrics. Therefore, using the HFTD and FPI as some of the parameters for the metrics further develops fire science and fire mitigation where it will most be effective in reducing the risk of catastrophic wildfire.

SDG&E's proposed metrics are intended to show manageable and controllable infrastructure risk. To remove elements that are outside of SDG&E's reasonable control, SDG&E will exclude contributions to overhead electric infrastructure-related faults and energized wire down events caused by foreign objects and third party contacts from its reporting. Foreign object contacts are unplanned system outages that are caused by aircraft, animal or animal activity, balloons or other mostly man-made objects such as shoes. For purposes of SDG&E's proposed metrics, vegetation contacts will be reported. Third party contacts are system outages consisting of acts of vandalism or sabotage, non-SDG&E vehicle contacts with SDG&E structures, non-SDG&E dig-ins on underground lines, and non-SDG&E contact with overhead lines.

The Commission finds value in metrics that correlate weather with events that may lead to ignitions. In D.19-05-036 (at p. 25), the Commission notes that metrics that track the number of elevated fire danger days (e.g., FPI Elevated or higher) and the number and types of potential ignition events that occur on those days are "imperative for providing the type of insight needed to better understand and properly analyze the risk of catastrophic [wild]fires caused by electrical lines and equipment." The metrics SDG&E proposes herein reflect this.

Given that metrics are an evolving area, SDG&E looks forward to working with the Commission and its staff, the soon-to-be established California Wildfire Safety Advisory Board, and stakeholders to develop relevant metrics for WMPs.

1. **Energized Wire down events within HFTD, when the FPI is rated as Elevated or higher**

This metric describes wire down events on structures within the HFTD. The dataset originates from outage records, so it is only attributed to wire down events that lead to or are part of an unplanned primary customer outage. HFTD determination is made by cross-referencing structure ID with current GIS mapped HFTD boundaries. Some structure locations may not be able to be mapped as the structures were removed sometime in the past. For those structures, reasonable inference can be made based on the location of the circuit that the wire down was

located on, cross-referencing if the isolating device that de-energized the wire down is in the HFTD, or using some other method. This metric excludes foreign object and third-party contacts.

2. **Equipment Caused Ignitions in HFTD, when the FPI is rated as Elevated or higher**

SDG&E tracks and maintains customer outage impact data including cause of outage of which equipment caused outages are a subset. These are all equipment caused outages but will be further filtered to those outages that caused ignitions. This will also be cross referenced with an ignition data set for equipment caused ignitions not associated with a specific outage, to ensure a more accurate metric and capturing all equipment ignitions. The metric would measure the number of equipment caused fire ignitions in HFTD. These would exclude equipment caused failures for equipment owned by third parties or equipment failures caused by third parties (e.g., car pole contacts) and foreign objects.

3. **Vegetation Caused Outages in HFTD, when FPI is rated as Elevated or higher**

SDG&E Vegetation Management investigates all outages deemed to be related to vegetation. Outage investigations are recorded in PowerworkZ and include a root cause analysis of the outage, whether the location is within the HFTD, and whether the incident resulted in a fire. SDG&E can measure the effectiveness of its enhanced vegetation management by comparing the number of tree-related outages which occur.

4. **Vegetation Caused Ignitions in HFTD, when the FPI is rated as Elevated or higher**

SDG&E Vegetation Management investigates all outages deemed to be related to vegetation. Outage investigations are recorded in PowerworkZ and include a root cause analysis of the outage, whether the location is within the HFTD, and whether the incident resulted in an ignition. SDG&E can measure the effectiveness of its enhanced vegetation management by comparing the number of tree-related outages that result in an ignition. SDG&E is also currently developing an ignition management database which will also record vegetation-related ignitions.

5. **Overhead Faults on Circuits in HFTD, when the FPI is rated as Elevated or higher**

This metric calculates all overhead faults related to system primary unplanned outages that are initiated by an equipment failure and exclude faults initiated by third party or foreign objects that make contact with SDG&E overhead electric lines. It also focuses reporting on circuits with at least some portion of them located within the HFTD.

6. Number of non-CAL FIRE rated fuse operations in the HFTD, when the FPI is rated as Elevated or higher

This metric would track the outages where the highest level of isolation device is a fuse and where the fuse operation involved a non-CAL FIRE rated fuse.[5] The data for this metric currently includes operations for all fuse types. The proposed metric would need to be developed to focus on non-CAL FIRE rated fuses. Data originates from the outage database, and therefore this data focuses on primary voltage unplanned outages that affect customers.

7. Number of Fire Potential Index (FPI) "elevated" and "extreme" days

As noted above in Section A, SDG&E develops and archives a daily FPI for its service territory. The FPI is a seven-day forecast tool that is intended to reflect the potential for large wildfire across the SDG&E service territory on any given day based on weather and fuels conditions and historical fire occurrences within each of SDG&E's eight operating districts. The situational awareness provided by the FPI is a foundational component of SDG&E's Wildfire Mitigation Plan and informs SDG&E's daily operating conditions and maintenance practices of the electric system 365 days a year.

D. New Areas of Data Collection

Report Requirement: Suggest new areas of data collection that could assist in assessing WMP effectiveness and align utility data collection efforts.

As discussed in Section A above, SDG&E collects and maintains robust data on its electric systems. Data from these sources, in concert with subject matter expertise, has been used to develop and refine SDG&E's various wildfire mitigation activities and programs. Over the past decade, SDG&E has hardened a significant number of its facilities to address the risk of wildfire in its service territory and developed and implemented programs to enhance situational awareness, which increases SDG&E's ability to monitor and understand the wildfire environment.

With the increasing impacts from climate changes, community growth, and other societal forces, SDG&E's wildfire risk mitigation strategy will continue to evolve. SDG&E considers other areas of data collection that may assist in refining, developing, and implementing wildfire mitigation activities and programs. To that end, SDG&E has identified the following potential new areas for data collection.

[5] These fuses are equipment that have not been previously granted an exemption from CAL FIRE.

1. Vegetation Risk Profile

SDG&E has begun the process integrate more data science into its vegetation management plan to develop a more analytical approach to mitigating fire risk associated with tree and powerline conflicts. SDG&E will create Vegetation Risk profiles of circuits by leveraging machine learning and artificial intelligence to integrate and correlate vegetation and meteorological datasets to gain additional insights on how atmospheric conditions impact growth rate of certain species. These analyses will also further the identification of certain high-risk vegetation areas (SDG&E WMP Section 4.4.4) where the presence of trees may pose a threat to electrical infrastructure. The Vegetation Risk profile will include specific location and height of inventory trees relative to electrical infrastructure, fuels, outage history, and weather data. The risk profile will be used to inform where tree trimming and removal activities may be most beneficial to mitigate fire potential.

2. Ignition Management Program

SDG&E believes it would be useful to track data related to "near ignitions" in addition to actual ignitions.[6] As described in its WMP (at Section 4.1.4.5), SDG&E has begun collecting information on ignitions and near-ignitions beyond that collected pursuant to D.14-02-015. The type of data that SDG&E will collect for this dataset is generic date, time, location, outage details. In addition, SDG&E has developed a new "Heat Information" form, which will collect information regarding whether evidence of heat was observed, as well as a description of it; a rough sense of cause as identified in a pick list (Vegetation Contact, Electric Facility, Contact by Object, Other/Undetermined); Structure ID, Facility type and voltage class. Most of this information will be recorded by Electric Trouble Shooters though there will also be other persons inputting data, and SDG&E's forensic fire coordinator will manage the program.

E. Proposed Schedule for Collecting and Using Data

Report Requirement: Propose schedule for collecting and using the data for future wildfire mitigation efforts.

SDG&E fully supports the Commission's desire to collect and use data for future wildfire mitigation efforts. Before a schedule can be developed, SDG&E believes it would be a more efficient and effective use of the Commission's and stakeholders' time to discuss and determine the data requirements, new sources of data, and potential uses first. The workshops tentatively scheduled in September 2019 in Phase 2 of R.18-10-007 would be the best opportunity to obtain input to formulate a schedule.

[6] SDG&E defines "near-ignitions" as events that manifest in charring, melting, heavy smoke deposits, and/or visible evidence of arching that could indicate enough heat was present, which could have led to an ignition.

F. Availability of Data to Third Party Researchers

Report Requirement: Propose a manner of making the data available to third party researchers for the purposes of improving wildfire mitigation. Before making this filing, the electrical corporations shall consult experts in data analysis, including, if relevant, presenters at the Wildfire Technology Innovation Summit co-sponsored by this Commission on March 20-21, 2019, to ensure they gather the data in a manner that allows assessment, including using common data gathering methods across all respondent electrical corporations. This Report shall include the results of this consultation.

SDG&E has and continues to work with the University of California San Diego (UCSD) and their WIFIRE program, serving as an advisor on the project from its inception and using this tool as a manner of making SDG&E weather data available to third party stakeholders for the purposes of improving wildfire mitigation. The WIFIRE tool was highlighted at the Wildfire Technology Innovation Summit co-sponsored by the CPUC on March 20-21, 2019. SDG&E believes that the WIFIRE program has the experience and expertise to expand and serve as a platform to further make data available to third party researchers for the purposes of improving wildfire mitigation. Following recent consultation with UCSD and the WIFIRE team, SDG&E will continue its partnership, making weather and fire potential data available to third party researchers through the WIFIRE platform for the purposes of improving wildfire mitigation.

The WIFIRE Lab, which was born out of a National Science Foundation (NSF)-funded project, develops integrated systems for natural hazards monitoring, simulation, and response. This is done by building knowledge cyberinfrastructures: the end-to-end management layer from the data collection to modeling efforts to data driven knowledge.

To meet the growing needs in hazards monitoring and response, the WIFIRE Lab aims to be an all hazards knowledge cyberinfrastructure, becoming a management layer from the data collection to modeling efforts. WIFIRE has the only integrated infrastructure that can provide this capability right now and it can be a neutral data resource/partner to any proposed activity. Value can be added to the raw data through reconfiguration of the formats, making it the best data in real-time for any monitoring and modeling effort for research and operational use.

The WIFIRE Lab in this capacity has a consortium of UCSD organizations and a number of partnerships including SDG&E, the university collaborators, industry partners, fire departments, utilities, the California Governor's Office of Emergency Services (CalOES) and the CPUC.

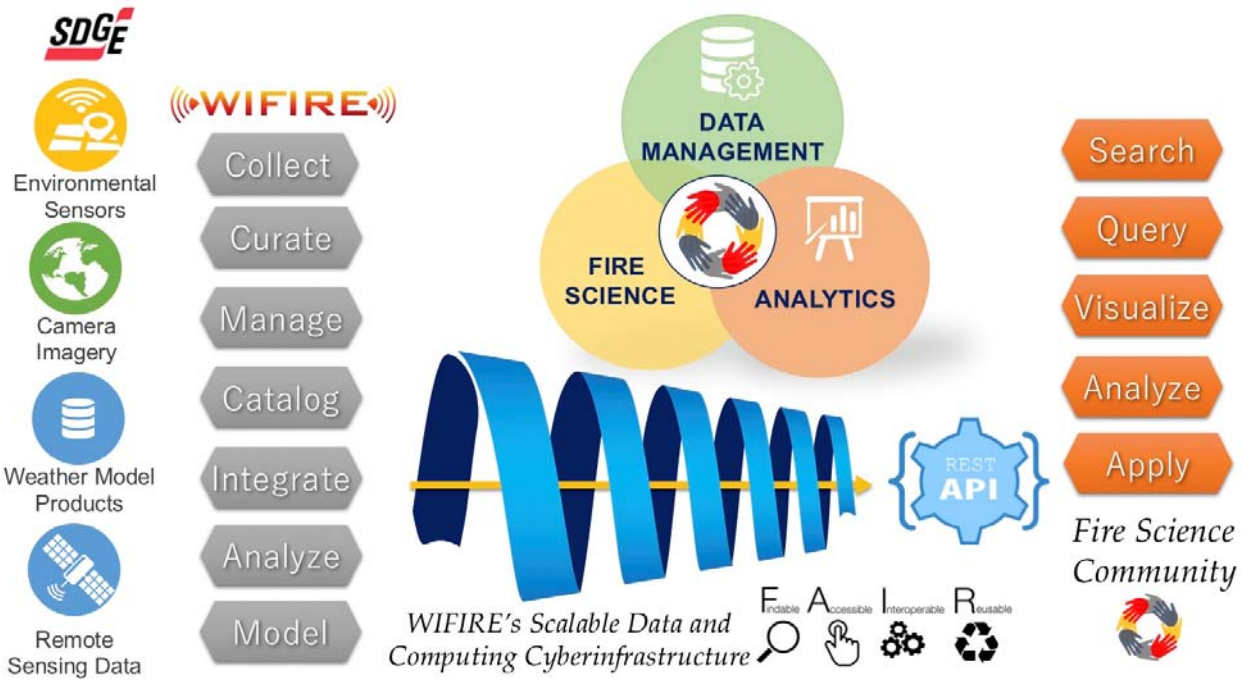
SDG&E has interacted with WIFIRE in potentially making its data available for wildfire research community via sharing through WIFIRE's data middleware infrastructure. These datasets include weather forecast model data, weather station measurements, vegetation databases, fuel moisture, airplane data over fires, camera and LIDAR imagery, and related environmental data collected within SDG&E's region.

The WIFIRE data sharing not only enables making SDG&E's datasets findable and accessible, but also makes the data interoperable and reusable in the context of open research questions.

Through such data sharing, SDG&E's data will be searchable via time range or geolocation and tagged metadata to make easy to find. WIFIRE also provides full data provenance available so researchers know how data was generated. Importantly, the licensing requirements and reuse policies for data can be satisfied within WIFIRE in alignment with "responsible" data practices.

WIFIRE is also well-positioned to add value to SDG&E's datasets for research communities so more value can be generated and captured from these datasets. Some examples of such value augmentation include the following:

- Data products derived from raw sensor data to help with further analysis
  - Correlation matrix showing correlation between different sensor measurements
  - Sensor measurement vectors at reduced dimensionality (e.g., from PCA)
  - Sensor measurements with uncertainty factors (based on instrument errors, measurement errors, etc.)
  - Sensor measurement vectors with missing data filled in
- Analytics products
  - Classifying land cover types from imagery
  - Identifying when and where Santa Ana conditions are occurring
  - Forecasting Santa Ana conditions based on weather & environment factors
  - Predicting burnability of a region
  - Real-time damage assessment based on imagery



Conclusion

SDG&E looks forward to workshops with Commission staff and interested parties in this proceeding.

Data Field	Definition
Year	Year in which the outage was initiated
Occurrence	Date and time in which the outage was initiated
Record Number	Unique record number within Reliability database. Each outage ID is broken out by unique circuit impacted. Each circuit within an outage ID is assigned a unique record number.
Outage ID	The identification number for the outage; comprised of YYMMDD + "E" for Electric + NMS switch plan number.
District Code	The abbreviated district in which the outage occurred
Substation Name	The substation feeding the circuit(s) that was/were de-energized during the outage
Circuit	Unique circuit ID the outage occurred on
Outage Type	Outage type refers to the ultimate isolating device jurisdiction. TR-Transmission; ST-Substaiton Transmission; SD-Substation Distribution; DI-Distribuition
Device	Circuit isolating device; A-Circuit Breaker; B-Fuse; C-Switch; D-Other
OH / UG	The infrastructure type that the fault occurred on; OH-Overhead, UG-Underground
Cause	The 3-digit code indicating the cause of the outage
Cause Description	The description of the code selected under "cause"
Secondary Cause	Secondary cause is a 3-digit code for either the infrastructure affected, a secondary cause to the outage, or a more detailed sub-category of the primary cause code
Cause_Description	The description of the code selected under "secondary cause"
FirstRestorationTime	The first time any number of customers were restored
Isolating Device	The device ID that operated to de-energize customers
DamagedDevice	The device type that failed or saw damage that initiated the outage
FromFacility	The structure location for the damaged device
ToFacility	If a damaged device is located between structures, this field is used to identify the mid-span location
Restoration Duration	The total time to restore all customers from the first customer out
Sustained Customer Impact	The total unique customers that saw a sustained outage
Momentary Customer Impact	The total unique customers that saw a momentary (5 minutes or less) outage
TmedFlag	If all outages on a certain date exceed a statistical limit called Major Event Day (MED), this flag is set against outages associated with that day and typically excluded from certain types of reports.
System SAIDI	The annual System Average Interruption Duration Index (SAIDI) impact for this outage Record
System SAIFI	The annual System Average Interruption Frequency Index (SAIFI) impact for this outage Record

Appendix B - Transmission Outage Data Dictionary

Type	Outage type - Tieline (TL), Circuit Breaker (BRKR), Bus, Transformer (XFMR)
Id	Element ID
Terminal1	Substation name of terminal 1
Terminal2	Substation name of terminal 2
Terminal3	Substation name of terminal 3
Terminal4	Substation name of terminal 4
Terminal5	Substation name of terminal 5
Terminal(s)	Substation name of other terminals
kV	Voltage Class in kV
Outage Date/Time	Beginning of outage
Restoration Date/Time	Time element restored
Load Restoration Date/Time	Time load restored (if applicable)
Cause1	Primary cause code
Cause2	Secondary cause code
Field Notes	decription of outage cause
Iso	
Outage Class	Forced (F)
Component Type Affected	Number associated with component type (conductor, pole, etc)

CPUC Running Master Dictionary	
Utility Name	Name of IOU reporting the fire.
Fire Start:	
Date	Date the fire started (MM/DD/YY)
Time	Time the fire started or an estimate if exact start time is not available. Use military time when inputting data.
Location:	
Latitude	Enter this data as close to the origin point of the fire. Latitude should be at least given to the thousandths decimal place ((i.e. X.00). More accuracy should be used when available.
Longitude	Enter this data as close to the origin point of the fire. Latitude should be at least given to the thousandths decimal place ((i.e. X.00). More accuracy should be used when available.
Material at Origin	Material involved in the initial fueling of the fire. **(Building, Vegetation, or Other)**
Land Use at Origin	Nature of land use in the vicinity of the point of the fire's origin **(Urban or Rural)**. Rural and Urban are defined in GO 165.
Fire:	
Size	An approximation of the fire's size given in acres. If only a structure was involved in the fire select structure only. (**Less than .25 Acres, .26-9.99 Acres, 10-99 Acres, 100-299 Acres, 300-999 Acres, 1000-4999 Acres, Greater than 5000 Acres, Less than three (3) meters of linear travel, Structure Only).**
Suppressed by	Who suppressed the fire? **(Customer, Fire Agency, Self Extinguished, Utility or Unknown).**
Suppresing Agency	If the fire was suppressed by a fire agency or agencies. List the lead agency when one or more agencies are involved.
Utility Facility:	
Facility Identification	IOU's description of the pole/tower or equipment involved.
Other Companies	Other Companies that were attached to pole in question and known to the utility. If the facilities involved were not overhead leave this field blank.
Voltage (Volts)	Nominal voltage rating of the utility equipment and/or circuit involved in the fire. If two or more voltages were involved list the higher voltage.
Equipment Involved With Ignition	List the equipment that supplied the heat that ignited the reported fire. **(Capicator Bank, Conductor, Fuse, Lightning Arrestor, Other, Switch, Transformer)**.
Type	The equipment involved in the event. **(Overhead, Pad Mounted or Subsurface)**.
Outage	
Was There an Outage	Was there an outage involved in the fire? **(Y/N)**. Exclude outages that were ordered by a governmental agency or were taken by the utility at it's discretion.
Date	List the first outage associated with the fire if multiple outages were involved. Exclude outages that were ordered by a governmental agency or were taken by the utility at it's discretion.
Time	List the start time of the first outage associated with this fire.
Suspected Cause	
Suspected Initating Event	List the suspected cause of the ignition. **(Contact Between Third Party Facility on Pole and Supply Lines, Contact From Object, Contamination, Equipment/Facility Failure, Normal Operation, Other, Unknown, Vandalism/Theft, Wire-Wire Contact)**.
Equpment/Facility Failure	The specific equipment that malfunctioned that resulted in the "Equipment Involved" to cause the reported fire. (Only to be used if "Equipment/Facility Failure" is selected as Suspected Ignition Cause). **(Capacitor Bank, Conductor, Fuse, Insulator, Lightning Arrestor, Pole, Guy/Span Wire, Other, Protective Relay, Crossarm, Recloser, Sectionalizer, Splice/Clamp/Connector, Switch, Transformer, Voltage Regulator)**.
Contact From Object	The first object that contacted the Communication or Electric Facilities (Only to be used if "Contact from Object" is selected as Ignition Cause). **(Animals, Balloons, Other, Vegetation, Vehicle)**.
Facililty Contacted	The first facility that was contacted by an outside object (Only to be used if "Contact from Object" is selected as Ignition Cause). **(Communication Facility, Electric Facility, Pole)**.
Contributing Factor	Factors that contributed to the ignition. **(Human Error, None, Other, Outside Force, Unknown, Weather)**.

Data Field	Definition
Outage ID	Unique identifier for the outage the wire down event occurred in that is comprised of the date and switch plan number.
OutageOccurance	Date of the associated outage and/or wire down event.
District	Identified District associated with the outage and/or wire down event.
CircuitVoltage	The nominal voltage of the circuit.
FromDevice	The upstream structure (pole) number.
ToDevice	The downstream structure (pole) number.
FeederID	The Circuit / Feeder ID number for the identified span.
HFTD	Identifier to determine if the structure is within Tier 3 or Tier 2 of the High Fire Threat District. A null in this field means it is outside the HFTD.
GISMaterial	The conductor material as defined in the current GIS data, such as copper or aluminum.
GISType	The conductor type as defined in the from GIS data, such as bare stranded or ACSR.
GISLength	The estimated conductor length in feet as from GIS data.
FailedEquipmentDescription	The equipment involved in the cause of the wire down other than the conductor.
ExternalForceDescription	The force that was responsible for causing the wire down.

SAP-PM for Electric Distribution CMP

Field	Description
Created On	Date on Which Record Was Created
Notification	Number that identifies the notification.
Order	Number which identifies an order within a client.
Notif.date	Date at which the notification was created.
Notifictn type	Key that enables notifications to be differentiated and grouped according to notification category, notification origin and other criteria.
Reference date	Date at which the equipment location and account assignment data are read and stored in the maintenance history upon completion of the PM notification. The PM notifications are sorted in the history according to this date and the reference time, which together form the reference time.
Req. start	Date at which processing of the notification is to start.
Required End	Date on which the processing of the notification is to be completed.
Equipment	Number by which a piece of equipment can be clearly identified.
Cost Center	Key uniquely identifying a cost center.
Functional Loc.	The label is used to identify a functional location from a user's point of view.
Street	Street name as part of the address.
Coding code txt	Describes the catalog code.
Description of Technical Object	Description of a technical object in the form of a short text.
Description	Short description of the contents of a notification.
User status	This shows which user status the request is in.
System status	The system status line shows which status are currently set for the request being processed.
Coding	Key from the assigned catalog that is used to code the notification.
External Order Num.	Field used for user to key in free form text for notes purposes (10 character limit)
Test Equipment ID No	Field used for user to key in free form text for notes purposes (10 character limit)
Reported by	Name of the person who reported the notification
Description	Description of the functional location in the form of a short text
Changed by	Name of person who changed object
Changed On	Date of Last Change

Appendix F – Weather Data Dictionary

Weather Network Dictionary	
Available Parameters:	
Date/Time	Date and time of observation in MM/DD/YYYY HH:MM format
Weather Station Name	Name of weather station
Station ID	Three-letter code used for identification of weather station
Latitude	Latitude of weather station
Longitude	Longitude of weather station
Elevation	Elevation of weather station location in feet above sea level
Wind Speed	Average of all three-second wind observations recorded within a 10-minute increment, reported in miles per hour
Wind Gust	Maximum three-second wind observation recorded within a 10-minute increment, reported in miles per hour
Wind Direction	Average direction of all three-second wind observations recorded within a 10-minute increment, reported in degrees
Wind Cardinal Direction	Average direction of all three-second wind observations recorded within a 10-minute increment, reported in one of 16 cardinal directions
Temperature	Air temperature, reported in degrees Fahrenheit
Relative Humidity	Relative humidity measurement, reported in percentage
Dew Point Temperature	Dew point temperature, derived from temperature and relative humidity, reported in degrees Fahrenheit

Weather Research and Forecasting Climatology Dictionary	
Available Parameters:	
Time	Local standard time in YYMMDDHH format
T2	Temperatures at a height of 2 meters above ground level, reported in degrees Kelvin
Q2	Mixing ratio at a height of 2 meters above ground level, reported in kg kg^{-1}
PSFC	Surface pressure, reported in Pascals
U10	U component of the wind at a height of 10 meters, reported in meters per second
V10	V component of the wind at a height of 10 meters, reported in meters per second
ALBEDO	Surface albedo, unitless
CANWAT	Canopy water, reported in kilogram per square meter
EMISS	Surface emissivity, unitless
GLW	Downward longwave flux at the ground surface, reported in watts per square meter
GRDFLX	Ground heat flux, reported in watts per square meter
HFX	Upward heat flux at the surface, reported in watts per square meter
LH	Latent heat flux at the surface, reported in watts per square meter
OLR	Top of atmosphere outgoing longwave radiation, reported in watts per square meter
PBLH	Height of the planetary boundary layer, reported in meters
PREC_ACC_NC	Accumulated grid scale precipitation over defined periods of time, reported in millimeters
QFX	Upward moisture flux at the surface, reported in kilograms per square meter per second
SFCEVP	Accumulated surface evaporation, reported in kilograms per square meter
SH20	Soil liquid water, reported in cubed meter per cubed meter
SMOIS	Soil moisture, reported in cubed meter per cubed meter
SMSTAV	Moisture availability, unitless
SNOWH	Physical snow depth, reported in meters
SNOW_ACC_NC	Accumulated snow water equivalent over a defined period of time, reported in millimeters
SST	Sea surface temperature, reported in degrees Kelvin
SWDOWN	Downward shortwave flux at the ground surface, reported in watts per square meter
TSK	Surface skin temperature, reported in degrees Kelvin
TSLB	Soil temperature, reported in degrees Kelvin
UST	u* (shear velocity) in Monin-Obukhov Similarity Theory, reported in meters per second
VEGFRA	Vegetation fraction, unitless
ZNT	Time-varying roughness length, reported in meters

Fire Potential Index Dictionary	
Available Parameters:	
Date	Date of Fire Potential Index calculation in MM/DD/YYYY format
ME	Daily forecast FPI number for Mountain Empire district
RA	Daily forecast FPI number for Ramona district
EA	Daily forecast FPI number for Eastern district
NE	Daily forecast FPI number for Northeast district
OC	Daily forecast FPI number for Orange County district
NC	Daily forecast FPI number for North Coast district
BC	Daily forecast FPI number for Beach Cities district
CM	Daily forecast FPI number for Metro district
MAX	Daily max forecast FPI number across all districts

Data Field	Definition
Outage Date/Time	Date and time outage began
Investigation Date	Date the SDG&E Forester conducted field investigation
Outage ID	Unique alpha-numeric identificaiton number assigned to Veg Mgmt inventory tree
Circuit	SDG&E electric circuit number where the outage occurred
VMA	Vegetation Management Area where the outage occurred. SDG&E Veg Mgmt breaks its service terriritory into 133 geographical VMAs to conduct its operations on an annual schedule
Property Location	Physical address of location of outage tree and customer information
Species	Tree species that caused the outage
Growth Rate	Generalized growth rate of the tree that caused the outage
Height	Height of the tree that caused the outage
DBH	Diameter in inches at breast height of the tree that caused the outage
HFTD	Designates whether the tree is located within the High Fire Threat District
Pre-Outage Clearance	Estimated clearance of the tree prior to the outage
Pre-Outage Compliance	Designates whether the outage tree was compliant with the applicable minimum clearance requirement prior to the outage
Outage Code Category	Short text cause of the outage as initially recorded by Electric Reliability
Outage Cause Code	3-digit code associated with the short text cause of the outage as initially recorded by Electric Reliability
Forester Cause Category	Short text cause of the outage as determined by the Forester's field investigation
Forester Cause Category	3-digit code associated with the short text cause of the outage as determined by the Forester's field investigation
Possible Outage Cause	Generalized category of outage cause
Responsible Party	Generalized category of party responsble for outage
Responsible Contractor	Specific contractor name responsbible for outage
Start Pole - End Pole	Pole numbers identifying the span where the outage tree is located
Outatge Base Line Dist	The horizontal distance in feet from the trunk of the outage tree to the conductor
Tree Unhealthy?	Forester determination of whether the outage tree was healthy
Fire Associated?	Was there a fire as a result of the outage
Outage Avoidable	Is it reasonable to infer that the outage could have been avoided by action taken by Veg Mgmt
Outage Facility Type	What type of facilities were impacted by the outage (distribution / transmission)
Outage Tree Defect	Were there observable defects in the outage tree
Outage Cause Comments	Forester's field investigation details
Resident Comments	Comments from any witness or others who experienced the outage
Recommendations	Forester recommendations and follow-up action to be taken by Veg Mgmt to avoid a future outage