



**Case:** A.20-09-019  
**ALJ:** Nojan  
**Witness:** PG&E - Cullings

**TURN Cross Examination Exhibit**

**Exhibit Number: TURN-**

Section from PG&E Testimony in the 2020 GRC (A.18-12-009)

Concerning Conductor Replacement

Application: 18-12-\_\_\_\_\_  
(U 39 M)  
Exhibit No.: (PG&E-4)\_\_\_\_\_  
Date: December 13, 2018\_\_\_\_\_  
Witness(es): Various

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**PACIFIC GAS AND ELECTRIC COMPANY**

**2020 GENERAL RATE CASE**

**PREPARED TESTIMONY**

**EXHIBIT (PG&E-4)**

**ELECTRIC DISTRIBUTION**

**CHAPTERS 1 – 10**

**VOLUME 1 OF 2**

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PACIFIC GAS AND ELECTRIC COMPANY  
CHAPTER 9  
DISTRIBUTION OVERHEAD SYSTEM HARDENING AND RELIABILITY

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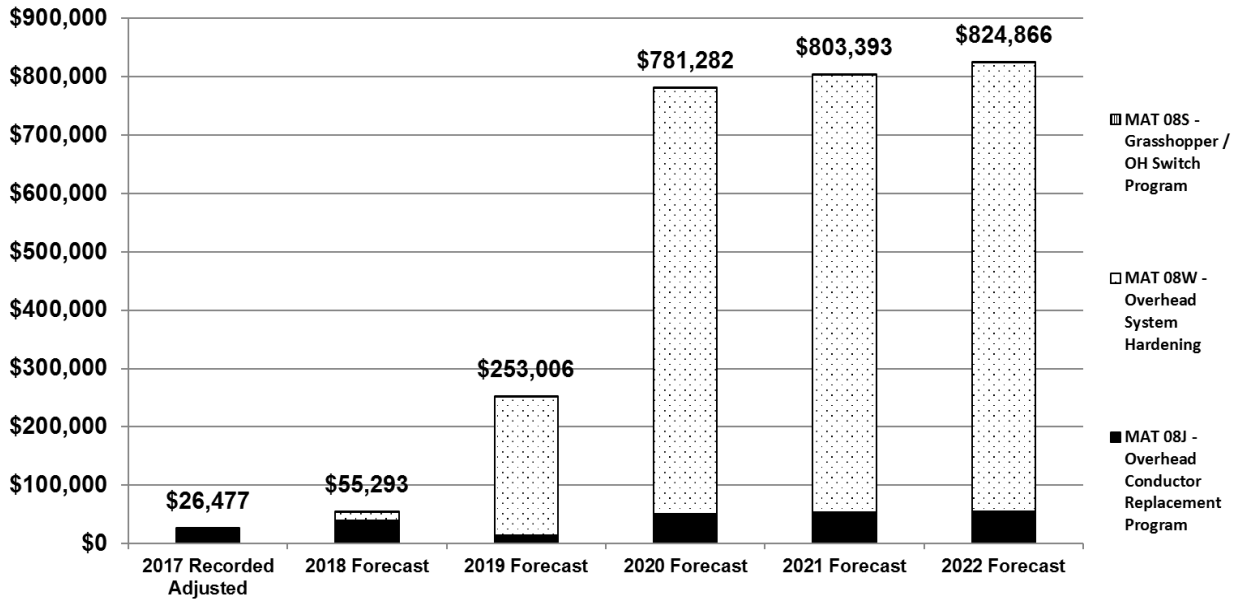
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CHAPTER 9  
DISTRIBUTION OVERHEAD SYSTEM HARDENING AND RELIABILITY

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**FIGURE 9-4**  
**MWC 08 CAPITAL FORECAST 2017-2022**  
**(THOUSANDS OF NOMINAL DOLLARS)**



### 1) Overhead Conductor Replacement Program (MAT 08J)

PG&E's electric distribution system includes approximately 81,000 circuit miles of overhead conductor, including approximately 50,000 miles of small conductor. PG&E forecasts an increase in overhead conductor replacement work to address annealed or deteriorated conductors and improve system safety and integrity.

A conductor may become annealed if it is subjected to excessive heating, typically as a result of multiple instances of fault current and/or high loads over its operating life. This heating, which is due to fault current and subsequent cooling, can alter the mechanical properties of the conductor, causing it to become weaker and potentially sag more. The conductor's electric current carrying capacity can also decrease as its cross-sectional area shrinks. When overhead conductors become annealed and/or deteriorated, proactively replacing the conductor is an effective way to mitigate overloads and failure rates.

As part of the 2017 GRC Settlement Agreement (Section 3.2.2.5.), PG&E agreed to perform a study on its overhead conductor assets and to use this study to help develop its future

1 GRC application. PG&E contracted with National Electric Energy  
2 Testing Research and Applications Center (NEETRAC) to perform a  
3 study on the overhead distribution conductors within its electric  
4 distribution system.

5 The NEETRAC study utilized PG&E's asset inventory data,  
6 electrical outage data, engineering investigation database  
7 information, and other industry benchmarking data to help establish  
8 a distribution of service life, the near-term replacement rate, and  
9 long-term steady-state replacement rates. In addition, the study  
10 provided forecasts of various levels of expected asset performance  
11 based on targeted replacement rates, system geography,  
12 maintenance rates and practices, and desired performance  
13 expectations (failure rates).

14 The study recommended various refinements to PG&E's  
15 overhead conductor asset program, including: (1) expanding the  
16 current Engineering Investigation Database to capture additional  
17 outage and asset data; (2) re-performing the longevity analysis  
18 contained in the NEETRAC study utilizing the expanded  
19 Engineering data set; and (3) inclusion of condition and operating  
20 data to drive proactive replacements through a data-driven span  
21 health index.<sup>26</sup>

22 The results of the NEETRAC study informed PG&E's decision  
23 to forecast replacing an average of 54.4 miles of overhead  
24 conductor annually in 2018-2019, and an average of 97.3 miles  
25 annually from 2020-2022 as part of its Overhead Conductor  
26 Replacement Program.<sup>27</sup> To fund this work, PG&E forecasts  
27 annual expenditures of \$39.8 million in 2018, \$15.0 million in 2019,  
28 \$50.7 million in 2020, \$53.5 million in 2021, and \$54.9 million in  
29 2022.<sup>28</sup> PG&E's 2020 forecast of \$50.7 million is \$27.6 million

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**26** See WP 9-43, Exhibit (PG&E-4) for NEETRAC's final report containing the results of this study.

**27** See WP 9-13, Line 4, Exhibit (PG&E-4).

**28** See WP 9-12, Line 8, Exhibit (PG&E-4).

1 more than its 2017 expenditures of \$23.1 million.<sup>29</sup> In 2017, PG&E  
2 replaced approximately 47 miles of overhead conductor as part of  
3 the MAT 08J Program.<sup>30</sup> Expenditure levels in MAT 08J are being  
4 reduced in 2019 to allow resources to focus on the ramping up of  
5 the Overhead System Hardening Program in MAT 08W as  
6 described below.

7 Starting in 2018, wire down-related conductor replacement has  
8 been combined with other conductor replacement in MAT 08J. This  
9 activity was previously tracked in MAT 08W, which has been  
10 repurposed for the Overhead System Hardening Program,  
11 described below.

## 12 **2) Overhead System Hardening (MAT 08W)**

13 PG&E's forecasts annual expenditures of \$14.8 million in 2018,  
14 \$236.9 million in 2019, \$729.5 million in 2020, \$748.8 million  
15 in 2021, and \$768.8 million in 2022 in MAT 08W for its new  
16 Overhead System Hardening Program.<sup>31</sup> PG&E initiated the  
17 program in 2018 with a series of small-scale projects to examine the  
18 advantages and disadvantages of different types of equipment from  
19 different vendors (e.g., steel and composite poles from multiple  
20 manufacturers; various types of insulated conductor, including the  
21 Hendrix system) and different construction approaches, including  
22 undergrounding of primary and/or secondary lines. In 2019, PG&E  
23 will incorporate lessons learned from the previous year's work and  
24 ramp up the program to rebuild a forecast level of 200 circuit miles  
25 of lines. From 2020-2022, PG&E forecasts increasing the volume of  
26 the program to approximately 600 circuit miles per year.

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<sup>29</sup> See WP 9-12, Line 8, Exhibit (PG&E-4).

<sup>30</sup> PG&E also replaces overhead conductor through various other programs related to distribution, transmission and substation work. PG&E estimates that it replaced approximately 239 miles of overhead conductor across all programs in 2017.

<sup>31</sup> PG&E recorded \$2.9 million in MAT 08W in 2017, but that spending was for conductor replacement related to wire down events. As discussed above, that activity has now been moved to MAT 08J. See WP 9-12, Line 10, Exhibit (PG&E-4).