**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 19, 2018**

The following questions relate to SDG&E-14, distribution capital. "Workpapers" relate to the relevant workpapers for this Chapter, "SDG&E-14-CWP AColton."

1. Please provide all electronic workpapers that support SDG&E-14 in Excel with working cells/formulas.

**Utility Response 01:**

Active Excel spreadsheets for that data do not exist. Most workpaper exhibits do not exist as Excel documents with working formulae. Workpapers and tables that appear in testimony are not created from, nor do they originate as Excel spreadsheets, these are produced from a GRID database system consisting of many data tables that are dynamically linked to permit grouping of cost centers and budgets, editing of historical values, selection of a forecast methodology, adjustments to forecasts and the production of workpapers. The use of a database for this purpose does not involve spreadsheets, the workpapers are formatted 'reports' from that collection of tables and linking relationships that form the database. Data extracts of this type contain only data values, the extract is not capable of producing 'working formulas'.

A report showing the five years of adjusted-recorded historical spend and the three years of forecasts has been created and accompanies this response. This information is obtained as a specifically-created database extract for O&M and many capital budgets, and is provided in tabular format as an Excel spreadsheet, although as previously discussed as a report it consists of values and contains no formulae.

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2. Please provide all electronic workpapers that supported this chapter (electric distribution capital) from the TY 2016 and TY 2013 GRCs.

**Utility Response 02:**

The workpapers for TY2016 can be found at https://www.sdge.com/regulatory-filing/12931/sdge-grc-testimony-exhibit-list. SDG&E presumes the question intends to cite the TY2012 GRC, as SDG&E does not have a TY 2013 GRC. Please see the accompanying files 'Exhibit SDG&E-06R A-Marcher_SDGE_Testiony_(ED_Capital) b.pdf' and 'Exh SDG&E-06-CWP-R Marcher_ZZ.pdf' for the 2012 GRC corresponding testimony.

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3. Please reproduce Appendix B (pp. AFC-B-1 to AFC-B-6) in Excel with working cells/formulas and include annual historical costs for each line item from 2007 to 2016. Please also provide actual recorded 2017 costs in the same format as soon as they are available.

**Utility Response 03:**

Please find Appendix B (pp. AFC-B-1 to AFC-B-6) in Excel format are provided in the accompanying file "TURN_DR-03 TURN-003-Excel.xlsx" these tables are extracts from the forecasting database and do not include formulae. The annual historical values from 2012 to 2016 applicable to the filing costs are found in work papers. The actual recorded 2017 values are not yet available.

4. Please reproduce Table AFC-4 (p. AFC-16) in Excel with working cells and provide annual historical costs in constant dollars from 2007 through 2016.

**Utility Response 04:**

Table AFC-4 (p. AFC-16) in Excel format is provided in the accompanying file "TURN_DR-03 TURN-003-Excel.xlsx." The annual historical costs from 2012 through 2016 is provided in workpapers submitted as part or the application.

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5. If not included in previous responses, please provide total electric distribution capital expenses in constant 2016 and nominal dollars from 2007 to 2017.

**Utility Response 05:**

The electric distribution capital expenses in constant 2016 and nominal dollars from 2012 to 2016 are provided in the accompanying file "TURN_DR-03 - ED capital expenses.xlsx"

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6. Please provide the amount authorized in the prior 3 GRCs by year for each of the categories listed in Table AFC-4 on page AFC-16. If categories have changed, please provide a reconciliation showing the accounting changes.

**Utility Response 06:**

Authorized amounts in the prior 3 GRCs by year for each of the categories listed is provided in the accompanying file "TURN-SEU-DR-003 Q6.xlsx."

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7. Please provide the measured annual peak load on SDG&E's system from 2010-2016, including the total MW, date and time.

**Utility Response 07:**

The measured annual peak load on SDG&E's system from 2010-2016 is shown below.

| Date and Time | Load (MW) |
|---|---|
| 9/27/10 15:32 | 4687 |
| 9/7/11 13:59 | 4371 |
| 9/14/12 16:30 | 4600 |
| 8/30/13 16:00 | 4604 |
| 9/16/14 15:52 | 4890 |
| 9/9/15 15:43 | 4711 |
| 9/26/16 17:52 | 4343 |

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8. Please provide all benefit-cost analyses conducted for this chapter with supporting documents and workpapers.

**Utility Response 08:**

In the derivation of the cost estimates for Electric Distribution Capital, SDG&E does not rely on cost/benefit analyses but rather on the estimated costs to meet compliance criteria to regulatory orders, environmental requirements, industry best practices and its own construction standards.

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9. Page AFC-3, lines 18-19, state "Roughly 75% of the forecasts for Electric Distribution Capital are zero-based and 25% are based on averages (predominantly a five-year average). Since a large portion of the capital electric distribution projects are specific projects that are non-recurring in nature, zero-based cost estimates or forecasts were used."

   a. Please explain how the 75% statistic was calculated. For instance, is this a percentage of total costs or number of projects? Please provide supporting calculations for this statistic.

   b. Please provide an explanation for "non-recurring in nature." For example, is this new utility work that has never been previously performed, a type of project that has never been done by the utility, or something else? Please explain.

**Utility Response 09:**

a. The 75% statistic is a percentage of the number of projects within the Electric Distribution Capital testimony. The calculation is as follows; total count of zero-based budgets divided by the total count of all numbered projects.

b. "Non-recurring in nature" applies to projects that are new in scope or description, or are otherwise non-routine or non-cyclical within a year.

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10. Regarding distribution capital workpapers, SDG&E-14-CWP, p. 453, please provide the units of work for each year 2012-2016 conducted for this category, segregated as appropriate. At a minimum provide the number of miles of cable replaced by cable type.

**Utility Response 10:**

Please see accompanying Excel file, "Turn-SEU-003-Underground Cable Failures – 2010 to 2016.xlsx"

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11. Regarding the Ocean Ranch-Rancho Del Oro substation project described on pp. AFC-23-24 in testimony and pp. 29-34 of the workpapers, please provide the following:

    a. Has SDG&E requested funding for this project in previous rate cases? Please list all the TY GRCs where funding was requested and the amount requested in each year. Please explain why the project was deferred from these test years.

    b. SDG&E states it "develops detailed cost estimates, based on current construction labor rates, material costs, overhead rates, contract pricing/quotes, and other project specific details" (p. AFC-24, lines 15-17).

        i. Was any of this information (labor rates, material costs, etc.) provided in the testimony or workpapers? If yes, please identify the location.

        ii. If no, please provide this information for each year of forecasted costs by line item according to this description or something more granular (materials, overhead, etc.).

    c. Please explain and provide evidence of the "capacity deficiency for the area" the project is meant to solve (p. AFC-24, line 7). This should include current capacity of the area, historical peak load growth (annual), and a projection of future growth, and an explanation of how the load growth projections were created.

    d. Regarding page 30 of the workpapers, please explain why the year 2013 includes negative costs and what this means.

    e. Please explain what "NSE" means in the workpapers, and provide a definition.

    f. Regarding page 30 of the workpapers, please provide historical costs from 2007 to 2016.

**Utility Response 11:**

a. No.
b. i. No
   ii. See below for a cost breakdown

2017

| Description | Unit (FT, HR, EA) | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Internal Labor | HR | 1,218 | $67 |
| Environmental, licensing and other misc charges | various | various | $103 |
| **Total** | | | $170 |

2018

| Description | Unit (FT, HR, EA) | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Internal Labor | HR | 9,309 | $512 |
| Trench Conduit 8-5 Including Handholes | FT | 3070 | $437 |
| Manhole | EA | 2 | $149 |
| 69/12kV Transformer (downpayment) | EA | 2 | $727 |
| Environmental, licensing and other misc charges | various | various | $2,034 |
| **Total** | | | $3,859 |

2019

| Description | Unit (FT, HR, EA) | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Internal Labor | HR | 3,527 | $194 |
| Trench Conduit 8-5 Including Handholes | FT | 4030 | $573 |
| Manhole | EA | 2 | $149 |
| Cable & Connections: 1000 kxmil AL | FT | 13500 | $379 |
| Cable & Connections: 1000 kxmil CU | FT | 2100 | $176 |
| Trench Conduit 4-5 Including Handholes | FT | 2300 | $246 |
| Retag/Cutover | EA | 6 | $3 |
| Trench Conduit 2-5 Including Handholes | FT | 1650 | $133 |
| 12kV Capacitor Padmount SCADA 12kVAR | EA | 4 | $135 |
| Trayer 4-Way w/ SCADA Padmount Switch | EA | 4 | $364 |
| 69/12kV Transformer (delivery charge and assembly) | EA | 2 | $2,539 |
| 1/4 section 12kV Metalclad Switchgear and Assembly | EA | 2 | $3,053 |
| 12kV Capacitor Bank | EA | 2 | $766 |
| Kerite Cable | EA | 1 | $474 |
| Below Grade | EA | 1 | $1,158 |
| Relay panels testing and commission | EA | 4 | $986 |
| Environmental, licensing and other misc charges | various | various | $3,228 |
| **Total** | | | $14,558 |

c. Please refer to the Proponent's Environmental Assessment (PEA) for Ocean Ranch Substation detailing the capacity deficiency outlined in section 2.0. The link to the PEA is

http://www.cpuc.ca.gov/environment/info/aspen/oceanranch/pea/ocean_ranch_pea.pdf

Additionally, the load growth is developed from new or existing customer's request for new load additions as well as comparing with the system growth.

d. The negative value shown in workpapers at page 30 for year 2013 represents a reassignment of costs for the land purchase of the Ocean Ranch substation into an Electric Transmission FERC-jurisdiction account and thus to remove it from the historical CPUC/GRC costs.

e. NSE' stands for Non-Standard Escalation, and is used in situations where forecasted costs are not expected to experience escalation at a standardized rate. (For estimates of escalation please see Exhibit SDG&E-39, Scott Wilder).

   Typical items that would be classified for non-standard escalation would be services or materials that have discrete escalation treatment, such as items under contract with defined future costs at specific times, which should not be further escalated as they are fixed and known. Certain materials or scarce supply items may also escalate differently than the standard escalation estimates.

f. Please reference page 30 of the workpapers which provides historical costs from 2012-2016. SDG&E objects to providing historical costs prior to 2012 as unduly burdensome and not reasonably tailored to lead to the discovery of admissible evidence.

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12. Please provide a list (in Excel format) of all circuits in SDG&E's territory with the following information in separate columns, based on 2016 data:

    i. All relevant circuit identification (circuit name, ID number, substation, etc.). Circuit voltage level. Whether circuit is OH or UG. Circuit installation date.

    ii. Peak load and peak load hour in 2016.

    iii. Minimum load and minimum load hour. Minimum load at hour ending 1200.

    iv. Circuit capacity (kW/MW).

    v. Circuit SAIDI in 2016.

    vi. Number of customers, segregated by residential, C&I, agricultural.

    vii. Amount of interconnected DG capacity, segregated by residential NEM, commercial NEM, wholesale solar PV, wholesale non-PV DG.

    viii. The percentage that solar PV represents of the circuit annual peak.

    ix. The percentage that solar PV represents of circuit minimum load.

**Utility Response 12:**

The overhead cost information highlighted in yellow in "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx," referenced below, is Confidential Pursuant to P.U. Code Section 583 & General Order 66-C/D and D.16-08-024.

i. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column A through E.

ii. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column F through G.

iii. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column H through J.

iv. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column K. With multiple variables required to calculate kW/MW for a 3-phase system, the capacity was provided in amps instead as this unit of measurement is our standard unit when describing a 12kV circuit capacity.

v. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column L.

vi. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column M through O.

**Utility Response 12 Continued:**

vii. SDG&E currently does not have a method to provide the available amount of interconnected DG capacity, segregated by residential NEM, commercial NEM, wholesale solar PV, wholesale non-PV DG.

viii. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column P.

ix. Please refer to attachment "TURN-SEU-003-SDGE 12kV circuits data CONFIDENTIAL.xlsx", column Q.

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13. Regarding the Distribution System Capacity Improvement project discussed on page AFC-31 of testimony and the Advanced Energy Storage Project:

a. Identify each circuit that is expected to be ">95% loaded" (p. AFC-31, line 18) from 2017-2019 respectively. Please also provide a definition of" >95% loaded."

b. Please provide the number of circuits that were upgraded in 2012-2016.

c. Regarding page 97 of the workpapers, please provide a more detailed accounting of the costs incurred in each year from 2012-2016. This should include the projects and materials that were installed.

**Utility Response 13:**

a. Below are circuits expected to be >95% loaded from 2017-2019 respectively.

**Circuits forecast to be >95% loaded**

| 2017 | | 2018 | | 2019 | |
|---|---|---|---|---|---|
| Circuit | % Loading | Circuit | % Loading | Circuit | % Loading |
| 192 | 98% | 192 | 99% | 91 | 96% |
| 209 | 102% | 209 | 103% | 192 | 100% |
| 298 | 102% | 394 | 96% | 209 | 103% |
| 394 | 96% | 486 | 98% | 394 | 96% |
| 486 | 97% | 506 | 122% | 457 | 96% |
| 506 | 121% | 509 | 103% | 770 | 97% |
| 509 | 103% | 730 | 96% | 783 | 105% |
| 730 | 96% | 770 | 98% | 832 | 97% |
| 770 | 98% | 783 | 105% | | |
| 783 | 114% | | | | |
| 852 | 101% | | | | |
| 959 | 96% | | | | |
| 961 | 117% | | | | |

The ">95% loaded" is defined as the distribution circuit's forecasted load is greater than 95% of the circuit's rated ampacity when the circuit is in a normal configuration.

b. Roughly 120 circuits were upgraded from 2012 to 2016.

c. SDG&E objects to this request on the grounds that the burden of this request clearly outweigh the likelihood that the information sought will lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SDG&E responds as follows. There are roughly 250 separate charges to the blanket Distribution System Capacity Improvement budget and they range from projects to cutover load, swapping of circuits to reduce transformer loading, reconductoring the circuit to increase capacity, extending circuit and etc. Of these projects, the material ranged from installing or replacing cable and/or conductor, installing or replacing switches, installing antenna poles, installing distribution conduit, installing new or replace distribution poles and etc. Data that correlates each project with the installed materials is not readily available, and would be burdensome to create.

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14. Regarding electric meters and regulators (p. AFC-54):

a. Please explain why this is a "zero-based" forecast considering electric meters and regulators have been installed by SDG&E for decades.

b. Page 251 of the relevant workpapers show a negative "non-labor" cost in 2016. Please explain why this is negative and what this means.

c. Please explain why there are no labor costs shown on page 251 of the workpapers in 2016-2019.

d. Regarding page 253 of the workpapers, please provide how many meters and regulators (separately) were installed annually from 2012-2016.

e. Regarding page 253 of the workpapers please separately break out electric meters and regulators for each year (historical 2012-2016 and forecast 2017-2019 if applicable).

f. Page 255 of the workpapers show 2017-2019 forecasted costs. Please explain how these estimates were derived and provide a more detailed accounting, including all materials used to derive the estimates.

**Utility Response 14:**

a. Material that is purchased to the electric meter and regulator budget is capitalized at the time of purchase. Electric meters are used primarily for new business and CMP work. Historical data, new business forecast, compliance change out forecasts and projected manufacturer price increase/decreases all contribute to establishing a zero-base forecast in preference to other methods.

b. In 2016, SDG&E used 2015 data as a proxy for expected 2016 data, which was not available at the time the initial forecast was developed. In order to accurately represent the expected 2016 value, SDG&E entered an adjustment against the proxy 2015 data. The adjustment should have been deleted once the actual 2016 data was used but was not, resulting in the negative number shown. Given that the forecast is zero-based and not dependent solely on historical data this has little impact on the forecast. The correct recorded value without the adjustments for 2016 was $2,370,851.

c. There are no labor charges associated with the purchase of electric meters for the capital budget, as this budget only pertains to purchasing the equipment.

d. See below for the amount of meters and regulators installed from 2012-2016.

e.

| Year | Meter Count | Regulator Count |
|---|---|---|
| **2012** | 39985 | 24 |
| **2013** | 28122 | 28 |
| **2014** | 19338 | 15 |
| **2015** | 20380 | 17 |
| **2016** | 17854 | 40 |

f. The historical counts for meters and regulators procured are shown below. SDG&E does not forecast values. Factors such as historical data, new business forecast, compliance change out forecasts and projected manufacturer price increase/decreases all contribute to establishing a zero-base forecast in preference to other methods. See response to a and e for further detail.

| Year | No. of Meters Purchased | No. of Regulators Purchased |
|---|---|---|
| 2012 | 31,004 | 42 |
| 2013 | 8,142 | 30 |
| 2014 | 8,666 | 30 |
| 2015 | 19,904 | 48 |
| 2016 | 7,609 | 44 |

Historical data including average monthly usage by material is one contribution to developing the forecast. The other contributors to develop the forecast is by new business material usage which are applied to the residential and commercial material cost by group and the potential manufacturer price increase. These data points (historical, new business and price increase) were included in the forecast.

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15. Regarding transformers (discussed beginning on page AFC-55):

a. Please explain why this category of expenses is "zero-based."

b. Please provide the average purchase and installed unit cost of a transformer by year from 2012-2016 and 2017 when available. Please provide all workpapers related to this response and an explanation of any variance in unit costs.

c. Is the transformer budget related to specifically identified projects over the 2017-2019 period? Please explain and provide a list of all projects in the relevant year, if applicable.

**Utility Response 15:**

a. This category is zero-based because SDG&E used a combination of historical data, new business forecast, capital budget projects, and projected manufacturer's price increase or decreases to establish a forecasted value. The 'zero-base' methodology designation is applied in the event historical averages, trends or the use of the base year are not employed and can address methods such as unit cost x volume, or discrete drivers such as described above.

b. Values do not include installation charges as the budget only included the purchase of the transformers. Variances in the average cost of the transformer is due to types of transformers purchased during any particular year in response to the usage. We have multiple suppliers with various prices for the same transformers. In addition, we have index pricing in our contracts that is subject to change on a quarterly basis.

| Average Cost for Distribution Transformers 2012 through 2017 (does not include installed costs) | |
|---|---|
| Year | Average Cost |
| 2012 | $ 6,329.11 |
| 2013 | $ 7,236.28 |
| 2014 | $ 5,178.49 |
| 2015 | $ 5,085.26 |
| 2016 | $ 6,802.78 |
| 2017 | $ 7,061.18 |

c. This budget consists of transformers used primarily for new business and Corrective Maintenance Program (CMP) work, which are not individually forecasted jobs but are considered blanket budgets, a collection of many like-kind small projects. Discretely designed jobs with 'reservations' in the SAP Inventory Management system are also considered in the forecast. Transformer replacement is performed on an as-needed basis and is not tracked by project.

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16. Regarding OH-UG conversion, SDG&E states on page 280 of the workpapers "To stimate future requirements for the conversion budget an average was taken of the last five years of actual net expenditures (normalized to 2016 dollar equivalents and inclusive of projected year-end figures for 2016). That average was increased by 10% for 2017 and increased again by 10% per year for each successive year through 2019."

    a. Please explain why SDG&E believes there will be more conversions than the five-year average indicates.

    b. Please provide the actual year-end 2016 figures.

    c. Please provide a justification for the 10% "escalation" figure.

**Utility Response 16:**

a. As the building industry increases the number of development projects, we also expect to see an increase in customers pursuing overhead to underground conversions. As such, SDG&E estimates there will be more conversions due to an increase in development activity by the building industry exceeding the five-year average.
b. The actual 2016 year-end costs are reflected in the workpapers at page 279.
c. Owing to the expected upswing due to influences described in part a, and based on the experience of personnel having managed this work during past cycles, the five-year average plus an additional 10% over two years was considered a reasonable estimate.

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17. Regarding OH Non-Residential New Business described on page AFC-61. SDG&E states "the forecast method used is a five-year average based on historical data incorporating growth factors derived from the construction unit forecast" Are the growth factors presented anywhere in testimony or workpapers? If yes, please identify the location. If no, please provide the growth factors used, how they are derived, and how they influence the 2017-2019 forecast. Please provide all relevant workpapers.

**Utility Response 17:**

SDG&E uses a 'Construction Unit' forecast (CU) as described in testimony beginning at page AFC-57, which is based primarily on permit applications filed by construction contractors. Please also see Appendix E of the testimony exhibit SDGE-15-R which illustrates the CU forecast.

SDG&E provides below a quantitative example of how SDG&E derives its CU forecast. The derivation of SDG&E's construction unit forecast begins with an input supplied by two national data providers, Moody's and IHS Global Insight. Two series are used, Moody's residential permits and Global Insight residential permits. These two series are averaged to produce a single set of blended residential permits. Then, the blended permit series is input to the residential construction unit forecasting equation to produce a forecast of residential construction units. Lastly, nonresidential construction units are computed by applying a percentage factor to residential construction units to produce a forecast of nonresidential construction units. The percentage factor was derived by analyzing SDG&E's residential and nonresidential historical construction unit data to develop a ratio of nonresidential units to residential units. The total of residential and nonresidential units represents SDG&E's construction unit forecast. See table below.

| | SDGE Construction Units | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Actual | Forecast | Forecast | Forecast | Forecast | Forecast | Forecast | Forecast |
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Moody's Permits 2/15/2017 | | 9,286 | 10,458 | 11,116 | 10,577 | 10,870 | 11,736 | 12,060 |
| Gilobal Insights Permits 4/3 2017 | | 13,872 | 14,490 | 14,877 | 15,382 | 16,116 | 16,174 | 16,147 |
| Blended Permits 50/50 | 10,001 | 11,579 | 12,474 | 12,997 | 12,980 | 13,493 | 13,955 | 14,103 |
| Residential Construction Units Forecast: | | | | | | | | |
| Residential CU = .666991*Last Yr Permits + .359851*Current Yr Permits - 341.408 | | 10,496 | 11,870 | 12,656 | 12,998 | 13,172 | 13,680 | 14,041 |
| R Square = .899, Std Error = 1,691.285, Last Yr Permits t= 5.350, Current Yr Permits t= 2.719 | | | | | | | | |
| Non-Residential Construction Units = Residential CU*.05 | | 525 | 594 | 633 | 650 | 659 | 684 | 702 |
| Total Construction Units | 9,726 | 11,021 | 12,464 | 13,288 | 13,648 | 13,830 | 14,364 | 14,743 |
| Percent Change From Year-to-Year | | 13% | 13% | 7% | 3% | 1% | 4% | 3% |

The CU Forecast provides information on the direction and magnitude of anticipated customer construction/development, up or down and to what degree. When the CU Forecast suggests an

**Utility Response 17 Continued:**

increase in customer construction activity, the number of forecasted CU's relative to the recorded number of CU's in the recent past reveals a percentage of anticipated growth. That percentage of growth is used to determine the extent to which the dollar requirements of specific projects should be increased or decreased to meet customer demand. For some projects, particularly those where customer demand trends to be sporadic, an average of the historical spends over the last 5 years is used as a basis to which the growth factors (percentage of change), derived from the CU Forecast, are applied. For other projects, such as UG Residential, customer activity levels are typically more consistent simply because of the high volume of customer projects that fall into that category. For those cases, the most recent historical spends are used as the basis to which the growth factors derived from the CU Forecast are again applied to better estimate the future funding requirements necessary to meet customer demand. Which approach was applied to each project is identified in the Forecast Methodology provided for each project.

For some projects, the volume of customer requests is greatly influenced by the general health of the economy, along with an increase or decrease in related residential and non-residential development activity. For those projects only somewhat influenced by new customer development activity, it is reasonable to believe customer demand for that type of work (conversions and relocations) will move in a direction similar to that suggested by the CU Forecast, albeit not necessarily to the same extent. For example, not all new customer developments require accompanying conversion, but some do and that number will likely increase along with the number of new customer developments. But since not all new customer development projects require such related work, those projects like conversions and relocations, were adjusted upward consistent with the CU Forecast, but not to the same level of growth as anticipated for the new customer developments in total. In anticipation of marked increases in customer construction activity, all New Business projects were subject to some level of increase in anticipated funding requirement.

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18. Regarding page 394 of the workpapers (local engineering ED pool):

    a. Please provide this workpaper in Excel showing all calculations with working cells and formulas.

    b. Please explain the purpose of each "step" shown in this workpaper (1, 1b, 2).

    c. Please explain what costs "are excluded from the basis of the forecast" and how this is determined. This should include but is not limited to how project-specific costs are removed.

    **d.** Please explain and provide supporting calculations for how the yearly increases from 2016 to 2019 are determined in "Step 2."

**Utility Response 18:**

a. The workpaper showing all calculations and formulas with working cells is provided in the accompanying file "TURN_DR-03 OH Pools Supporting Tables.xlsx".

b. The first step shown in the workpaper is to include all the items that have Local Engineering – Distribution. Step two excludes the items that do not have Local Engineering – Distribution. Please see the detailed process in the accompanying file "TURN_DR-03 OH Pools Supporting Tables.xlsx".

c. Please see the attached supporting document provided in answer a and b above.

d. Please see the attached supporting document provided in answer a and b above.

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19. Regarding the Local Engineering – Electric Distribution Pool (budget code 901) discussed starting on page AFC-69 of testimony:

    a. Please explain how costs are recorded to this pool, and how it is ensured that project-specific costs are not duplicated. Please provide an example.

    b. Please provide a transaction level detail of costs recorded to this cost category in 2016.

    c. Please explain how "New advanced tools, like LiDAR and PLS-CADD, are also changing the way engineering and design work is done for electric distribution facilities" (page AFC-70, lines 26-27) and why this should increase overhead costs?

    d. Please explain what "LiDAR and PLS-CADD" are and provide relevant websites.

    e. Please explain the statement "The underlying cost driver in the growth of expenditures for this Pool is due to industry trends increasing the use of detailed engineering studies or designs, instead of relying solely on standards." The explanation should include at a minimum what is meant by "standards," when SDG&E began using "detailed engineering studies," and why industry trends are driving increased costs.

    f. SDG&E states at page AFC-70, lines 16-18, "The forecast for this pool is derived from the base year expenditures with a net upward adjustment based on a historical relationship of Local Engineering electric distribution capital overhead to capital expenditures." Please provide all supporting workpapers, calculations, and assumptions, regarding the "net upward adjustment."

    g. Please provide a list of all activities that comprise this budget category.

**Utility Response 19:**

a. Engineering and planning work performed in a supervisory and/or support capacity is charged to the overhead pools, which is then allocated across projects that eventually close to plant. Work that is performed for a specific project is directly charged to the appropriate budget code. Workorders for capital projects are created and marked in such a way that they are or are not allocated costs from the pool. A sample of a project that might be allocated pool expenses is a circuit expansion, which does not normally have fully-assigned engineering staff. A sample of a project that would not receive pool expenses but rather be charged directly would be a project with dedicated engineering staff such as a major substation. It is possible for a project to incur both pool and direct charges during its conception, design and construction, with the pool charges being incurred primarily for the conception and design. Since persons charging labor can only charge up to the total of actual time spent, duplicated costs for pool labor cannot be allocated to a project.

**Utility Response 19 CONTINUED:**

b. For transaction detailed costs recorded for 2016 please see the attached file "TURN_DR-03-OH Pools Supporting Tables.xlsx"

c. See response to question e.

d. Light Detection And Ranging (LiDAR) is a survey method that SDG&E utilizes to gather survey information to incorporate into our designs. Power Line Systems - Computer Aided Design and Drafting (PLS-CADD) is a software tool that SDG&E utilizes to design its overhead structures. SDG&E does not recommend any specific websites for additional information, but a general website search (e.g., Google) will produce many informative results.

e. In the past, distribution design has predominantly been standards and codes-based and not necessarily engineered to account for site specific data. Previously, when a new facility or new electrical infrastructure was needed, an engineering "standards" book could be referenced to guide in the engineering decision making for suitable design and construction of facilitates. More recently, in addition to a "standards" book, detailed engineering utilizing site specific and generally more conservative data is being conducted for new facilities and for rebuilding electric infrastructure due to the increased focus on risk reduction and regulatory changes. Site specific information is being incorporated into designs that are utilizing PLS-CADD software and LiDAR survey data, whereas in the past, designs were based on standards and code-based criteria. An example would be rather than designing only for established and standard wind zone criteria, as has been general industry practice, designs are now utilizing the more conservative of either the established standard wind zone criteria or the wind speed data that is now available and is more specific to each site. This increased reliance on detailed engineering and design for the distribution system (and decreased reliance on "standards-based" system design) has led to increased facility design requirements and expenditures in overhead pools.

f. The supporting workpapers, calculations, and assumption are provide in the accompanying Excel file "TURN_DR-03-OH Pools Supporting Tables.xlsx."

g. This pool includes engineering work associated with construction of Substation assets (FERC accounts 108, 352-353, 361-362 and 397).

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20. Regarding the Local Engineering – Substation Pool (budget code 904):

a. Page AFC-72 lines 7-8 state "The forecast for this pool is derived from the base year expenditures with a net upward adjustment based on a historical relationship of Local Engineering – substation capital overhead to capital expenditures." Please provide all workpapers, calculations, and assumptions that explain and justify the described "net upward adjustment."

b. Please explain how costs are recorded to this pool and how these do not overlap with project specific costs.

c. Please provide all tables presented on pages 396-400 of the workpapers in Excel with working formulas.

d. Regarding page 396 of the workpapers, please explain how the "FTE" is determined, separately for historic 2012-2016 (by year) and forecast 2017-2019. Please provide all supporting calculations and workpapers.

e. Please explain and provide supporting calculations for the cost drivers behind the requested increase from 2016-2019, separately for each year.

f. Please provide a list of all activities and historical costs from 2012-2016 for the "labor" and "non-labor" categories shown on page 396 of the workpapers.

g. Please provide an electronic version of the tables on page 404 of the workpapers, including all calculations with working formulas in Excel.

h. Please provide an explanation of workpaper page 404, including at a minimum how each "step" is accomplished, what costs are excluded and how this is determined, and how the percentage increase for forecast years is determined. Please provide all supporting workpapers and documentation related to this response.

**Utility Response 20:**

a. For workpapers, calculations, and assumption please refer to the detailed Excel file "TURN_DR-03-OH Pools Supporting Tables.xlsx" provided with this Data request response.

b. The response to this question are substantially similar to those for the Local Engineering Pool in Question 19a, except that they apply to substation projects. Engineering and planning work performed in a supervisory and/or support capacity is charged to the overhead pools, which is then allocated across projects that eventually close to plant. Work that is performed for a specific project is directly charged to the appropriate budget code. Workorders for capital projects are created and marked in such a way that they are or are not allocated costs from the pool. A sample of a project that might be allocated pool expenses is a circuit expansion, which does not normally have fully-assigned engineering staff. A sample of a project that would not receive pool expenses but rather be charged

**Utility Response 20 CONTINUED:**

directly would be a project with dedicated engineering staff such as a major substation. It is possible for a project to incur both pool and direct charges during its conception, design and construction, with the pool charges being incurred primarily for the conception and design. Since persons charging labor can only charge up to the total of actual time spent, duplicated costs for pool labor cannot be allocated to a project.

c. Active Excel spreadsheets for that data do not exist. Most workpaper exhibits do not exist as Excel documents with working formulae. Workpapers and tables that appear in testimony are not created from, nor do they originate as Excel spreadsheets, these are produced from a database system which consists of many data tables that are dynamically linked to permit grouping of cost centers and budgets, editing of historical values, selection of a forecast methodology, adjustments to forecasts and the production of workpapers. The use of a database for this purpose does not involve spreadsheets, the workpapers are formatted 'reports' from that collection of tables and linking relationships that form the database. Data extracts of this type contain only data values, the extract is not capable of producing 'working formulas'.
d. Full-Time Equivalents (FTEs) are calculated as a standard formula which divides all labor costs by an average salary of $100 thousand. The increase in FTEs in these overhead pools is being driven by the increase in forecasted labor cost in other budgets such as New Business.
e. For workpapers, calculations, and assumption please refer to the detailed Excel file “TURN_DR-03-OH Pools Supporting Tables.xlsx” provided with this data request response.
f. The list of all activities are provided in the file “TURN_DR-03-OH Pools Supporting Tables.xlsx” provided with the data request response. Our analysis relied on 2016 data and it is provided in the attachment mentioned.
g. For workpapers, calculations, and assumption please refer to the detailed Excel file “TURN_DR-03-OH Pools Supporting Tables.XLSX” provided with this data request response.
h. The first step shown in the workpaper is to include all the items that have Local Engineering – Distribution. Step two excludes the items that do not have Local Engineering – Distribution. Please see the detailed process in the accompanying file “TURN_DR-03 OH Pools Supporting Tables.xlsx”.

21. Regarding the Department Overhead Pool (budget code 905):

    a. Please explain how costs are recorded to this pool and how SDG&E ensures these do not overlap with project specific costs.

    b. Please provide a justification and explanation for requested cost increases for this pool.

    c. On page 408 of the workpapers please explain how "FTE" is determined for historical and forecast years separately.

    d. Please provide an electronic version of page 414 in Excel with working cells/formulas/calculations.

    e. Please provide an explanation of workpaper page 414, including at a minimum how each "step" is accomplished, what costs are excluded and how this is determined, and how the percentage increase for forecast years is determined. Please provide all supporting workpapers and documentation related to this response.

    f. Please provide a justification and all supporting documentation and workpapers for the increase in requested costs from 2016-2019.

**Utility Response 21:**

a. The response to this question are substantially similar to those for the Local Engineering Pool in Question 19a, except that they apply to engineering and planning work performed in the SDG&E construction and operating districts. Engineering and planning work performed in a supervisory and/or support capacity is charged to the overhead pools, which is then allocated across projects that eventually close to plant. Work that is performed for a specific project is directly charged to the appropriate budget code. Workorders for capital projects are created and marked in such a way that they are or are not allocated costs from the pool. A sample of a project that might be allocated pool expenses is a circuit expansion, which does not normally have fully-assigned engineering staff. A sample of a project that would not receive pool expenses but rather be charged directly would be a project with dedicated engineering staff such as a major substation. It is possible for a project to incur both pool and direct charges during its conception, design and construction, with the pool charges being incurred primarily for the conception and design. Since persons charging labor can only charge up to the total of actual time spent, duplicated costs for pool labor cannot be allocated to a project.

b. This budget provides funding for supervision and administration of crews in the SDG&E construction and operation districts. This overhead pool is charged for expenses that are not attributable to one project, but benefit many projects, or

**Utility Response 21 CONTINUED:**

construction operation districts. The historical relationship of electric and gas distribution capital overhead to capital expenditures justify the costs increases.

c. Full-Time Equivalents (FTEs) are calculated as a standard formula which divides all labor costs by an average salary of $100 thousand. The increase in FTEs in these overhead pools is being driven by the increase in forecasted labor cost in other budgets such as New Business.
d. For workpapers, calculations, and assumption please refer to the detailed Excel file "TURN_DR-03-OH Pools Supporting Tables.XLSX" provided with this Data reqeuest response.
e. The first step shown in the workpaper is to include all the items that have Department Overhead Pool charges. Step two excludes the items that do not have Department Overhead Pool charges. Please see the detailed process in the accompanying file "TURN_DR-03 OH Pools Final Supporting Tables.XLSX".
f. SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this budget code, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows: Please see the testimony and workpapers regarding this budget code. For workpapers, calculations, and assumption please refer to the detailed Excel file "TURN_DR-03-OH Pools Supporting Tables.XLSX" provided with this Data request response.

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22. Regarding the contract administration pool (budget code 906):

a. Please explain why there are no recorded costs for this pool (workpaper page 416).

b. Please explain how forecast costs for this pool have been determined.

c. Please explain how the "forecast is derived from the Base Year Recorded xpenditures with a net upward adjustment based on a historical relationship of contract administration overhead to capital expenditures" (page 417 of workpapers) if there are no recorded costs, including in the Base Year.

d. Regarding workpaper page 422, please explain each "step." Please explain and rovide all calculations for what costs are allocated to the contract administration pool from steps 1 and 2.

e. Please provide an electronic version of the workpapers related to this overhead pool, including all calculations.

f. Please explain, justify, and show all calculations for the requested increase in xpenditures from 2016-2019 (separately for each year) for the budget category.

**Utility Response 22:**

a. The pool costs are forecasted principally as a function of total direct capital costs, often using a zero-base or base-year approach rather than as a function of historical values. The overhead labor pools are costs spread to planned capital projects as overhead costs through the ratebase and RO modeling process, and appear in testimony as an input to that later modeling rather than as direct project costs. In the preparation for GRC forecast modeling, only the direct costs were extracted for each witness and thus these overhead pool costs were not included in that process. Because those costs are not extracted as direct costs in the initial GRC modeling, a discrete adjustment entry is required to include them. If the forecasting methodology selected does not require those historical costs that adjustment is not required, as is the case for the Contract Administration (CA) Pool, which was forecasted by the relationship of CA expenses to total capital.

b. As stated in our testimony page AFC-74 the forecast for the contract administration pool is derived from the base year Recorded with a net upward adjustment based on historical relationship of contract administration overhead to capital expenditures. For detailed workpaper and methodology please refer to the Excel file "TURN_DR-03-OH Pools Supporting Tables.xlsx" provided with this data request response.

c. Please see answer to Q22 a.

d. The first step shown in the workpaper is to include all the items that have Contract Administration charges. Step two excludes the items that do not have Contract Administration Pool charges. Please see the detailed process in the accompanying file "TURN_DR-03 OH Pools Supporting Tables.xlsx

**Utility Response 22 CONTINUED:**

e. For workpapers, calculations, and assumption please refer to the detailed Excel file "TURN_DR-03-OH Pools Supporting Tables.xlsx" provided with this data request response.
f. For workpapers, calculations, and assumption please refer to the detailed Excel file "TURN_DR-03-OH Pools Supporting Tables.xlsx" provided with this data request response.

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23. Please provide SDG&E's historical SAIDI and SAIFI statistics from 2010-2016 and all supporting calculations, workpapers, and documentation. Please provide all acronyms and clearly label all workpapers.

**Utility Response 23:**

The System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI) is shown below for underground and overhead facilites.

SAIDI and SAIFI attributable to underground facilities

| Year | UG | SAIDI | SAIFI |
|---|---|---|---|
| 2012 | U | 37.05 | 0.2403 |
| 2013 | U | 32.42 | 0.2136 |
| 2014 | U | 31.11 | 0.2310 |
| 2015 | U | 32.09 | 0.2449 |
| 2016 | U | 36.61 | 0.2690 |

SAIDI and SAIFI attributable to overhead facilities

| Year | OH | SAIDI | SAIFI |
|---|---|---|---|
| 2012 | O | 27.32 | 0.2925 |
| 2013 | O | 27.54 | 0.2584 |
| 2014 | O | 33.49 | 0.3718 |
| 2015 | O | 25.83 | 0.2812 |
| 2016 | O | 36.14 | 0.3505 |

SDG&E's 2016 reliability report showing 2007-2016 data, in compliance with D.16-01-008, is publicly available at ftp://ftp.cpuc.ca.gov/ElecReliabilityAnnualReports/2016/SDGE_2016_Reliability_Annual_Report.pdf.

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24. Please provide all relevant RAMP analyses and supporting workpapers for all costs under "Reliability/Improvements."

**Utility Response 24:**

SDG&E objects to this question under Commission Rule 10.1 to the extent that it is vague, ambiguous, overbroad and unfairly burdensome, and would require SDG&E to search through documents that are already in TURN's possession, available on our website, and/or a matter of public record in CPUC proceedings. Subject to and without waiving this objection, SDG&E responds as follows: See APPENDIX C of SDG&E-14 Direct Testimony of Alan Colton - Electric Distribution – Capital testimony. This section relates all budgets that support RAMP, including those under Reliability/Improvements. Refer to SDG&E's RAMP Report (I.16-10-015/I.16-10-016 Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, November 30, 2016, available at https://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas.) for analysis related to those categories referenced in the SDG&E-14 direct testimony. Please also refer to the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively) for more details regarding the utilities' RAMP Report.

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25. Regarding budget code 230 - replacement of underground cables:

a. Please provide the number and miles of underground cables that failed each year from 2010-2016. Please segregate by type of cable.

b. Please provide the cost to replace underground circuits per circuit mile from 2010-2016. Please segregate by type where possible. Please provide all supporting workpapers.

c. Please explain and provide all supporting workpapers/calculations for the cost increase from 2017 to 2018 and 2019 for this budget category (workpaper page 453).

d. Regarding workpaper page 453, please provide all data and supporting analyses and workpapers/calculations, including referenced "electric reliability circuit analysis" and "cable failure data," that demonstrate underground cable has "a high probability of failure."

e. Please provide the related RAMP analysis for this category including if possible the quantified assumption in reliability improvements due to spending on this category.

**Utility Response 25:**

a. See the accompanying Excel spreadsheet "Turn-SEU-003-Underground Cable Failures – 2010 to 2016.xlsx".

b. See the accompanying Excel spreadsheet "Turn-SEU-003-Underground Cable Cost Per Mile – 2010 to 2016.xlsx".

c. SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this budget code, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows: Please see the testimony and workpapers. SDG&E expects underground cable to have a useful life of 50 years. Based on the amount of underground cable in SDG&E's system and a blended rate for replacement per foot of cable, it has been determined that a funding increase is needed to maintain the replacement of underground cable within the useful life period. See accompanying file "Turn-SEU-003-Cable Budget Funding Analysis.pdf" for backup documentation.

d. See responses to parts a and b above.

e. RAMP did not perform any specific analysis that factored in reliability for this budget.

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26. Please explain the negative costs on page 466 of the workpapers.

**Utility Response 26:**

The negative values attributed to this budget are primarily salvage costs.

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27. Regarding capital restoration of service (budget code 236):

    a. Please provide an explanation of increased forecast costs from 2017-2019.

    b. Please explain why a four-year average cost was used.

    c. Please explain how the "3% incremental" cost was determined (page 465 of workpapers) and provide all supporting workpapers and documents.

    d. Please provide all benefit-cost analyses conducted for this budget with supporting documents and workpapers.

**Utility Response 27:**

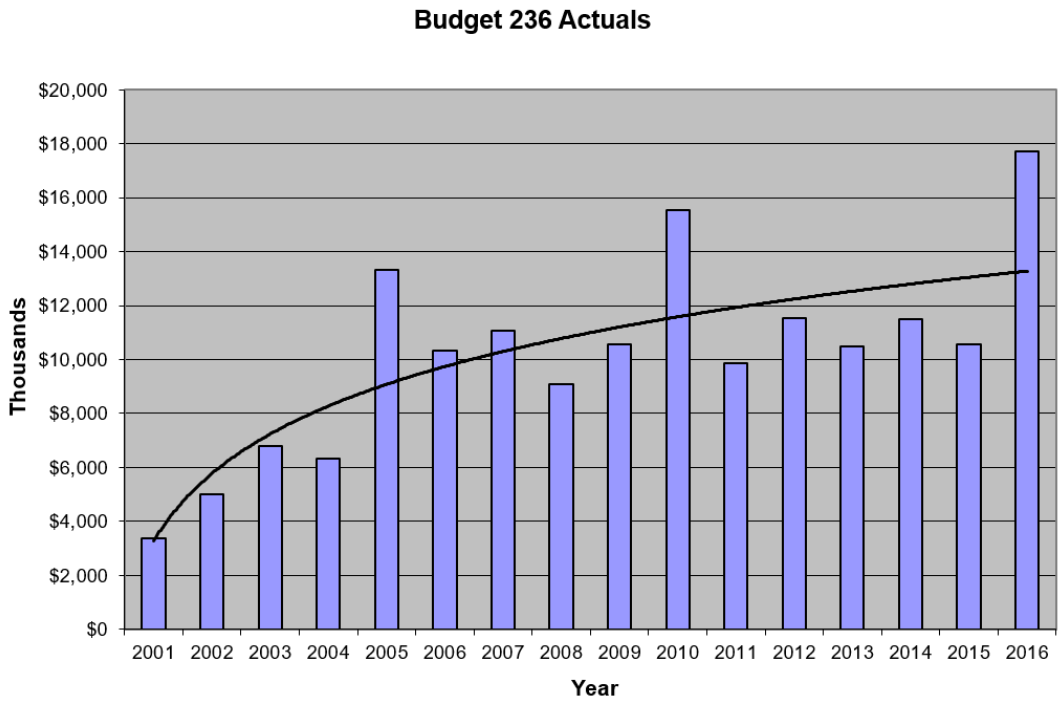
a. The capital restoration budget is directly related to SDG&E's aging infrastructure and increased cost of resources. This budget has historically shown a general upward trend in spend year over year as the infrastructure continues to deteriorate at a rate that reflects its installed age and the rate that SDG&E replaces that infrastructure.. In addition, 2016 showed a substantial increase in actual spend from previous years. This is expected to result in slightly elevated forecasts for subsequent years.

b. A 4-year average along with an additional 3% incremental year to year was determined to be the method that most accurately reflects the historical spend and anticipated future spend of this budget. A 3-year average would over-leverage the forecast upward, due to the substantial increase in 2016 spend and, similarly, a 5-year average would understate the anticipated future need by discounting the recent 2016 experience.

c. The 3% incremental is derived from an estimate of the budget's overall growth experience. It takes into account the historical average yearly increase over the life of

**Utility Response 27 CONTINUED:**

budget. See the chart below with actuals included.




d. This budget is purely reactive and is a requirement to fund repairs to SDG&E distribution facilities as necessary to restore electric service to customers in compliance with CPUC General Order 166. No benefit cost analysis is required for a budget of this nature.

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28. Regarding emergency transformer and switchgear, please explain why there are negative costs in 2017 and 2019 and what this means.

**Utility Response 28:**

This was an adjustment error discovered after the initial filing. We have submitted revised testimony for BC-62540 emergency transformer & switchgear, please see Exhibit SDG&E-14-R.

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29. Regarding the replacement of 4kV substations (budget code 6260):

a. Please provide the outage rates of 4kV substations compared to other voltage level substations from 2010-2016. Please provide all workpapers/calculations/assumptions.

b. Please provide the SAIDI for each year from 2010-2016 separately for 1) all 4 kV circuits combined, and 2) all other (above 4 kV) circuits combined.

c. Please provide the relevant RAMP analysis that informed these expenditures.

d. Please quantify the reliability improvement SDG&E expects from these expenditures and provide all calculations/assumptions/workpapers.

e. Please explain why there are no historical costs for this category.

f. Please provide all unit costs of replacement for this category.

g. Please provide in an Excel spreadsheet 1) the peak capacity of each 4kV circuit and 2) the historical and projected load from 2010-2021 for each circuit . Please indicate how the load forecast was created.

h. Please provide the expected life of each primary component of a 4kV substation and all supporting documentation.

**Utility Response 29:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, with respect to its request for "all" documents supporting aspects of the testimony and workpapers on this budget code. Subject to and without waiving this objection, SDG&E responds as follows:

a. Below are the outages that have occurred at 4kV substations and 12kV substations.

| Frequency of Substation Outages | | |
|---|---|---|
| **Year** | **4kV Subs** | **12kV Subs** |
| 2010 | 3 | 11 |
| 2011 | 3 | 7 |
| 2012 | 5 | 11 |
| 2013 | 1 | 4 |
| 2014 | 3 | 6 |
| 2015 | 1 | 3 |
| 2016 | 0 | 15 |

**Utility Response 29 CONTINUED:**

b. The SAIDI associated with the substation outages is shown below.

| SAIDI of Substation Outages | | |
|---|---|---|
| **Year** | **4kV Subs** | **12kV Subs** |
| 2010 | 0.16 | 3.51 |
| 2011 | 0.13 | 2.39 |
| 2012 | 1.13 | 1.88 |
| 2013 | 0.27 | 1.13 |
| 2014 | 0.07 | 3.49 |
| 2015 | 0.13 | 1.50 |
| 2016 | 0.00 | 3.95 |

c. Please see the relevant testimony and workpapers. The RAMP analysis did not inform the majority of these GRC proposed expenditures. RAMP-related 4 kV Modernization efforts focused on the replacement of "package substation" infrastructure.

d. SDG&E expects to see improvements in reliability with respect to reductions in wire slapping, downed conductors, underground cable failures, 12 kV wires falling into 4 kV underbuilds, and enhanced switching ability (i.e. SCADA). These improvements are quantified as projected monetized benefits over a 20-year period based on third-party proprietary models.

e. Historical costs for this category from recent years are not available because 4 kV infrastructure improvements were not charged to this budget. Minimal 4 kV infrastructure has been removed in recent years, however when it has been completed it has been aggregated with other 12 kV budgets with wider scope or have been completed as part of other substation upgrade projects not directly driven by the 4 kV upgrades.

f. Overhead reconstruction unit costs were estimated at approximately $100/ft., underground re-cabling unit costs were approximately $37/ft. on average (per circuit), and 12 kV substation breaker additions were approximately $160,000 each.

**Utility Response 29 CONTINUED:**

g. 1) Please refer to attachment "TURN-SEU-003-SDGE4kV circuits data CONFIDENTIAL.xlsx" which only contains meter data rolled up to the 4kV breaker or transformer. The information highlighted in yellow in "TURN-SEU-003-SDGE4kV circuits data CONFIDENTIAL," referenced below, is Confidential Pursuant to P.U. Code Section 583 & General Order 66-C/D and D.16-08-024.

2) SDG&E does not conduct load forecasts of 4kV circuits, as it is rolled up into 12kV load. SDG&E has only the past two years of data readily available.

h. Please see the testimony and workpapers. The expected life of each primary component of a 4kV substation is shown below. The expected life of 4kV substation equipment is based on SDG&E's experience on its own system, but can vary based on location, load, and operational profile.

12/4kV Transformers: 60 Years
Air Breaker: 40 years
Gas Breaker: 20 years
Oil Breaker: 40 years
Vacuum Breaker: 40 years

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30. Regarding budget cost code 11249, Install SCADA online capacitors, please quantify the expected reliability improvement due to these costs and provide all supporting studies, calculations, and workpapers.

**Utility Response 30:**

SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this budget code, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows: Please see the testimony and workpapers. In addition to the items discussed in the Direct Testimony of A. Colton (SDG&E-14) the expected reliability improvements for projects in budget 11249 include the following.

- Avoided outages – VAR deviance alarm
- Reduced scope of capacitor survey
- Avoided power purchase costs
    - Reduced GHG emissions
    - Lower cost to customers
- May minimizing wear and tear on LTCs
- May increase capacitor life due to less switching
- Improved voltage support for customers
- Reduce the number of forced outages from capacitor failures annually due to VAR deviance operation to remove capacitor from the system.
- Reduce costs for annual Capacitor Survey program.

SDG&E anticipates that the projects in this budget serve to maintain existing reliability performance; SDG&E has not calculated a reliability improvement estimate.

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31. Regarding Wireless Fault Indicators (budget code 112530):

    a. Please provide all studies that quantify the reliability benefit of these indicators in SDG&E's system. Please provide all supporting calculations and workpapers.

    b. Please provide all alternatives to wireless fault indicators and the unit cost of each.

    c. Please provide the number of indicators installed on SDG&E's system each year from 2010-2016.

    d. Please provide the unit cost per indicator from 2012-2016.

    e. Please provide all relevant RAMP analyses that support this request.

    f. Please explain why workpaper page 529 shows forecasted costs of $0.

**Utility Response 31:**

a. Wireless Fault Indicators (WFIs) are used to improve reliability metrics by monitoring distribution lines. An alert email is sent to through a wireless network. This allows Operators to dispatch Electric Trouble Shooters closer to the exact fault location to more quickly identify and locate faults. This significantly reduces fault locating time and travel for troubleshooters. SDG&E installs WFIs as a means to maintain existing reliability performance and with the anticipation that their use will permit faster response times leading to faster restoration times, improving SAIDI metrics. No specific study is available.

b. Non-Wireless Fault Indicators are estimated to cost approximately $200 each. Troubleshooters are dispatched to a less localized area and then need to check multiple non-wireless fault indicators to determine the fault location.

c. The number of indicators installed on SDG&E's system each year from 2010-2016.

2010 – 0 units

2011 – 50 units

2012 – 2,230 units

2013 – 560 units

2014 – 237 units

2015 – 0 units

2016 – 10 units

**Utility Response 31 Continued:**

d. The unit cost per indicator from 2012-2016 $540 per unit

e. There are no relevant RAMP analyses that support this request.

f. Forecasted labor cost for 2017 were $0 because the project was being completed by contractors. The contracted labor costs are included under 'Contracted Services', which is recorded as nonlabor.

g. Wireless Fault Indicators will reduce outage durations by allowing operators to dispatch troubleshooters to the affected section of the circuit. The 'heartbeat' feature of the WFIs give the operators and troubleshooters confidence that the units' indication is not a false positive. Inaccurate indication of manual indicators has led operators to close-in isolating devices multiple times, causing unnecessary stress on the circuit and extending the outage duration.

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32. Regarding SCADA Expansion (budget code 112670):

    a. Regarding workpaper page 543, please provide the number of SCADA systems installed from 2012-2016.

    b. Please provide all studies and supporting calculations that show how SCADA has improved reliability on SDG&E's system.

    c. Please explain why there were no costs in 2016 for this budget category, nor any forecast for 2017.

    d. Please explain why there were dramatically less costs for this budget category in 2014 and 2015 than 2012 and 2013.

    e. Please provide all studies and supporting assumptions/calculations that quantify the reliability improvement when SCADA systems are improved.

    f. Please explain how SDG&E will target SCADA system installation.

    g. Please explain how the 2018-2019 requested budget forecast was determined and provide all supporting workpapers and calculations.

**Utility Response 32:**

    a. Budget Code 11267 covered installation and/or upgrades of SCADA devices and/or controllers on 18 circuits in 2012, 7 circuits in 2013, and 2 circuits in 2014, 0 circuits in 2015, and 0 circuits in 2016.

    b. SDG&E has not conducted specific studies for the benefits of SCADA installation. SCADA implementation is a commonly-accepted technology and is used industry-wide in order to improve reliability metrics by decreasing time in fault identification and improving restoration response to electric outages. The implementation of SCADA fault-isolating devices further expands automated isolation points in the system, preventing customers upstream of the isolating device from being interrupted by damage downstream of the device. Additionally, relay target information sends the Distribution Operations department identifying information about the nature of the damage and location, enabling quicker identification and ultimately restoration. When SCADA tie switches are paired with isolating devices, faster remotely operated restoration may occur to customers downstream of the isolating device during times of upstream failure. In this second scenario, the action is further enhanced with the implementation of Fault Location, Isolation, and Service Restoration (FLISR) technology. The technology

**Utility Response 32 Continued:**

performs these actions faster than a Distribution Operator normally could, reducing the sustained outage impact to a mere momentary outage (less than 5 minutes). Manual operation of devices to identify, isolate, and restore faults would range from 45 min. to 1.5 hours depending on conditions, response times, and outage traffic on the system. Net benefits to each individual circuit identified are based on the customer counts, electrical layout, and topography of the circuit. Furthermore, higher-resolution load data provided by contemporary SCADA equipment promotes the implementation of protective relay settings to closer margins, enhancing safety while optimizing reliability.

c. SCADA devices are now installed routinely as part of SDG&E's core business, frequently as a standard part of other projects. These installations are covered under a variety of capital projects including those addressing specific reliability or capacity concerns. Additionally, budget code 11267 was revised prior to 2014 to exclude substation-specific SCADA expansion projects that would have covered the costs during 2016 and 2017 as SDG&E focused on distribution substation SCADA improvements and distribution synchrophasors installations (among other distribution initiatives) during these years, as opposed to distribution line device installations.

d. Budget code 11267 was revised prior to 2014 to exclude substation specific SCADA expansion projects which would have incurred some of the costs during 2014 and 2015, as SDG&E shifted towards 'distribution substation' SCADA improvements during these years as opposed to 'distribution line' device installations.

e. See responses to questions b and f. Additionally, SDG&E tracks reliability figures and analyzes circuits that have experienced outages for reliability improvements.

f. SCADA installations at substations and on distribution feeders are targeted and prioritized by anticipated customer impact. Those substations and circuits with the largest customer counts are planned for upgrade ahead of those with fewer customer counts. Additionally, substations and circuits with aging equipment or those with historically higher failure rates will be elevated in priority. Furthermore, circuits experiencing recent reliability problems to the extent that they fall under the "Worst Circuit SAIDI" designation may also be prioritized for the installation of additional SCADA equipment, along with other types of reliability improvement strategies.

**Utility Response 32 Continued:**

g. Please refer to testimony and workpapers supporting this budget. The budget forecast is based on historical average costs and workload capacity to cover installation of 7-10 SCADA sites per year, to continue with this initiative.

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33. Regarding "Advanced Ground Fault Detection" (budget code 122460):

    a. Please provide an explanation of how this technology works.

    b. Please provide all studies, calculations and supporting documents and workpapers that demonstrate reliability improvement due to deployment of this technology.

**Utility Response 33:**

a. Advanced Ground Fault Detection or Advanced Sensitive Ground Fault (Advanced SGF) refers to a variety of modern algorithms designed to improve public safety and reduce risk of wildfires by detecting high impedance ground faults. These algorithms are an improvement over legacy fixed overcurrent relay elements. These differ by vendor and may include:
   - Automatically tracking the natural variation in load unbalance (which is seen at the SCADA site or relay as negative sequence current). The algorithm then varies the fault detection threshold real-time to account for load, essentially allowing for the relay to detect a sudden change in current and detect a high impedance ground fault.
   - Detecting a downed or otherwise damaged line by measuring current spikes that indicate intermittent arcing typical of a high impedance ground fault. These type of algorithms tally the current spikes and isolate the apparent fault based on the number of spikes seen over time.
   - Utilizing frequency and/or harmonic signatures seen on the distribution feeder using vendor patented technology.

b. Please refer to testimony and workpapers supporting this budget. SDG&E adopts new technology in the course of industry improvements in the management of its distribution system. Advanced SGF is intended to lead to faster identification and location of high impedance ground faults and downed wire will lead to quicker restoration of service (particularly during operating conditions where fire risk is elevated and patrols are required prior to re-energization). However, the primary driver for installing controllers capable of Advanced Ground Fault Detection is to improve public safety and reduce risk of wildfires. SDG&E does not have specific documentation of reliability improvement for this technology.

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34. Regarding the Microgrid for Energy Resilience (budget code 16243):

a. Has this project been approved in a previous GRC?

b. Has SDG&E selected the communities where it will deploy the microgrid? If yes, which ones? If no, why not?

c. Please provide all workpapers that support the cost forecast for this project.

d. Please provide a list of all renewables and corresponding capacity (kW or MW) expected to be procured for this project.

**Utility Response 34:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this budget code, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:

a. No
b. No, however SDG&E is in the process of finalizing potential sites, and completing engineering and planning with internal and external stakeholders to integrate renewables, enhance system reliability and energy security.
c. The costs forecast for this project is shown below.

**2018**

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| **Labor** | **HR** | **19,230** | **$1,100.0** |
| **Energy Storage Unit** | **EA** | **1** | **$1,940.0** |
| **Land** | **EA** | **1** | **$900.0** |
| **Telecom equipment** | **EA** | **1** | **$200.0** |
| **Underground cabling** | **EA** | **1** | **$800.0** |
| **Electric Interconnection** | **EA** | **1** | **$600.0** |
| **DERMS Integration** | **EA** | **1** | **$275.0** |
| **Commissioning** | **EA** | **1** | **$79.0** |
| **Total** | | | **$5,894** |

**2019**

**Utility Response 34**
**Continued:**

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| **Labor** | **HR** | **25,000** | **$1,400.0** |
| **Energy Storage Unit** | **EA** | **2** | **$3,880.0** |
| **Telecom equipment** | **EA** | **1** | **$378.0** |
| **Underground cabling** | **EA** | **1** | **$800.0** |
| **Electric Interconnection** | **EA** | **1** | **$600.0** |
| **DERMS Integration** | **EA** | **1** | **$675.0** |
| **Commissioning** | **EA** | **1** | **$183.0** |
| **Total** | | | **$7,916** |

d. This project will include three micro grids, utilizing energy storage systems, with a capacity up to 8 MWh each.

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35. Regarding the Morro Hill Substation Rebuild (16260A):

a. Please provide all supporting workpapers for the cost forecast.

**Utility Response 35:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this project, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:

The costs forecast for this project is shown below.

2017

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Engineering | EA | 12 | $12.0 |
| **Total** | | | $12 |

2018

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Engineering | EA | 1 | $192.0 |
| Transformer | EA | 1 | $926.0 |
| **Total** | | | $1,118 |

2019

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Below Grade | EA | 1 | $406.0 |
| UG/Cont Cable | EA | 1 | $101.0 |
| Switchgear | EA | 2 | $1,584.0 |
| Capacitor | EA | 1 | $150.0 |

| | | | |
|---|---|---|---|
| Protection/Control | EA | 3 | $75.0 |
| Distribution Cable | EA | 1 | $449.0 |
| Labor | HR | 17,927 | $986.0 |
| **Total** | | | $3,751 |

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36. Regarding the Grid Analytics (budget code 172530) project:
    a. Please explain why this is a capital project rather than an O&M expense.
    b. How much will the project improve SAIDI , SAIFI and MAIFI Please explain and provide supporting workpapers/calculations.
    c. Please provide all supporting workpapers for the forecasted costs.
    d. Please provide all benefit-cost analyses conducted for this budget with supporting documents and workpapers.

**Utility Response 36:**

a. The Grid Analytics project exceeds SDG&E's capitalization threshold of $500,000 as a new software asset and will be a new data and reporting platform for asset and operations management reporting.

b. The projects will improve SDG&E's SAIDI, SAIFI and MAIFI metrics by enhancing visibility into asset failure information and enabling SDG&E to correlate this information with our outage data. The company has multiple asset repository systems that require manual processes and resources to correlate the information. With an integrated asset data platform and reporting user interface, we will be able to evaluate the asset's performance and make more rapid investment asset decisions. These decisions are anticipated to eventually reduce the probability of future asset failure and increase performance.

c. SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this project, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:
Please see the testimony and workpapers supporting this budget code. The table below summarizes the high-level cost estimates forecast for the project. The non-labor total costs include ~$1M in expected hardware/software costs and ~$3M in professional services. Detailed cost estimates will be developed as part of project business case phase.

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Labor | EA | 1 | $2,200 |
| Non-Labor | EA | 1 | $4,400 |
| Total | | | $6,600 |

d. The cost-benefit analysis will be conducted in the business-case phase of the project.

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37. Regarding the "Replace Obsolete Substation Equipment Project" (992820):

    a. Please explain and provide all adjustments and relevant assumptions for the cost increase from 2016 to 2019.

    b. Please provide all RAMP-related workpapers related to this project.

    c. Please provide an estimate of SAIDI, SAIFI and MAIFI improvements due to this project for each year. Please provide all workpapers, calculations, and assumptions.

    d. Please provide a list of specific equipment that will be replaced.

    e. Please explain how SDG&E will decide what equipment to replace.

    f. Please provide an explanation for the expected life of a transformer, differentiating by type.

    g. Please provide an explanation for the expected life of a circuit breaker, differentiating by type.

    h. On page AFC-108, lines 11-13 state "The sum of all distribution substations contains a total of approximately 300 transformers with an average age of approximately 13 years and 1500 circuit breakers, with an average age of 26 years." Please provide supporting data and workpapers to show the average age of 1) transformers and 2) circuit breakers. Please provide a list of all transformers and the corresponding age of the transformer in Excel in two separate columns.

    i. Please explain how SDG&E will identify what equipment to replace in this program.

    j. Please explain and provide all supporting workpapers showing how it was determined that three percent and five percent of bank transformers and circuit breakers respectively should be replaced under the program (p. AFC-108).

    k. Please provide all benefit-cost analyses conducted for this budget with supporting documents and workpapers.

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**Utility Response 37:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting testimony and workpapers on this project, and/or information that has already been provided or made available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:

a. The funding of this budget includes the costs to replace obselete substation equipment. Additionally, the increase in the funding of this budget is to address the Electric Infrastructure Integrity RAMP risks assocated with this budget. See response b for further information.
b. See APPENDIX C of SDG&E-14 Direct Testimony of Alan Colton - Electric Distribution – Capital testimony. This section relates all budgets that support RAMP, including those under Reliability/Improvements. Refer to SDG&E's RAMP Report (I.16-10-015/I.16-10-016 Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, November 30, 2016, available at https://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas) for analysis related to those categories referenced in the SDG&E-14 direct testimony. Please also refer to the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively) for more details regarding the utilities' RAMP Report.
c. SDG&E does not estimate the reliability improvements when evaluating the replacement of substation equipment. The SEA Team evaluates equipment based on many parameters, including:
    - Condition – Inputs include electrical testing, visual inspections, dissolved gas analysis, laboratory oil testing, etc.
    - Risk – Inputs include customer count, equipment rating, availability of spare equipment, etc.
    - Capacity
    - Cost
    - Feasibility
    - Maintenance trends and estimated useful life
    - Availablility of spare parts
    - Historical failures of like equipment
d. Equipment replacements are reviewed on an annual basis (see answer to 37e). Equipment currently on the list include: 12kV circuit breakers at Melrose, Pacific Beach, Kettner, Chicarita, and Barrett substations. LTC replacements have been

**Utility Response 37 Continued:**

identified at Encinita and Granite subsations, and transformer replacements at Morro Hill and San Mateo substations.

e. SDG&E utilizes a cross-functional committee (Substation Equipment Assessment Team, or SEA Team) to determine equipment replacement. Please refer to the testimony of Alan Colton on page AFC-8 for more information on the SEA Team.

f. Power Transformers, including the following voltage classes, have an expected life of 60 years. The expected life is based on SDG&E's experience with power transformers on its system, but can vary based on location and load profile.
   - 12/4kV
   - 69/4kV
   - 69/12kV
   - 138/12kV
   - 138/69kV
   - 230/69kV
   - 230/138kV
   - 500/230kV

g. Circuit breakers have an expected life based on the type of breaker as noted below. The expected life is based on SDG&E's experience with circuit breakers on its system, but can vary based on location and operational profile.
   - Air Breaker: 40 years
   - Gas Breaker: 20 years
   - Oil Breaker: 40 years
   - Vacuum Breaker: 40 years

h. Please see the accompanying Excel file, titled "TURN-SEU-003-Transformer and Breaker Age.xlsx"

i. Please refer to response in part e.

j. The percentage of the replacements was based on assumed workload capability of SDG&E personnel and reasonable schedule to limit an increase of equipment exceeding their estimated life and maintain a reasonable average life of equipment.

**Utility Response 37 Continued:**

k. SDG&E conducts an overall substation and equipment assessment to determine if SDG&E customers would benefit more from in kind equipment replacement , rebuild of equipment , or an overall substation rebuild. The parameters listed in 37c are taken into account for the entire substation along with forecasted planning data to determine the extent of equipment replacement/repair in a substation. Examples include:

Planning criteria requires more or larger equipment than is prudent to replace or rebuild in the current installation.

Transformer analysis determines that the remaining life is such that it would be prudent to replace the transformer or its Load Tap Changer (LTC).

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38. Regarding SF6 switch replacement (14249):

a. Please provide an estimate of the amount of gas that has leaked from these switches. Please provide all supporting workpapers.

b. Please provide a list of alternatives and costs to replacing the switches.

c. Please explain whether the existing SF6 switches will be taken out of rate base if they are replaced.

d. What is the probability that an SF6 switch will leak? Please explain and provide all supporting workpapers.

e. Please explain whether replacing SF6 switches is a safety or environmental issue.

**Utility Response 38:**

a. Based on historical analysis of recovering gas out of failed switches, over 50% of the switches contained less than 50% of its nameplate capacity. SDG&E objects to the request for "all supporting workpapers" as unduly burdensome.

b. The alternative to not replacing the switches would be to keep them energized until they're reached their end of useful life. The cost of replacing the switches at that time would be comparable to the costs outlined in the budget justification. However, SDG&E would not be limiting its exposure to the fines associated with GHG regulatory compliance. Fines could be as much as $25,000 per day per violation.

c. The existing SF6 switches would follow the same accounting protocol as other non-SF6 switch removals for rate base.

d. SDG&E does not have statistics predicting SF6 leak rate. However, due to the increase of leaking switches, about 15 years after they were first installed, SDG&E moved away from SF6 switches as the primary switchgear and moved to switches with alternative insulation mediums.

e. The proposed budget to replace SF6 switches addresses environmental concerns relating to compliance with AB32 and other environmental requirements, as well as to address the potential of switches that would not be operable during outages or maintenance activities or which, due to the absence of sufficient gas pressure, may be unsafe to operate.

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39. Regarding the Cleveland National Forest Power Line Replacement Projects:

a. Please provide the supporting evidence that the project is in a fire zone.

b. Please quantify the level of risk reduction if this project is accomplished. Please provide all supporting workpapers.

c. Was this project approved in a previous GRC? Please provide a Decision number and page reference.

d. Please quantify the benefits of this project and provide all calculations/workpapers.

e. For each forecasted cost from 2017-2019 please provide a breakdown of the exact activities and materials that drive these costs.

f. Please provide all RAMP related reports that justify this project.

g. Please explain what it means including the benefits of "consolidating over 70 individual Special Use Permits for existing electric facilities on National Forest lands into one Master Special Use Permit" (page 915 of workpapers).

h. Please quantify the risk reduction of replacing wood poles with steel poles in a forest.

**Utility Response 39:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting aspects of testimony and workpapers on this project, and/or information that has already been provided or is available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:

a. Please refer to Section D.08, Fire and Fuels Management, of the project Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The link is provided below.

http://www.cpuc.ca.gov/environment/info/dudek/CNF/MSUP-PTC_PowerLineReplacementProject_Vol1P1_Final_EIR-EIS.pdf

b. PCNF was included in SDG&E's RAMP report as a mitigation to the Wildfire risk (see I.16-10-015, RAMP Report Risk Chapter SDG&E-1 – Wildfires Caused by SDG&E Equipment, submitted on November 30, 2016). It should be noted that CNF includes a transmission and distribution component. Both were presented in SDG&E's RAMP Report, in accordance with Commission guidance. However, the transmission component of the CNF project is under the jurisdiction of the Federal Energy Regulatory Commission (FERC) and, therefore, is not included in SDG&E's GRC showing. The risk reduction benefits for the

distribution component of CNF were estimated as part of the System Hardening, Inspection & Repair Programs – Distribution mitigation grouping in the RAMP Report. Besides the Commission-required analysis provided in the RAMP, SDG&E has not undertaken additional risk reduction analysis of CNF.

The Wildfire risk chapter can be found on our website: http://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas. Workpapers for SDG&E's RAMP risk chapters can be accessed using the following steps:

- Visit the RAMP proceeding on SDG&E's website: https://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas.
- Click on "Discovery."
- Click on "CUE."
- The risk reduction benefit workpapers are shown as "CUE DR-01 RAMP RSE Workpapers." The cost-related workpapers are labeled as "CUE DR-01 Cost Workpapers."

c. Costs in the years 2014-2016 for Cleveland National Forest (CNF) were included in the 2016 GRC in two sections of Electric Distribution Capital Testimony:

1. Safety and Risk Management – see budget code 13282 in testimony (pg 118) and Capital Workpapers (pg 775-777), and see 6.2.2.1.5 for this category in CPUC GRC Decision document.
2. Transmission/FERC Driven Projects – see budget code 8165 in the testimony (pg 133) and Capital Workpapers (pg 856-867), and See 6.2.2.2.4 for this category in CPUC decision document.

Below are links to the Testimony, Workpaper, and CPUC 2016 GRC decision documents.

- Revised Prepared Direct Testimony of John Jenkins - Electric Distribution Capital: https://www.sdge.com/sites/default/files/regulatory/SDG%26E-09-R__John_Jenkins_Testimony_0.pdf
- Revised Capital Workpapers to Prepared Direct Testimony of John Jenkins: https://www.sdge.com/sites/default/files/regulatory/SDG%26E-09-CWP-R_EDIST.pdf

SDG&E's TY 2016 GRC costs and post-test-year mechanism were approved by adoption of settlement agreements, as described in GRC Decision (D.) 16-06-054: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M164/K606/164606603.pdf

d. Please refer to the Revised Plan of Development for this project, specifically sections 1 and 2 and the USDA Forest Service Record of Decision. The links are provided below.

http://www.cpuc.ca.gov/environment/info/dudek/CNF/POD2/CNF%20Revised%20POD%20(04-19-13S).pdf
http://www.cpuc.ca.gov/environment/info/dudek/CNF/MSUP_Final%20ROD_Mitigation_Appendix.pdf

e. Approximate forecasted costs from 2017-2019 for CNF include:

| CNF GRC Filing Figures 2017 - 2019 | | | |
|---|---|---|---|
| Cleveland National Forest MSUP | 2017 ($K) | 2018 ($K) | 2019 ($K) |
| Labor | 1,210 | 781 | 782 |
| Non-Labor | 24,945 | 38,428 | 39,253 |
| Total Direct Costs | 26,155 | 39,209 | 40,035 |

| | | | |
|---|---|---|---|
| Labor | 1,210.05 | 780.80 | 781.92 |
| Mgmt & Non-Union Labor | 556.64 | 780.80 | 781.92 |
| Union Labor | 653.41 | - | - |

| | | | |
|---|---|---|---|
| Non-Labor | 24,945.08 | 38,428.49 | 39,253.40 |
| EPC | 16,918.40 | 32,156.56 | 33,781.39 |
| Services | 6,958.83 | 5,996.16 | 5,319.97 |
| Other | 658.65 | 47.40 | 44.44 |
| Easements/ROW & Fee-Owned Property | 83.82 | 95.04 | - |
| Leased/Rented Property | 40.95 | 66.36 | 66.36 |
| Internal Settlements | 74.86 | 41.97 | 41.24 |
| Vehicle Utilization | 115.11 | - | - |
| Materials | 94.22 | - | - |
| Employee Costs | 0.24 | 25.00 | - |

f. Please refer to SDG&E's response to part b above.

g. Please refer to the Revised Plan of Development for this project, specifically sections 1 and 2 and the USDA Forest Service Record of Decision. The links are provided below.

http://www.cpuc.ca.gov/environment/info/dudek/CNF/POD2/CNF%20Revised%20POD%20(04-19-13S).pdf

http://www.cpuc.ca.gov/environment/info/dudek/CNF/MSUP_Final%20ROD_Mitigation_Appendix.pdf

h. Please refer to SDG&E's response to part b above.

**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 24, 2018**

40. Regarding the Electric Integrity Ramp project (162520):

    a. Please provide all RAMP analyses and supporting workpapers related to this project.

    b. Please provide a list of activities related to this project that are safety related versus activities that are reliability related.

    c. Regarding part (b) please identify the historic annual (2012-2016) and forecast (2017-2019) costs of each activity.

    d. Regarding the "overhead small wire and connector replacement" part of the program, please provide the following:

        i. All data that demonstrates that #6 and other small wire has a higher propensity to cause wire down, outage, or public safety incidents.

        ii. A definition of what wire sizes are considered "small" with explanation.

        iii. The number of wire down, outage, and public safety incidents (separately) on an annual basis from 2010-2016.

        iv. The number of wire down, outage, and public safety incidents (separately) from 2010-2016 involving or caused by small wire.

        v. The miles of small wire cable replaced annually from 2010-2016. Please provide all supporting workpapers.

        vi. An inventory of cable (miles) by size of cable at end of 2016. Please provide supporting workpapers.

        vii. The cost per replacement mile of cable. Please provide supporting documents/workpapers. Please explain whether the unit cost varies by cable size.

        viii. All evidence that replacing small wire cable will reduce safety incidences and "wire down" events.

        ix. Please explain how data will be tracked to demonstrate the success of this program.

    e. Regarding the "Switch Inspection and High Risk Replacement" portion of the program:

        i. Please provide or identify all RAMP related reports and supporting workpapers related to this project.

        ii. Please identify the number of safety incidences that occurred from 2010-2016 due to switch inspection.

        iii. Please explain how SDG&E will identify what switches to replace.

        iv. Please provide all evidence this program will reduce safety incidents.

**Question 40: Continued:**

v. Please explain how data will be tracked to demonstrate the success of this program.

f. Regarding "strategic undergrounding:"

i. Please provide or identify all RAMP related reports and supporting workpapers related to this project.

ii. Please explain how SDG&E will determine what areas to underground equipment.

iii. Please provide a list of equipment that will be targeted by SDG&E for undergrounding.

iv. Please provide unit costs for undergrounding equipment.

v. Please provide a list of the safety incidences caused by overhead conductors from 2010-2016.

vi. Please provide the quantitative impact on safety incidences this activity is expected to provide.

vii. Please explain how data will be tracked to demonstrate the success of this program.

**Utility Response 40:**
SDG&E objects to this request under Rule 10.1 as overly broad, vaguely worded and unduly burdensome. Subject to and without waiving this objection, SDG&E responds as follows:

a. See APPENDIX C of SDG&E-14 Direct Testimony of Alan Colton - Electric Distribution – Capital testimony. This section relates all budgets that support RAMP, including those under Reliability/Improvements. Refer to the RAMP filing (I.16-10-015/I.16-10-016 Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, November 30, 2016) for analysis related to those categories referenced in the SDG&E-14 direct testimony. Please also refer to the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively) for more details regarding the utilities' RAMP Report.
b. Safety and reliability goals are often interlinked, as discussed throughout testimony and SDG&E's RAMP Report. See below for a list of activities related to this project that are primarily safety related versus activities that are primarily reliability related.
    - Safety Related Activities
        - Post-Construction True-Up QA/QC (also known as Pole Risk Mitigation and Engineering; PRiME)

- Overhead small wire and connect replacement (also known as Wire Safety Enhancement; WiSE)
- Anchor rod maintenance (also known as Freeway Crossings)
- Annual Pole Reinforcement (GO 165)
- Pole Replacement (GO 165)
- Replace live front transformers and terminators

- Reliability Related Activities
  - SCADA capacitor deployment
  - Proactive cable replacement
  - Proactive at-risk identification and replacement of 600-amp tee connectors (also known as Tee Modernization Program; TMP)
  - Condition Based Maintenance (CBM) – gas circuit breakers, transformers, and batteries
  - Substation rebuild/replacements
  - Advanced SCADA infrastructure – relaying and communications
  - Replace degraded or non-functioning SCADA RTUs

ii. Activities that are both Safety and Reliability Related

- 4 kV Modernization
- Switch Inspection and High-Risk Replacement
- Avian Protection Systems (GO 165)
- Improvement of Overhead and Underground Service (GO 165)
- Strategic Undergrounding
- DOE ("Do Not Operate Energized") Switch Removal and Replacement Program
- Switch Replacement and Manhole Repair
- Proactively replace bridged cutout switches with SCADA gang operated or disconnect switches

c. Please refer to the capital workpapers submitted in testimony pages 741-764 for annual and forecasted spend for each activity in this budget.

d. Regarding the "overhead small wire and connector replacement" part of the program:

i. Based on 437 wire down event records evaluated by the Electric Risk Analysis team for years 2011-2016, 25% of wire downs involved #4 wires and 49% of wire downs involved #6 wires. Please see the accompanying Excel file, "TURN-SEU-003-Wire Gauge Mileage.xlsx". Please note this data do not represent all wire down events. Per the conductor data provided in section vi., these conductors also represent a large portion of the overall infrastructure. However, #4 and #6 both make up a disproportionately large ratio of the wire down events relative to their share of the system. These event records were collected pursuant to engineering investigations for equipment failure trends. For example, wire downs caused by vehicles contacting poles were not included because the event was not a result of equipment failure nor a design/construction issue.

ii. SDG&E classifies #4 and #6 overhead wire gauges as relatively small wire. These wires are generally more often used in rural areas that are also subjected to inclement weather. These wires were originally constructed due to customer load being generally sparse and lower in electric demand.

iii. The number of wire down, outage, and public safety incidents (separately) on an annual basis from 2010-2016 is shown below.

Sustained Primary Wire Down Outages (excludes Planned and Major Event Days (MED)):

2010 = 71

2011 = 70

2012 = 70

2013 = 67

2014 = 66

2015 = 60

2016 = 106

iv. SDG&E objects to this request as vague and ambiguous with respect to the meaning of "small wire." Subject to and without waiving this request, SDG&E responds as follows: SDG&E does not track or distinguish wire down, outage and public safety incidents with small wire distinctions.

v. SDG&E objects to this request as vague and ambiguous with respect to the meaning of "small wire." Subject to and without waiving this request, SDG&E responds as follows: SDG&E does not track the data as characterized in the question.

vi. Below is the approximate conductor in miles at the end of 2016.

| Conductor | Miles of Conductor |
|---|---|
| 636 ACSR AL | 525 |
| 336 ACSR AL | 207 |
| #2 AL/CU | 2,227 |
| #4 AL/CU | 1,363 |
| #6 CU | 1,550 |
| 1/0 AL/CU | 188 |
| 3/0 ACSR AL | 75 |
| 4/0 CU | 196 |
| OTHER | 206 |

vii. Costs may vary depending on additional scope required to complete proposed reconductoring (e.g. pole replacements, switch installations, advanced protection). Costs for replacements resembling the proposed scope are not available as this work has not yet commenced. Unit costs may also not be applicable as scope of work is determined on a per circuit basis in order to optimize risk reduction potential. Unit costs should not vary substantially between wire gauge being replaced, since most will be reconductored to the same #2 AL.

viii. This program targets reductions in potential safety risks in various areas of the electric distribution infrastructure. These risks, as elaborated in the RAMP filing, aim to reduce the likelihood of safety risks from occurring. However, they do not guarantee reductions in safety incidents. One of the most notable safety incidents referred to in the RAMP EII chapter is a wire down event with the potential to cause serious injury to the public or personnel. With the proposed wire safety enhancement (WiSE) program, SDG&E will seek to reinforce overhead distribution wires with more resilient wires and advanced system protection that will prevent wire downs and/or prevent energized wire down conditions from occurring. As aged and weathered small gauge wires, deteriorated or loosened connectors, and other wire down prone equipment are proactively replaced, the wire down event rate per conductor gauge is expected to reduce over time. These proactive infrastructure improvements will also enable SDG&E asset managers to deeply investigate construction standards to systematically strengthen system resilience in both urban and rural areas known to experience inclement weather or other environmental factors. Overall, the systematic improvements proposed in the RAMP chapter aim to address comprehensive infrastructure-related safety risks across overhead, underground, and substation equipment. These improvements are expected to drive further utilization of advanced technologies and improved methods, potentially yielding increased reliability and public safety.

ix. The Electric Risk Analysis team will closely monitor trends in equipment failures related to wire downs, particularly areas where such infrastructure

improvements have been made pursuant to this proposed program. The scope and bill of material for the proposed infrastructure will be evaluated for continual improvements over time in order to ensure technical specifications (e.g., conductor size, design/application criteria, system protection techniques, material specifications, etc.) are oriented to reduce safety risks.

e. Regarding the "Switch Inspection and High Risk Replacement" portion of the program:

iii. See APPENDIX C of SDG&E-14 Direct Testimony of Alan Colton - Electric Distribution – Capital testimony. This section relates all budgets that support RAMP, including those under Reliability/Improvements. Refer to the RAMP filing (I.16-10-015/I.16-10-016 Risk Assessment and Mitigation Phase Report of San Diego Gas & Electric Company and Southern California Gas Company, November 30, 2016) for analysis related to those categories referenced in the SDG&E-14 direct testimony. Please also refer to the Risk Management testimony chapters of Diana Day and Jamie York (Exhibit SCG-02/SDG&E-02, Chapters 1 and 3, respectively) for more details regarding the utilities' RAMP Report.

iv. SDG&E will identify and prioritize switches to be replaced by considering several factors including environmental impacts (e.g., corrosion-prone areas), reliability impacts (customer count), age, type, manufacturer, composition of metal connections (e.g. bimetals), and other factors continually being evaluated by engineers. Switches that are field-maintenance only (FMO) are not constructed with modern standards and are generally prioritized. Overhead switches are subject to more environmental forces and are generally prioritized ahead of underground switches. Upon inspection, switches that exhibit any real-time hot spots (significant temperature rises) are replaced with increased urgency.

v. SDG&E will identify and prioritized switches to be replaced by considering several factors including environmental impacts (e.g., corrosion-prone areas near the coast), reliability impacts (customer count), age, type, manufacturer, composition of metal connections (e.g. bimetals), and other factors continually being evaluated by engineers. Switches that are field-maintenance only (FMO) are not constructed with modern standards and are generally prioritized. Overhead switches are subject to more environmental forces and are generally prioritized ahead of underground switches. Upon inspection, switches that exhibit any real-time hot spots (significant temperature rises) are replaced with increased urgency.

vi. This program targets reductions in potential safety risks in various areas of the electric distribution infrastructure. These risks, as elaborated in the

RAMP filing, aim to reduce the likelihood of safety risks from occurring, however in no way guarantee reductions in safety incidents. This proposed program is largely informed by qualitative inputs provided by SDG&E field experts. These experts have provided accounts of several personnel safety risks associated with switch infrastructure. These risks include switch mechanical failures due to corroded and stuck switch positions, loose connections caused by weathering/aging (seating issues), and switch breakage upon actuation due to failed hardware. These personnel safety risks may be categorized as near-misses and are often controlled by sufficient training, safety protocols, and real-time corrective actions to avoid potential injuries (i.e., visual confirmation; de-energization for safety). Switch and switch hardware failures however have caused arcing or tracking on adjacent cross arms and poles, resulting in localized fires. These fires have not been known to cause injuries to the public or personnel, however possible. Replacing these aged switches with superior products that are more resilient to corrosion is expected to reduce the chance of fires or personal injury over time, such that personnel are not as dependent on added safety protocols.

vii. Where possible, SDG&E aims to explore advanced predictive data analytics techniques to gain insight regarding infrastructure failures and improve the capability to address them prior to failure. As a requirement for performing these analytics, data collection for existing conditions of infrastructure as well as post-mortem data (i.e., failure mode) are crucial in order to achieve reputable insights. SDG&E will continue to build upon a longstanding archive of detailed equipment failure reports (EFR), reliability records, and advanced geospatial visualizations (i.e. GIS data) to realize modern methods for managing electric assets through various paradigms such as reliability improvement, safety risk reduction, enterprise cost-benefits, etc. As SDG&E works toward proactively replacing assets, data are expected to be collected to help determine the strength or accuracy of the safety risk mitigating action (e.g., replacing a span of wire). For example, customized field data collection forms may be utilized to qualitatively or quantitatively measure the condition of the asset being replaced. Through this feedback, engineers and analysts can refine the targeted asset groups over time. The success of the EII safety risk mitigations will be tracked per individual project classification (e.g., wire safety, switch replacement, cable replacement, etc.) in order to understand the varying levels of individual project performance.

f. Regarding “strategic undergrounding:”

i. Please see information provided in SDG&E’s RAMP Report (available at https://www.sdge.com/regulatory-filing/20016/risk-assessment-and-

mitigation-phase-report-sdge-socalgas) and the accompanying Excel work paper, "TURN-SEU-003-Strategic Undergrounding.xlsx."

ii. SDG&E determines areas to be undergrounded via feedback obtained from engineers within the Electric Regional Operations group and is regularly captured through the Electric Risk Analysis team. Proactive undergrounding driven by the need to mitigate overhead safety risks is not common, however may be utilized when other less costly and more feasibly constructed solutions are exhausted. In areas where proactive undergrounding would have already been in queue as driven by other existing programs, this option will be utilized to expedite the work given the known near-term safety risk reduction benefits.

iii. Pursuant to this proposed program, a list of equipment targeted for strategic undergrounding due to wire down risks is not currently available.

iv. Unit costs are not available at this time.

viii. SDG&E experienced a serious overhead conductor-related safety incident in January 2016.

v. Expected quantitative impacts for this proposed program are not available.

vi. The success of the program will be measured by the reduction of wire-down failure events, as overhead conductors spans are strategically undergrounded.

**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 24, 2018**

41. Please provide a list of safety incidents each year from 2010-2016 and the corresponding cause in Excel format.

**Utility Response 41:**

SoCalGas/SDG&E objects to this request on the grounds that it is vague, ambiguous, and overbroad, with respect to the term "safety incidents." Subject to and without waiving this objection, SDG&E responds as follows: Please see the accompanying file, "Turn-SEU-003-SDGE Safety Incidents 2010-2016 Summary.xlsx" for a list of OSHA-reportable safety incidents each year from 2010-2016.

**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 24, 2018**

42. Will SDG&E track costs separately for each activity of the Electric Integrity Ramp project (16252)? Please explain.

**Utility Response 42:**

The success of the Electric Infrastructure Integrity RAMP safety risk mitigations will be tracked per individual project classification (e.g. wire safety, switch replacement, cable replacement, etc.) in order to understand the varying levels of individual project performance. This is expected to help determine activity success per asset class and may inform investment and resource allocation strategies.

**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 24, 2018**

43. Regarding Pole Risk Mitigation and Engineering (PRiME)

a. Please provide or identify all RAMP related reports and supporting workpapers related to this project.

b. Please provide the unit costs of pole replacement in each year 2012-2016.

c. Please provide all workpapers that justify the costs of this program.

d. Please explain whether the costs of this project are to analyze poles or to actually replace poles. Please identify the costs of each of this activity forecast for 2017-2019.

e. Page AFC-125, lines 19-21 state "This occurred with FiRM. SDG&E embarked on the program with an initial strategy, but as data came in and construction progressed, SDG&E saw the need to alter the methodology and approach for that program." Please explain this statement including why SDG&E altered the program.

f. Please explain how the pilot phase was determined to replace or analyze 1,600 poles ramping up to 22,600 poles in 2019. Please provide all supporting workpapers.

g. Please provide the number of poles SDG&E expects to replace in each year from 2017-2019.

h. Please provide all reports and workpapers related to this program to-date.

i. Please provide the quantitative impact on safety due to this program.

j. Please provide all evidence of any proven impact on safety due to this program.

**Utility Response 43:**
SDG&E objects to this request under Rule 10.1 as overly broad and unduly burdensome, to the extent that it seeks "all" documents supporting aspects of testimony and workpapers on this project, and/or information that has already been provided or is available to TURN. Subject to and without waiving this objection, SDG&E responds as follows:

a. PRiME was included in SDG&E's RAMP report as a mitigation to the Electric Infrastructure Integrity (EII) risk (see I.16-10-015, RAMP Report Risk Chapter SDG&E-12 – Electric Infrastructure Integrity, submitted on November 30, 2016, at SDGE 12-17) It is also referred to in the RAMP report as the Post-Construction True-Up Quality Assurance and Quality Control (QA/QC) program. The EII risk chapter can be on our website: http://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas. Workpapers for SDG&E's RAMP Records Management risk chapters can be accessed using the following steps:
    - Visit the RAMP proceeding on SDG&E's website: https://www.sdge.com/regulatory-filing/20016/risk-assessment-and-mitigation-phase-report-sdge-socalgas.
    - Click on "Discovery."

- Click on "CUE."
- The risk reduction benefit workpapers are shown as "CUE DR-01 RAMP RSE Workpapers." The cost-related workpapers are labeled as "CUE DR-01 Cost Workpapers."

b. The unit cost to replace a pole from 2012-2016 vary based on the complexity of the work. Approximately $25,000 per pole was used based on similar construction activities.

c. Refer to response in f below. SDG&E used the following methodology to determine pole counts for the years 2018 and 2019:

The pilot phase of 1600 poles will allow SDG&E to achieve a higher confidence level to verify pole failure rates to further assist in project forecasting.

SDG&E will ramp from 1600 poles in 2018 to 22,600 poles in 2019 in order to ensure SDG&E can complete pole analysis within SDG&E's Fire Threat Zone/Highest Risk Fire Areas by 2021.

Refer to item g response: Number of poles to be replaced and/or analyzed was determined as a result of data collected from SDG&E's CMP program.

Cost data was determined by using average costs based on other SDG&E programs for each activity required to meet the specific task e.g., pole analysis, pole replacement, or pole rearrangement.

d. The costs include both analysis and replacement/rearrangement of poles.

- 2017 Approximations
  - Project Management = $270K
- 2018 Approximations
  - Analysis = $1.78M
  - Construction = $2.80M
- 2019 Approximations
  - Analysis = $5.83M
  - Construction = $34.60M

e. The change in strategy was the evolution of FiRM throughout its lifecycle from 'Pole Care' in 2013 (focus on poles) to today where we take a more comprehensive approach (focus on wire, connectors, and poles) to minimizing fire risk by leveraging the Wildfire Risk Reduction Model (WRRM) and internal stakeholder meetings to help identify and prioritize the work to reduce fire risk. The WRRM takes into account various data points such as asset information, asset failure rates, and fire modeling theory and governing equations and provides

a quantitative evaluation to help identify and prioritize the scope of work. The results of the WRRM are then reviewed and discussed amongst the internal stakeholders at SDG&E, including operations and engineering, to validate results and refine the scope of work.

f. The pilot phase of 1600 poles will allow SDG&E to achieve a higher confidence level to verify pole failure rates to further assist in project forecasting. SDG&E will ramp from 1600 poles in 2018 to 22,600 poles in 2019 in order to ensure SDG&E can complete pole analysis within SDG&E's Fire Threat Zone/Highest Risk Fire Areas by 2021.

g. The number of poles SDG&E expects to replace in each year from 2017-2019 is shown below.

- 2017 Pole Replacements
  - No pole replacements
- 2018 Pole Replacement Approximations
  - 1600 to be analyzed
  - 112 pole replacements
  - 48 pole rearrangements
- 2019 Pole Replacement Approximations
  - 22,600 to be analyzed
  - 1,582 pole replacements
  - 678 pole rearrangements

h. Refer to response in f above. SDG&E used the following methodology to determine pole counts for the years 2018 and 2019:

The pilot phase of 1600 poles will allow SDG&E to achieve a higher confidence level to verify pole failure rates to further assist in project forecasting.

SDG&E will ramp from 1600 poles in 2018 to 22,600 poles in 2019 in order to ensure SDG&E can complete pole analysis within SDG&E's Fire Threat Zone/Highest Risk Fire Areas by 2021.

Refer to item g response: Number of poles to be replaced and/or analyzed was determined as a result of data collected from SDG&E's CMP program.

Cost data was determined by using average costs based on other SDG&E programs for each activity required to meet the specific task, e.g. pole analysis, pole replacement, or pole rearrangement.

i. SDG&E estimated potential risk reduction benefits in its RAMP report pursuant to D.14-12-025 and D.16-08-018. The risk reduction benefits for PRiME were estimated as part of the larger overhead mitigation grouping in the RAMP report. Besides the analysis provided in the RAMP, SDG&E has not undertaken additional quantitative impact on safety for the PRiME program. As stated in Exhibit SDG&E-14-R, Revised Testimony of Alan Colton, on page AFC-125, in 2018 SDG&E plans to perform a quantitative pilot based on 1,600 poles. The "[r]esults from the pilot phase will be used to prioritize future year projects based on risk and to further define cost" (Exhibit SDG&E-14-R at AFC-125 lines 23-24).

j. As mentioned in the response to part i above, SDG&E plans to perform a quantitative analysis in the form of a pilot in 2018 to provide the impacts on safety due to this program.

**TURN DATA REQUEST-03**
**SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8**
**SDG&E_SOCALGAS RESPONSE**
**DATE RECEIVED: DECEMBER 20, 2017**
**DATE RESPONDED: JANUARY 24, 2018**

44. Regarding the Advanced Energy Storage Project (11247):

a. Please provide the list of circuits energy storage will be installed on. Please include all relevant identifying information for each circuit.

b. Please provide the number of circuits storage will be installed on.

c. Please provide the number of times reverse power flow has been experienced on each of the circuits listed in part (a).

d. Please provide the percentage of annual peak load PV generation comprises on each of the circuits listed in part (a).

e. Please provide the percentage of annual minimum load PV generation comprises on each of the circuits listed in part (a).

f. Please provide all supporting workpapers that support the costs for this project, including the capacity of storage that will be installed and the cost per kWh.

g. What alternatives exist to installing energy storage on high PV circuits? Please explain and provide a unit cost for each alternative, and explain why the alternative was not selected.

h. Please explain why SDG&E does not propose this project as part of the energy storage mandate or AB 2868.

**i.** Please provide a list of battery storage installations, including capacity of the storage, in SDG&E's territory and the primary and secondary uses (purpose) of the storage installation.

**Utility Response 44:**

a. SDG&E has identified potential circuits, but has not finalized a list. SDG&E is still completing engineering analysis to verify these locations.

b. This project will install up to six energy storage systems.

c. The number of times reverse power flow has been experienced is still in the engineering and planning phase, and these circuits have not been determined.

d. The percentage of annual peak load PV generation comprised is still in the engineering and planning phase, and these circuits have not been determined.

e. The percentage of annual minimum load PV generation comprised is still in the engineering and planning phase, and these circuits have not been determined.

f. The forecasted costs are shown below.

2018

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Energy Storage Unit | EA | 2 | $3,880.5 |
| DERMS Integration | EA | 2 | $120.0 |
| Labor | HR | 20,981 | $1,154.0 |
| Total | | | $5,154 |

2019

| Description | Unit | Quantity | Cost ($1000) (material, direct charges, contract costs) |
|---|---|---|---|
| Energy Storage Unit | EA | 4 | $7,761.0 |
| Labor | HR | 40,709 | $2,239.0 |
| Total | | | $10,000 |

g. SDG&E has explored other power electronic devices in the pilot arena, and the technology continues to emerge. At this time, energy storage systems, coupled with inverter technology, provide the most operational flexibility and functionality, and provide renewable integration in the evening hours when the sun is not shining.

h. SDG&E will be proposing projects to deploy energy storage, as part of AB 2868. The Advanced Energy Storage Project will focus on distribution circuits that have high concentration of PV penetration.

i. A list of battery storage installations, including capacity of the storage, in SDG&E's territory and the purpose of the storage installation is shown below.

| **Project** | **ES Size (kW)** | **Energy (kWh)** | **Purpose** |
|---|---|---|---|
| Borrego Microgrid Yard- SES1 | 500 | 1500 | Reliability |
| Borrego Microgrid Yard- SES2 | 1000 | 3000 | Reliability |
| Pala Energy Storage Yard | 500 | 1500 | Renewable Integration & Reliability |
| Pala Unit 2 | 1000 | 2000 | Renewable Integration & Reliability |
| Mission Valley - Skills Training Center | 25 | 72 | Testing & Training |
| Clairemont | 25 | 72 | Renewable Integration |
| Poway | 25 | 72 | Renewable Integration |

| | | | |
|---|---|---|---|
| Borrego Springs CES | 25 | 50 | Renewable Integration & Reliability |
| Borrego Springs CES | 25 | 50 | Renewable Integration & Reliability |
| Borrego Springs CES | 25 | 50 | Renewable Integration & Reliability |
| Century Park CES | 50 | 82 | Testing & Training |
| Energy Inovation Center- Indoor | 4.5 | 10.7 | Testing & Training |
| Energy Inovation Center- Outdoor | 10 | 10 | Testing & Training |
| San Diego Zoo | 100 | 130 | Renewable Integration & Vehicle Charging |
| UCSD MESOM | 6 | 10.7 | Renewable Integration & Reliability |
| Suites at Paseo (SDSU Private Dormitories) | 18 | 32.1 | Renewable Integration & Reliability |
| Del Lago Academy | 100 | 200 | Renewable Integration & Reliability |
| Ortega Highway (Quest) 1243 Unit 1 | 1000 | 3000 | Existing Project Delayed |
| Ortega Highway (Quest)1243 Unit 2 | 1000 | 3000 | Existing Project Delayed |
| Carmel Valley (Canyon Crest) | 1000 | 3000 | Renewable Integration & Reliability |
| Santa Ysabel Substation | 6 | 11 | Renewable Integration & Reliability |
| Santa Ysabel Substation | 30 | 36 | Renewable Integration & Reliability |
| Caltrans Park-N-Ride Del Lago (OPRA) | 200 | 400 | Vehicle Charging |
| ITF (OPRA) | 200 | 400 | Testing & Training |
| Civita Microgrid | 125 | 200 | Renewable Integration & Reliability |

| | | | |
|---|---|---|---|
| Miguel Substation | 3,000 | 8,000 | Renewable Integration |
| El Cajon BESS 1 | 7,500 | 30,000 | Resolution E-4791 |
| Escondido BESS 1 | 10,000 | 40,000 | Resolution E-4791 |
| Escondido BESS 2 | 10,000 | 40,000 | Resolution E-4791 |
| Escondido BESS 3 | 10,000 | 40,000 | Resolution E-4791 |