Application No.:	18-09-002
Exhibit No.:	SCE-01A-Second Amended
Witnesses:	B. Chiu D. Daigler P. Herrington M. Jocelyn L. Letizia D. Tessler T. Tran

SOUTHERN CALIFORNIA EDISON®

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(U 338-E)

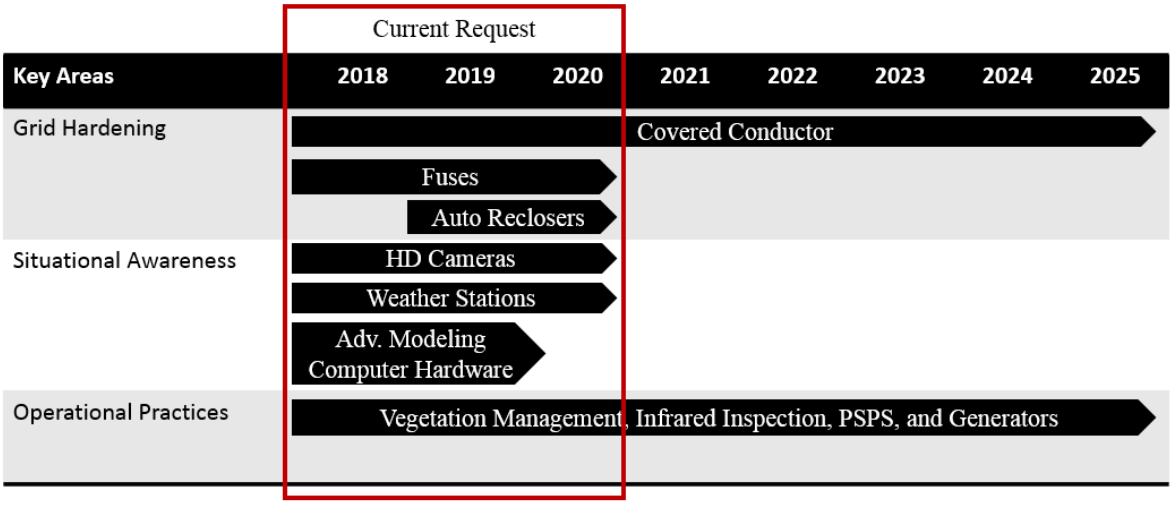
Second Amended Prepared Testimony in Support of Southern California Edison Company's Application for Approval of Its Grid Safety and Resiliency Program - Annotated

Before the

Public Utilities Commission of the State of California

Rosemead, California
December 26, 2018

Table I-1
Grid Safety and Resiliency Program Deployment Timing



SCE's Application is focused solely on obtaining Commission approval of GS&RP program activities and associated incremental forecast costs not included in the 2018 GRC. This will allow SCE to recover costs associated with mitigation measures it believes can be deployed in the near future, including deployment of covered conductor on approximately 600 overhead distribution primary circuit miles of the approximately ~~10,000~~ 13,000 total overhead distribution primary circuit miles in SCE's HFRA.[17] Table I-2 summarizes program activities, forecast incremental costs, and the associated revenue requirement in SCE's request.[18]

[17] SCE expects to continue advancing its understanding of enhanced fire risk mitigation measures, and refining its risk mitigation efforts as part of the GS&RP.

[18] SCE's estimates are based on the best information available at this time. As with any new program, SCE expects to refine work processes and tools that may impact spending levels. Additionally, factors outside of SCE's control, such as limited material supplies or large events (e.g., storms) could divert internal resources or limit the availability of contractor resources and impact SCE's ability to execute the proposed plan. SCE anticipates gaining additional information that will help refine and inform elements of SCE's GS&RP that will extend into future GRCs.

b) What Exists Today

(1) SCE's Historical Use of Bare Conductor Wire

SCE operates a large overhead electrical distribution system, and a substantial portion of it is located in HFRA.[73] In constructing its overhead distribution system, SCE has historically relied principally on bare conductor over other options, such as undergrounding or legacy-designed covered conductor.[74] This was consistent with the standard practice used by California's other investor-owned public utilities and utilities in many other jurisdictions.

For many electric utilities, including SCE, bare conductor wire has been the traditional design standard for overhead distribution systems throughout their service areas. Indeed, bare conductor is consistent with the requirements of G.O. 95. SCE commissioned an informal survey of utilities across the United States, to confirm that other major utilities outside of California, such as Oncor Electric, Duke Energy, and Xcel Energy, also use bare conductor for their overhead distribution systems. This widespread use of bare conductor is due to a number of factors. It has demonstrated good reliability, supports a high number of customers (due to its high temperature rating), and is cost effective. As part of the WCCP, SCE will use covered conductor in HFRA, but bare conductor will remain the primary design standard for new construction and re-construction work throughout SCE's service area outside of HFRA.

[73] SCE has approximately ~~13,400~~ 23,000 distribution circuit miles in HFRA. A large portion, around ~~73~~ 56 percent or approximately ~~9,800~~ 13,000 circuit miles, is overhead and around ~~27~~ 44 percent, or approximately ~~3,600~~ 10,000 circuit miles, is underground. The underground portion is primarily located in more densely populated urban areas and is generally understood to represent lower wildfire risk.

[74] Legacy-designed covered conductor accounts for only a minimal portion (estimated to be approximately 50 circuit miles) of SCE's existing overhead distribution system, which consists of approximately ~~28,000~~ 39,000 circuit miles of primary overhead distribution conductor across SCE's entire service area.

conductor would have lower cost, and underground conversion would have greater benefit, re-conductoring with covered conductor has the greatest overall value. A dollar spent re-conductoring with covered conductor provides nearly three times as much value in wildfire risk mitigation as a dollar spent re-conductoring with bare conductor, and over four times as much value in wildfire risk mitigation as a dollar spent on underground conversion. Moreover, by deploying covered conductor in connection with other mitigation measures included in the GS&RP—including installing remote-controlled automatic reclosers and circuit breakers with "fast curve" settings and fusing strategy—SCE can further bridge the benefit gap between covered conductor and underground conversion.

From these results, SCE selected covered conductor—as implemented in WCCP—as a key component of SCE's GS&RP.

d) Forecast

Table IV-10
2018-2020 Wildfire Covered Conductor Program Costs
($000)[90]

[90] Refer to Work Paper Vol. 2 (Scope - Covered Conductor (Amended Dec 2018); Unit Cost - Covered Conductor; Forecast - Covered Conductor; Unit Cost - Tree Attachments; Forecast - Tree Attachments; Scope - Fire Resistant Poles; Forecast - Fire Resistant Poles; Capital Related Expense - WCCP; Development and Delivery - Fire Resistant Poles; Development and Delivery - Covered Conductor). The WCCP in SCE-01A (A. 18-09-002) was informed by Geographic Information System (GIS) data that has been updated during an ongoing asset review. Additionally, SCE improved its methodology for querying system data. These updates increase the forecasted overall WCCP scope but do not change the expected forecast for 2018–2020 under GSRP. For years 2018–2020, WCCP levels of spend and estimated circuit miles executed are constrained by cycle times and potential resource growth.

(1) Program Scope

SCE has approximately 4,500 distribution circuits in its overall service area and approximately 1,300 circuits traverse HFRA.[97] WCCP will focus on certain spans located in HFRA that pose the greatest risk of fire ignition on these approximately 1,300 circuits. As discussed in Chapter III, SCE has taken a more expansive approach regarding designating portions of its service area as HFRA beyond those identified in the Commission's fire threat map, including for purposes of WCCP.

In this Application, SCE proposes to begin a multi-year effort that SCE will subsequently include in future GRCs. SCE has identified approximately ~~4,000~~ 5,500 circuit miles of bare overhead conductor in HFRA best suited for re-conductoring with covered conductor ~~between 2018 and 2025~~ to mitigate contact-related faults and the risk of wire down events during fault conditions. In this Application SCE requests to begin replacement of approximately 592 circuit miles throughout 2018-2020[98]. The balance of the WCCP work ~~(2021 - 2025)~~ will be addressed in a future rate case. SCE has focused WCCP on only the primary overhead distribution system. This is because the current standard for secondary voltages requires triplex covered conductor and the secondary overhead distribution system accounts for a much smaller proportion of the overall risk of fire ignition. But SCE may

[97] SCE's distribution circuits were not designed around the portions of SCE's service area that are considered to be HFRA. As a result, significant variation exists in each circuit's HFRA exposure. For instance, some circuits are located entirely in a HFRA while others have only a small portion that traverses a HFRA. The below table shows HFRA circuits, grouped by quartile, based on the percentage of each circuit's length that resides within HFRA.

Breakdown of Circuits with Varying HFRA Exposure				
Percent of Circuit Length within HFRA by Quartile	**Number of Circuits**		**Percent of Total**	
> 75 percent	~~759~~	791	~~58%~~	59%
50 to 75 percent	~~138~~	155	~~10%~~	12%
25 to 50 percent	~~152~~	163	~~12%~~	12%
< 25 percent	~~267~~	227	~~20%~~	17%
TOTAL	**~~1316~~**	**1336**	**~~100%~~**	**100%**

[98] Refer to Work Paper Vol. 2 (Scope - Covered Conductor (Amended Dec 2018))

to guide the order in which circuits would be hardened via WCCP.[99] This approach enables SCE to maximize the risk reduction benefits over time and is designed to prioritize circuits with greater wildfire risk, which includes both ignition frequency as well as ignition consequence, and the greatest estimated mitigation effectiveness when covered conductor is installed.

The risk analysis to support WCCP was a system-level analysis, in other words an articulation of the overall risk benefit that could be attained by covered conductor application. As discussed, to implement WCCP, SCE defined the program's scope and implementation prioritization. The combination of segment targeting and circuit prioritization is intended to allow SCE to approach the calculated system-level benefits as rapidly as practicable via covered conductor deployment over the 2018 to 2020 period. However, the work undertaken during this initial time period will not be enough to re-conductor all existing bare conductor in HFRA that require replacement, only a portion the total circuit spans. Nevertheless, by re-conductoring 592 circuit miles, or around ~~six~~ five percent of the total overhead primary circuit miles in HFRA, SCE will be able to reduce wildfire risk over this initial period on the highest priority circuits—which is why it is critical to start this incremental work in the immediate future as opposed to waiting several years until the next GRC to roll out this necessary program.

SCE's decisions regarding the scope of WCCP and the methodology for prioritizing the HFRA circuits accurately account for both the relative risk of wildfire ignition and the relative effectiveness of installing covered conductor as a wildfire risk mitigation, so the most impactful projects are undertaken first and resources are effectively deployed. By using a circuit prioritization methodology, SCE expects to maximize the operational efficiencies of concentrating work on a circuit-by-circuit basis. SCE considered other options to guide installation of covered conductor. For instance, another option would be to prioritize HFRA separately and work through the list by beginning only with spans in Tier 3, then moving to spans in Tier 2, and then moving to any remaining spans that SCE considers to

[99] Refer to Work Paper Vol. 1 (Circuit Deployment Prioritization.

terms of wildfire mitigation effectiveness and cost. But insulating retrofit conductor wrap was rejected due to its limited application, cost, and potential for failure.[107]

Additionally, as an alternative option for covered conductor deployment, SCE also considered the possibility of installing covered conductor on only one or two of the three phases on SCE's overhead distribution system. This partial installation of covered conductor was rejected because it is less effective at mitigating faults, can lead to potential issues associated with using bare and covered conductor on a single span, and is inconsistent with the prudent practices of utilities in other jurisdictions.

f) Deployment Time

SCE has already begun to install covered conductor on portions of ~~ten~~ nine circuits in HFRAs. SCE's GS&RP plans to move forward with the re-conductoring work under WCCP that is part of this Application at an accelerated pace through the rest of 2018, 2019 and 2020. As shown in Table IV-11, the work will cover 71 circuit miles in 2018, 96 circuit miles in 2019, and 426 circuit miles in 2020. At this rate, SCE anticipates installing 592 circuit miles of covered conductor under WCCP by the end of 2020.

Table IV-11
WCCP Deployment 2018-2020

Category (Circuit Miles)	2018		2019		2020		Total	
Short Circuit Duty: Vintage Small Conductor	~~-~~	31	~~44~~	71	~~157~~	128	~~201~~	230
Contact From Object	~~71~~	39	~~52~~	25	~~269~~	298	~~391~~	362
Total	~~71~~	71	~~96~~	96	~~426~~	426	~~592~~	592

While this timeline is ambitious and accelerated, it is operationally feasible for SCE to ramp up and complete this target in addition to its other related activities. Indeed, one purpose of creating the PMO was to consolidate SCE's grid hardening projects to

[107] The manufacturer of the silicone rubber conductor wrap recommends application where protection of less than 20 feet is required, making it unsuitable for most applications. In field tests, it also proved difficult to install and presented the possibility of failure if the wrap were to come off over time or during high wind conditions. The high-density polyethylene/co-poly conductor cover is significantly more expensive than covered conductor (approximately $5.75 per foot as compared to $0.80 per foot) and requires the same ancillary upgrades to the other components of the distribution system, such as poles, due to added weight.