**CPUC Docket:** A.23-05-010
**Exhibit Number:** TURN-20
**Witness:** Eric Borden

# PREPARED SURREBUTTAL TESTIMONY OF ERIC BORDEN

# ADDRESSING PORTIONS OF SOUTHERN CALIFORNIA EDISON'S REBUTTAL TESTIMONY REGARDING WILDFIRE GRID HARDENING INVESTMENTS

Submitted on Behalf of

**THE UTILITY REFORM NETWORK**

360 Grand Avenue, #150
Oakland, CA 94610

Telephone: (415) 929-8876
E-mail: tlong@turn.org

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# TABLE OF CONTENTS

# I. INTRODUCTION AND SUMMARY

In its wildfire grid hardening rebuttal testimony responding to The Utility Reform Network's (TURN's) recommendations in opening testimony, Southern California Edison (SCE) presents results of a new analysis (referred to as rebuttal or new analysis)1 which includes a comparison of the cost-effectiveness of its proposed targeted undergrounding (TUG) scope with covered conductor (CC) and Rapid Earth Fault Current Limiters (REFCL) on a circuit segment basis. The utility's analysis appears to reach different conclusions about the relative cost-effectiveness of these alternatives than what was presented in TURN's opening testimony.[2]

TURN has not had the opportunity to scrutinize the reasonableness of most of SCE's assumptions and inputs in its rebuttal analysis. Nevertheless, TURN demonstrates herein that SCE's rebuttal analysis does not accurately reflect TURN's proposal: when modified to correct for key assumptions that better reflect TURN's actual proposal, the analysis bolsters TURN's findings that covered conductor, or covered conductor with REFCL when it is economically feasible, is significantly more cost-effective than TUG. We find the following:

- While SCE's proposed unit costs for REFCL in the GRC proposal is about $100,000 per overhead mile,[3] SCE's rebuttal analysis estimates unit costs of REFCL between $0 and $1.3 billion, a weighted average cost (by miles) of about $5 million per mile. This inaccurately reflects TURN's proposal as advocating for REFCL (with covered conductor) at any cost, even if clearly uneconomic for certain circuit segments.[4]

- By instituting a unit cost limit for REFCL of $200,000 per mile -- above which the alternative to which undergrounding would be compared is CC without REFCL -- and leaving all other assumptions the same as SCE's, SCE's new

[1] SCE-15, Vol. 5, Part 2 ("SCE Rebuttal Testimony"), pp. 8, 18-19, 30-31, 34 and Appendix B, pp B1-B16.
[2] TURN-12, pp. 24-26.
[3] SCE response to DR TURN-SCE-40 Q7 and Excel attachment "TURN_SCE_040_7abe.xlsx" (attached to TURN-12-Atch1, pp. 14-15).
[4] These unit costs are based on a "high level desktop exercise" conducted by SCE which cannot be adequately scrutinized for reasonableness in the limited time before evidentiary hearings. See SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis," tab "Unit Costs."

rebuttal analysis continues to support TURN's conclusions presented in opening testimony. Assuming this reasonable unit cost threshold, SCE's rebuttal analysis demonstrates that CC, or CC with REFCL, is more cost-effective than TUG for 565 out of 580 total SRA miles, 97.5 percent of miles in the SRA.

- The 15 miles where SCE's analysis shows TUG is more cost-effective than CC or CC with REFCL is more than subsumed by TURN's recommendation for 177 miles of TUG from 2025-2028. Not only does SCE's analysis continue to support TURN's recommended scope, it also supports the applicability and feasibility of TURN's recommended location-specific analysis.

The ensuing sections present background information, modifications to SCE's analysis to make it a better comparison with TURN's proposal, and results of this analysis.

## II. BACKGROUND

TURN's analysis in opening testimony relies on SCE's risk modeling results to demonstrate that "covered conductor is more cost-effective than undergrounding" for "each [5 percent] risk percentile."[5] While SCE does not directly dispute TURN's analysis, it does present a wholly new analysis, relying on a new set of data, assumptions, and calculations, to find that "TUG has a higher BCR [benefit cost ratio] over 50% of the time [compared with CC/REFCL]."[6] SCE presents the following table that purports to show TUG cost-effectiveness is greater than CC with REFCL for 257 out of 459 circuits, which corresponds to 245 miles in areas SCE has determined are a "Severe Risk Area" (SRA), a total of 580 miles.

**Figure 1. SCE rebuttal cost-effectiveness findings (TUG vs. CC/REFCL)**

| | 2025 | 2026 | 2027 | 2028 | Total |
|---|---|---|---|---|---|
| Total Circuit Projects | 38 | 105 | 185 | 131 | 459 |
| Circuits with TUG BCR > CC/REFCL++ BCR | 17 | 53 | 113 | 74 | 257 |

*Source: SCE-15, Vol. 5, Part 2 ("SCE Rebuttal Testimony"), Figure II-11, p. 31.*

[5] TURN-12, p. 26, referencing Figure 14.
[6] SCE-15, Vol. 5, Part 2 ("SCE Rebuttal Testimony"), p. 30.

SCE's new analysis incorporates numerous additional calculations and assumptions, most of which we have not had time to scrutinize for accuracy given the case schedule. The primary elements we have identified driving the results of SCE's analysis are as follows.

- SCE includes vegetation management, inspections, operation and maintenance (O&M), and capital remediation costs in its costs for covered conductor and REFCL, which increases the costs of this remediation relative to TUG. In the limited time available, TURN has not had an opportunity to scrutinize the reasonableness of the costs that SCE included in these categories.
- SCE uses more granular unit cost estimates for CC and REFCL than its direct testimony/S-MAP analysis, which used higher level averages.
    - In the rebuttal analysis, CC unit costs range from $560,000 to $1,000,000 per region.
    - TUG unit costs are not made more granular and shown as an average of $4.7 million per mile for all projects and regions.[7]
    - REFCL unit costs range from $0 to $1.3 ***billion*** per mile.[8]
- SCE conducts the analysis only for the SRA and not all of the HFRA.
- SCE estimates a present value revenue requirement (PVRR) based on various factors and a 7 percent discount rate.
- SCE includes risk reduction calculations by circuit and converts these values to dollars. The workpapers do not have any supporting calculations for these values in the analysis.
    - As a result, it is not clear whether the analysis incorporates the time benefit of CC vs. TUG.
    - Nor is it clear how risk reduction was apportioned to SRA circuit segments.
- SCE states that, in its new analysis, REFCL costs were "allocated to [the] SRA."[9] It is not clear what exactly this means and how it was accomplished.

[7] See SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis," tab "Unit Costs."
[8] Ibid.
[9] SCE Rebuttal Testimony, p. 30.

- REFCL unit costs are based on a "high level desktop exercise" conducted by SCE.[10] Details of this analysis are not provided in the rebuttal analysis workpapers.

- "Capital remediation" costs are a large cost driver in SCE's analysis affecting the cost-effectiveness of CC and REFCL vs. TUG. It is not clear what these costs comprise and whether these costs could be allocated between REFCL and CC.[11]

    - It is also not clear whether TUG estimates for these costs are accurate.

- There is a discrepancy in SCE's calculations for some circuit segments between capital cost estimates for CC/REFCL on different tabs.[12]

    - TURN's analysis presented herein may be conservative because we use capital costs for CC/REFCL that are generally higher than those used by SCE due to this discrepancy.[13]

For purposes of the modified analysis presented in this testimony, TURN does not change most of the parameters of SCE's analysis. This is solely because of the limited time available to prepare this surrebuttal and should not be viewed as agreement that SCE's methodology is correct with respect to the aspects I did not change.

## III. SCE'S NEW REBUTTAL ANALYSIS DOES NOT ACCURATELY REFLECT TURN'S PROPOSAL

SCE's proposed unit cost for REFCL deployment in its direct testimony is about $100,000 per overhead mile.[14] By contrast, the weighted average unit cost by miles included in SCE's analysis is about $5 *million* per mile.[15] My testimony in TURN-12 was that REFCL should be deployed

[10] SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis," tab "Unit Costs."
[11] In my analysis presented below which segregates out the cost-effectiveness of covered conductor if deployed alone, I attribute all capital remediation cost to covered conductor, which may be a conservative assumption.
[12] I have not had an opportunity to examine this issue for TUG costs.
[13] The average difference is about 6 percent. This affects around 72 miles out of 580 in total. SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis."
[14] SCE response to DR TURN-SCE-40 Q7 and Excel attachment "TURN_SCE_040_7abe.xlsx" (attached to TURN-12-Atch1, pp. 14-15).
[15] Calculated from SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis." This includes escalation. TURN estimated present value revenue requirement of these costs in the same fashion as SCE and applied to implied unit costs (REFCL CAPEX / miles) on each year's "Estimated Costs" sheet.

where it is "feasible" in conjunction with covered conductor..[16] The major flaw of SCE's new rebuttal analysis is that it inaccurately reflects TURN's proposal by ascribing unrealistic and infeasible costs for REFCL, and incorporating these into its comparison between CC/REFCL and TUG; including these costs for locations where SCE's analysis shows it would not be economic to deploy REFCL[17] skews the cost-effectiveness comparison in favor of TUG.

SCE estimates such inflated costs for REFCL – in the most egregious instances, more than $1 billion per mile for a few circuit segments - that it is clear REFCL is not (if SCE's unit cost estimate is accurate) an applicable technology for these segments. It is also possible that SCE has not properly assigned costs to SRA circuit segments in a way that matches costs and benefits.[18] Whatever the reason for the extremely high localized REFCL costs for some segments, in these cases, the more appropriate comparison is between CC (without REFCL) and TUG.

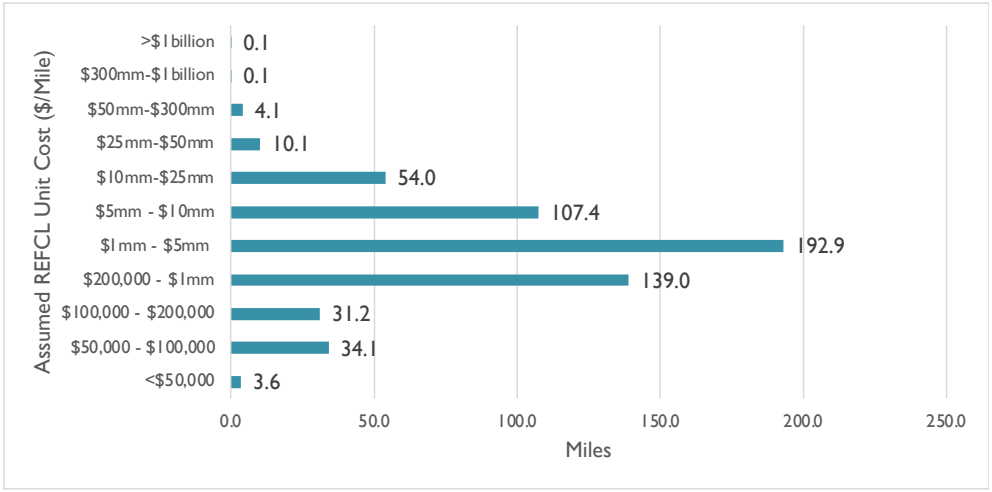
The following figure shows the inflated unit costs assumed for REFCL deployment, which drive SCE's contention, shown above, that TUG is more cost-effective than CC and REFCL 50 percent of the time.

[16] TURN-12, pp. 24, 31.

[17] I do not mean to suggest that I accept SCE's location-specific REFCL unit cost estimates. In the limited time to prepare this testimony, I have not had an opportunity to scrutinize the reasonableness of those estimates and how they were determined.

[18] SCE's rebuttal testimony at page 30 states "the costs of REFCL are allocated to SRA." While the exact meaning of this statement is unclear, it is possible SCE has assigned the entire estimated REFCL cost of serving a larger geographic area to a smaller number of miles, which is inappropriate because: 1) it is not accurate, and 2) likely creates a mis-match between estimated costs and benefits if itdoes not count risk reduction benefits outside of the SRA. If this is the case, SCE is inaccurately calculating the benefit-cost ratio by comparing benefits for a small circuit segment versus costs for a much larger area. In the limited time to prepare this testimony, I have not yet had an opportunity to conduct the discovery necessary to investigate this concern.

**Figure 2. SCE assumed REFCL unit costs ($/mile)**




*Source: Calculated from SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis," tab "estimated costs." Include SCE's assumptions regarding present value revenue requirement.*

The figure shows that only 69 of approximately 580 SRA miles are below the $200,000 unit cost cutoff.

## IV. SCE'S REBUTTAL ANALYSIS, WHEN MODIFIED TO INCLUDE ONLY *FEASIBLE* REFCL DEPLOYMENT, SUPPORTS TURN'S TUG RECOMMENDATIONS AND DEMONSTRATES THE UNREASONABLENESS OF SCE'S PROPOSAL

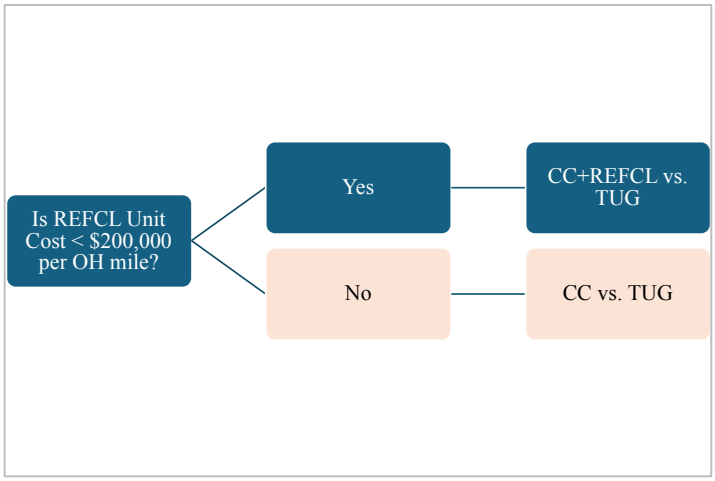
Rather than assume REFCL would be deployed regardless of feasibility, TURN utilized SCE's rebuttal workpapers to model a comparison of TUG, CC, and CC with REFCL in a manner that offers an improved comparison between TURN's and SCE's proposals. Namely, for purposes of this analysis (prepared in the limited time after receiving SCE's new rebuttal analysis) we leave all assumptions the same as SCE's, except for: 1) segregating out costs and benefits for covered conductor deployment, assuming 72 percent mitigation effectiveness for CC;[19] 2) imposing a reasonable limit on REFCL unit costs of $200,000 per mile and for those circuit projects, using

[19] SCE-04, Vol. 5, Part 2A, p. 39. This was multiplied by the assumed risk reduction of TUG (approximately 100 percent of risk, though this was not included in SCE's workpapers) to derive risk reduction of covered conductor.

SCE's calculated benefit-cost ratio in most cases[20] and 3) for the other circuit projects, calculating the benefit-cost ratio of just covered conductor deployment.

If REFCL unit costs exceed $200,000 per mile for a given circuit, the cost-effectiveness of covered conductor was compared with TUG. If it was less, SCE's BCR comparison (CC+REFCL vs. TUG) was adopted. This logic is displayed in the figure below.

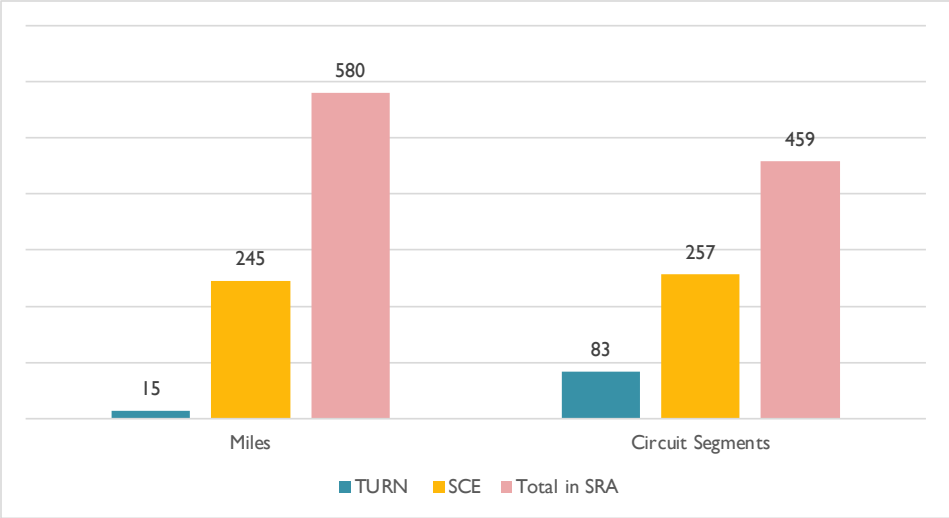
**Figure 3. Cost-effectiveness comparison to better reflect TURN's proposal**




The results of this analysis, which more closely aligns to TURN's proposal but incorporates assumptions in SCE's rebuttal analysis, including additional costs of vegetation management and capital remediation costs for CC or CC with REFCL, is that the BCR for TUG is higher than TURN's recommendation for just 15 miles in SRA, as shown in Figure 4.

[20] As noted above, in some instances there was a discrepancy in cost data used by SCE in its analysis. In those instances, if CC and REFCL were compared with TUG (REFCL unit costs were less than $200,000 per mile), CC and REFCL costs were sourced from the "estimated costs" tabs for each year, grossed up by SCE's assumed factors to calculate present value revenue requirement. The average difference between costs is about 6 percent, affecting around 72 miles out of 580 in total. SCE rebuttal workpapers, "A2305010-Confidential_Appendix B_ Benefit Cost Ratio Analysis."

**Figure 4. Modified rebuttal analysis: segments and miles where BCR of TUG is greater than CC or CC/REFCL**




Instead of the 56 percent of circuit segments cited by SCE, just 18 percent of circuit segments, representing 2.5 percent of miles analyzed, are found where TUG has a greater BCR than CC/REFCL.

## V. CONCLUSION

Contrary to SCE's assertions in its rebuttal testimony, when modified to better reflect TURN's proposal, and even without scrutinizing other important elements of SCE's new analysis, the modified analysis shows that CC, or CC with REFCL, is more cost-effective on 97.5 percent of circuit miles in the SRA (565 out of 580 miles in total for the SRA).

That said, the utility's analysis underscores the feasibility and applicability of TURN's proposal for a location-specific analysis to compare the cost-effectiveness of various alternatives on a project-level basis.[21]

[21] TURN-12, pp. 31-32.

## ATTACHMENT A

## Workpapers for Surrebuttal Testimony

The voluminous Excel workpapers which support the analysis herein are intended to be part of this testimony. They are based on SCE's rebuttal workpapers for its Targeted Undergrounding BCR Analysis, which SCE has designated as confidential.

The workpapers for this Surrebuttal Testimony are available to persons who are entitled to receive confidential information, upon email request to TURN's Legal Assistant ryanagiba@turn.org and to TURN's attorney at tlong@turn.org.