Updated
Appendix G.
Distribution Need Analysis

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DISTRIBUTION SUBSTATION NEED ANALYSIS – PASO ROBLES DPA

I. LIMITATIONS IN THE EXISTING DISTRIBUTION SYSTEM

A. Reliability

The Paso Robles Distribution Planning Area (DPA) encompasses the communities of San Miguel, Paso Robles, Templeton, Creston, Atascadero, and Santa Margarita. Pacific Gas and Electric Company (PG&E) serves approximately 47,000 households and businesses (also referred to as customer connections[1]) within this DPA at 12 kilovolt (kV) and 21 kV primary voltage through four substations: San Miguel (70/12 kV), Paso Robles (70/12 kV), Templeton (230/21 kV), and Atascadero (70/12 kV). Bordering the Paso Robles DPA to the east is the Cholame DPA, which includes the communities of Shandon and Parkfield, and serves approximately 1,500 customer connections at 12 kV and 21 kV through one substation: Cholame Substation (70/12 and 70/21 kV). The two DPAs are connected by one long 12 kV circuit tie between a San Miguel Substation distribution line (feeder) and a Cholame Substation feeder. Twelve existing 21/12 kV pad-mounted transformers in the field (outside of substations) in the Paso Robles DPA provide the existing circuit ties between 21 kV and 12 kV feeders, and three existing 21/12 kV pad-mounted transformers in the field provide the existing 21-to-12 kV ties in the Cholame DPA.

Reliable distribution systems consist of substations located at regular intervals and sized correctly in terms of capacity and number of feeders to cover the area between substations without overextending some substations and underutilizing others. The Paso Robles DPA is not currently in line with these system goals.

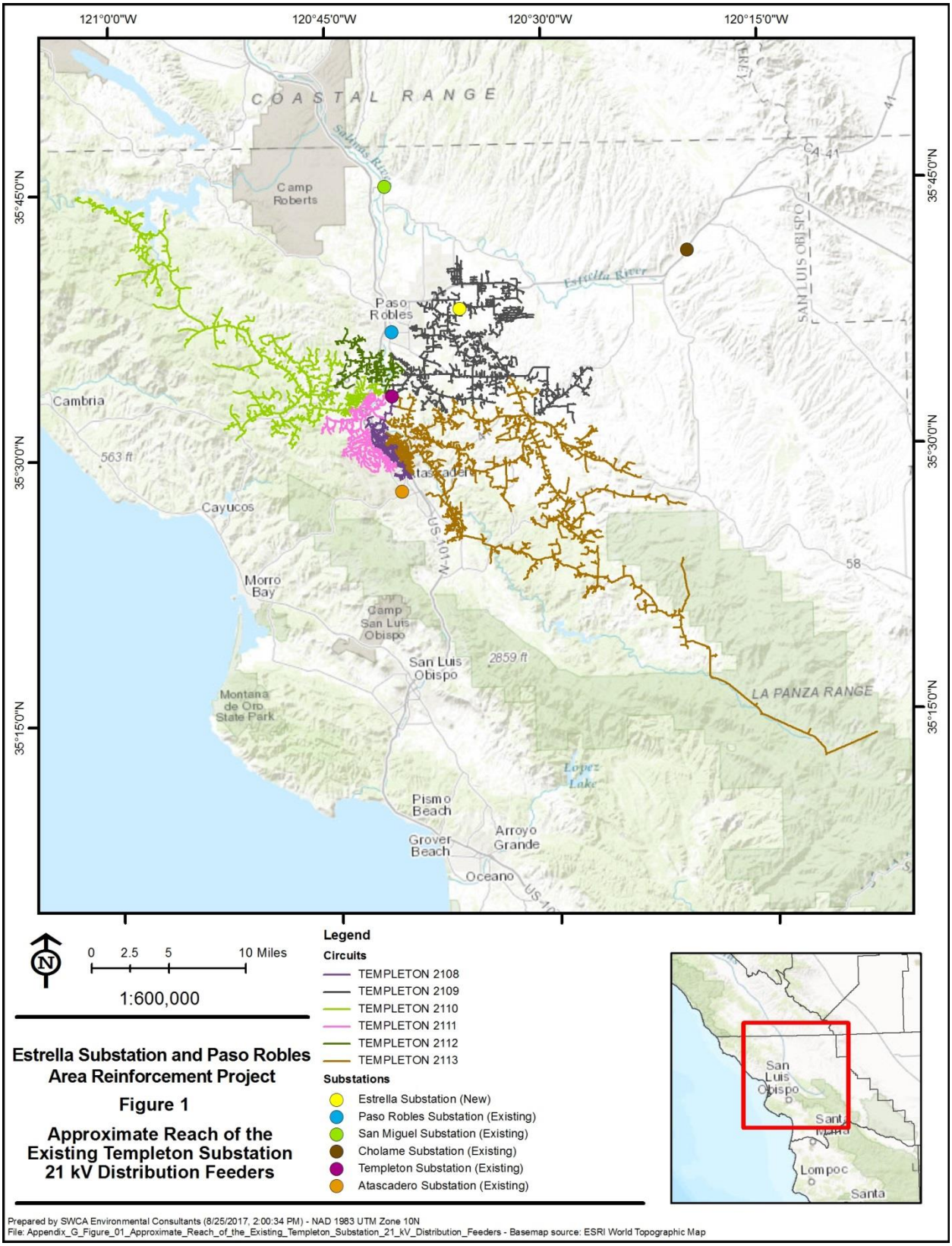
Templeton Substation has lengthy 21 kV ~~distribution lines (~~feeders~~)~~ that can carry ~~roughly~~ 73% more load and experience one-third less voltage drop than the 12 kV feeders from the other area substations because of their higher operating voltage. Even though Templeton Substation is south ~~of the city~~ of Paso Robles and Paso Robles Substation, its 21 kV feeders extend several miles east and north of Paso Robles Substation, serving much of east Paso Robles as well as areas south and west of Paso Robles. (*See* Figure 1. Approximate Reach of the Existing Templeton Substation 21 kV Distribution Feeders.)

Because 21 kV feeders are no more reliable than 12 kV feeders in terms of ~~distance and~~line length or area served, service reliability on a ~~line~~21 kV feeder is sacrificed by extending ~~the~~its reach ~~of a 21 kV feeder~~ to take advantage of its superior voltage performance, or adding more customers ~~or~~and load to take advantage of its superior capacity. Tripling the length of a feeder increases exposure to outages by 300%. Adding 73% more customers increases the number of customers experiencing an outage by 73%.

Put simply, if a line is three times as long, it will have three times as much exposure to potential outages such as car-pole accidents or vegetation/storm-related line failures as compared to a line 1/3 as long. Multiple feeders are already planned from Estrella Substation and could be installed from Templeton Substation if Estrella Substation were not built. The length of these feeders is determined by the various routes from Estrella or Templeton substations to the area of anticipated growth north of California State Route (SR-) 46 and south of Paso Robles Airport. For Templeton Substation, in particular, short feeders are not an option.

[1] Each customer connection connects to a home or business, representing many more customers than indicated by the number of connections.

Figure 1. Approximate Reach of the Existing Templeton Substation 21 kV Distribution Feeders



If an accident takes out a long line feeding a remote load center, it is likely that many more customers would be affected than if the line were served from a local source. This is due to additional customers that must be served between the distant substation and the load center. In order to serve an area with a series of shorter feeders, a closer substation site is required; in this case, Estrella Substation is capable of serving the growth area with shorter feeders. The use of longer but more segmented feeders from Templeton Substation, for example, would not be an effective reliability strategy because the urban areas with most of the demand would be at the far end of the feeders (i.e., on the last segment of main line that would be out of power whenever one of the many segments between it and the substation is lost).

In addition, the areas north of SR-46 south of the airport contain sensitive commercial-industrial businesses that not only require a high degree of service reliability, but also a high degree of power quality for sensitive processes such as light manufacturing and wine-making. Longer feeders result in increased line impedance, which degrades power quality, so commercial-industrial customers located in the growth areas in northern Paso Robles would have a generally higher level of power quality if served from a substation at Estrella as opposed to Templeton. Templeton Substation circuits currently have more than double the average electrical resistance compared to the average circuits for all PG&E substations in the service area.[2]

Many factors affect service reliability including line length, exposure of lines to traffic or vegetation, and line loading. Line length alone is not the only factor, but the longer the line, the more likely it is to traverse areas detrimental to service reliability and to affect more customers if the line goes out of service.

For these reasons, the long feeders from Templeton Substation have resulted in poor service reliability. For example, the Templeton 2109 main line serving much of east Paso Robles, both north and south of ~~California State Route (~~SR~~)~~ 46, has experienced five sustained outages and nine momentary outages over the past 5 years. These outages affected an average of just under 3,000 customer connections per event, with over 4,300 households and businesses affected in the largest event. Table 1 presents a 5-year outage history of main-line outages to the Templeton 21 kV feeders in Paso Robles, Atascadero, and Santa Margarita. All of the outages were a significant distance from Templeton Substation. The number of outages is relatively high for typical distribution main lines, but not unexpected in these areas due to the long express nature of the 21 kV feeders. Table 1 captures most of the sustained outages experienced by all customers in these areas; however, many customers experienced significantly more sustained outages due to more-localized outages on smaller lines extending from the main lines.

Table 1. Five-Year Outage History ~~(Feb. 2012 to Feb. 2017)~~ of Templeton 21 kV Feeders (February 2012 to February 2017)

Feeder Name	Area Served Where Outages Occurred	No. of Sustained Outages	No. of Momentary Outages	Average No. of Customer Connections Affected Per Event	Highest No. of Customer Connections Affected by an Event
Templeton 2108	Northern Atascadero	7	10	2,955	3,189
Templeton 2109	Northeast Paso Robles	5	9	2,957	4,325
Templeton 2110	Rural West Paso Robles	4	20	1,802	2,926
Templeton 2111	Western Atascadero	6	10	1,847	2,433
Templeton 2112	Southern Paso Robles	3	10	475	1,068
Templeton 2113	Santa Margarita	7	25	1,911	5,446

[2] For similar reasons, the distribution system in the Paso Robles DPA will have a higher hosting capacity for distributed energy resources (DER) if new distribution is added from Estrella Substation versus an expansion of the Templeton Substation distribution system. (See Section IV.C.)

B. Capacity

Ideally, the distribution feeder ties between distribution substations within a DPA can be used to transfer load between substations as well as restore service from one feeder to another in the event of outages on the distribution system. Because of this arrangement, forecasted overloads at one substation can be eliminated by transferring load to an adjacent substation. This process can continue until all possible load transfers are performed to allocate load to each transformer bank according to its capacity, and all substations within the DPA reach their maximum buildout (i.e., contain the maximum number and size of transformer banks and/or feeders). There is a practical limit in the ability to divide DPA load among all of the banks in exact proportion to their capabilities. Operating experience indicates that overloads become unavoidable when DPA load reaches approximately 95% of the total aggregate capacity of all of the substation banks. For this reason, PG&E normally defines available DPA capacity at 95% utilization, or 95% of its aggregate bank capacity. The available capacity within the Paso Robles DPA is 212.55 megawatts (MW) based upon 95% utilization.

In 2010, Paso Robles Substation reached its ultimate build out of three 70/12 kV, 30 megavolt-ampere (MVA) transformers. Templeton Substation currently consists of two 230/21 kV, 45 MVA transformers with lengthy distribution feeders that serve north and east beyond Paso Robles Substation. (*See* Figure 2. Current Distribution System.) Atascadero and San Miguel substations are single-transformer facilities (30- and 16 MVA, respectively) with limited space for expansion or 70 kV transmission constraints. ~~(*See* Figure 2, Current Distribution System.) The available capacity within~~San Miguel Substation, which has a limited transmission source for new distribution, would need to be completely rebuilt to support another distribution bank. It would still have a limited transmission source from Coalinga Substation and would be limited to only 18 MW in the event the feed from Estrella Substation or Paso Robles Substation is lost. Atascadero Substation (at the south end of the DPA ~~is 212.55 megawatts (MW) based upon 95% utilization~~and not shown in Figure 2) has no space at the substation to support another distribution transformer and, in addition, is far from the load growth that needs to be served.

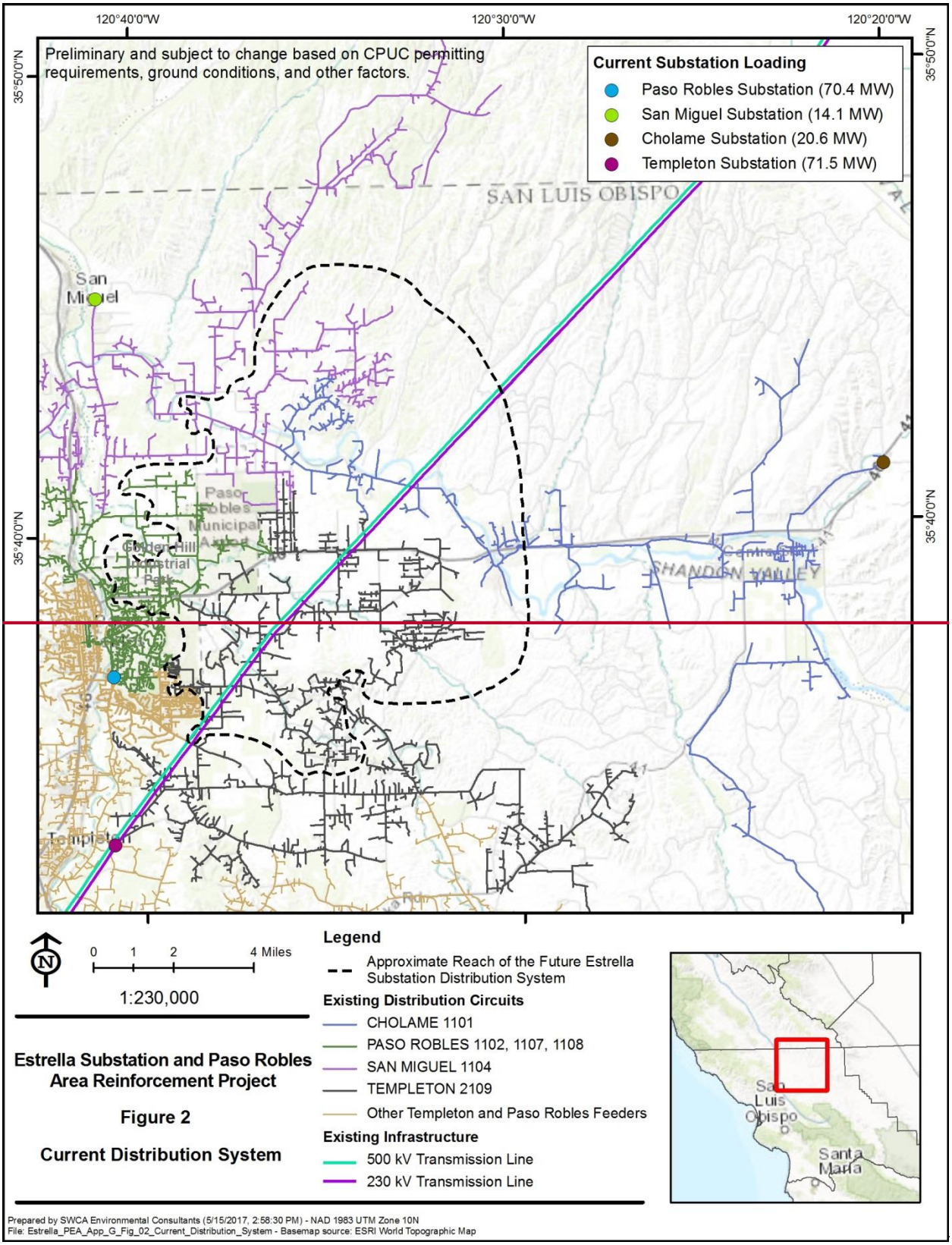
Table 2 below indicates substation historical capacities and historical peak loads for the Paso Robles DPA from 2007 to 2016.

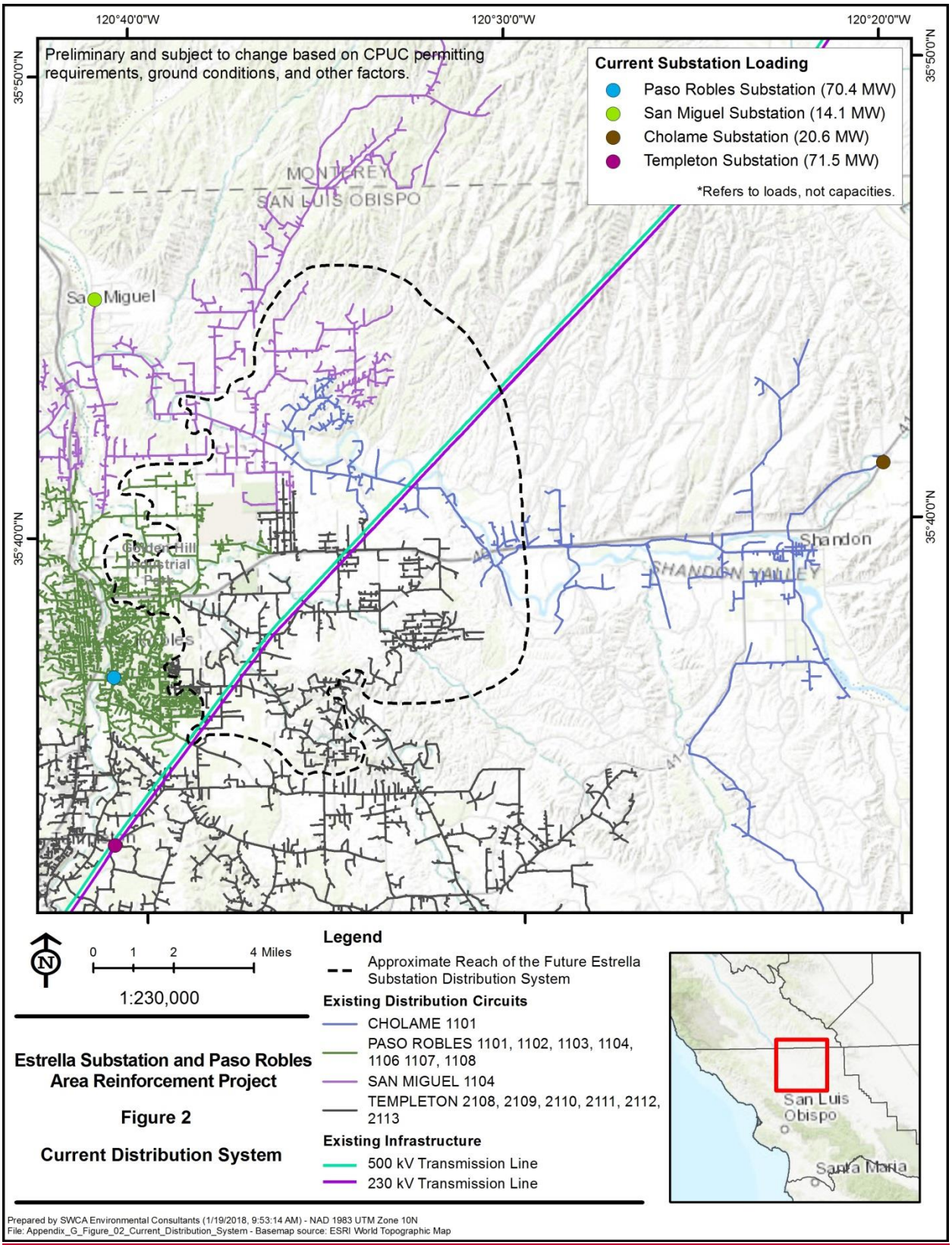
Table 2. Historical Paso Robles DPA Capacity and Load

	Historical Capacity and Load (MW)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Historical Available DPA Capacity	182.46	197.51	197.51	212.55	212.55	212.55	212.55	212.55	212.55	212.55
Historical DPA Peak Load	179.44	169.40	164.40	158.73	150.69	173.98	180.63	164.72	169.33	190.14

Figure 2 illustrates the current distribution system and indicates all distribution lines whether they are looped or radial. In general, main lines with larger overhead and underground conductor sizes are part of looped systems, while lines with smaller conductor sizes are radial systems tapped off the looped main-line systems.

Figure 2. Current Distribution System




120°40'0"W
120°30'0"W
120°20'0"W
35°50'0"N
35°40'0"N
Preliminary and subject to change based on CPUC permitting requirements, ground conditions, and other factors.
Current Substation Loading
Paso Robles Substation (70.4 MW)
San Miguel Substation (14.1 MW)
Cholame Substation (20.6 MW)
Templeton Substation (71.5 MW)
*Refers to loads, not capacities.
MONTEREY
SAN LUIS OBISPO
San Miguel
Shandon
SHANDON VALLEY
0 1 2 4 Miles
1:230,000
Legend
Approximate Reach of the Future Estrella Substation Distribution System
Existing Distribution Circuits
CHOLAME 1101
PASO ROBLES 1101, 1102, 1103, 1104, 1106 1107, 1108
SAN MIGUEL 1104
TEMPLETON 2108, 2109, 2110, 2111, 2112, 2113
Existing Infrastructure
500 kV Transmission Line
230 kV Transmission Line
San Luis Obispo
Santa Maria
Estrella Substation and Paso Robles Area Reinforcement Project
Figure 2
Current Distribution System
Prepared by SWCA Environmental Consultants (1/19/2018, 9:53:14 AM) - NAD 1983 UTM Zone 10N
File: Appendix_G_Figure_02_Current_Distribution_System - Basemap source: ESRI World Topographic Map

II. SITING OF NEW DISTRIBUTION SUBSTATION

A. Siting Principles

PG&E's distribution planning practices emphasize that the siting of a new substation or the addition of capacity at an existing substation should be done in a way that improves service reliability for the area, with the aim of locating substations at regular intervals and sizing them correctly to cover the area between substations without overextending some substations and underutilizing others. Thus, from an engineering perspective, the most important factors in distribution substation siting include:

1. Proximity of existing and forecasted electric load
2. Existing and future substation radius in miles from the substation for distribution facilities sphere of influence:
    a. 21 kV – Rural = 11 miles; Urban = 4 miles
    b. 12 kV – Rural = 7 miles; Urban = 3.5 miles
3. Proximity to existing transmission and distribution systems
4. Length and location of new transmission and distribution lines

(*See*, e.g., PG&E Planning Standard TD-3350P-09 (07/14/2014 (Rev.3)) (currently being updated) ("TD-3305P-09"), attached as Exhibit B.) TD-3305P-09 indicates that the "sphere of influence" of a substation is a radial distance in miles from the substation, a distance that varies with the voltage and rural or urban nature of the DPA. In 2007, PG&E distribution planners completed the process of designating all DPAs within the service area as being rural or urban/suburban for distribution planning purposes. The Paso Robles DPA was designated an urban/suburban area, which means that the population is over 60 persons per square mile. (*See* Guide for Planning Area Distribution Systems Document # 050864, dated 9/15/09 and revised 3/4/2010, (currently being updated) at pages 9 and 32, attached as Exhibit C.) Therefore, for a 21 kV distribution substation in an urban-designated DPA, the applicable radius is 4 miles.

In addition to engineering feasibility, many other factors drive substation siting decisions, including site suitability (*e.g.,* slope, access, proximity to flood zones, proximity to earthquake zones), site availability, land use, and environmental concerns. (*See, e.g.,* TD-3305P-09, Exhibit B, at 8-9.)

B. Location of Expected Load Growth

City of Paso Robles (City) planners are expecting strong industrial growth in the Paso Robles city limits north of SR-46 within the next 10 years and a resurgence of residential growth south of SR-46. City planners are estimating a 50% increase in the population of Paso Robles by 2045.

According to the City of Paso Robles ~~(City)~~ Public Works Director, most of the industrial growth is expected to occur within the Golden Hill Industrial Park and directly south of Paso Robles Airport along Dry Creek Road, including the Aerotech Industrial Park now occupied by Advance Adapters, a maker of specialty parts for four-wheel drive vehicles. At this time, industrial growth is anticipated to be led by wine production. For example, within Golden Hill Industrial Park, San Antonio Winery, a large 1 MW facility, is now nearing completion. Justin Vineyards, owned by Wonderful Company (Pom Wonderful), operates a large new facility and is planning to expand as soon as the industrial park itself expands eastward toward Airport Road.

To the south of SR-46, approximately 2 miles east of Paso Robles Substation and 2.7 miles west of the Estrella Substation site, development of the 827-acre Chandler Ranch property is expected to begin soon.

The City has approved development of the first 154 acres of the ranch, and construction on the first 350 residences could start within 2 years.

Throughout Paso Robles, several new hotels or hotel expansions have received approval, with several now under construction. These include the new Oxford Suites Hotel, Pine Street Promenade Hotel, Hilton Garden Inn, Marriott Residence Inn, ~~and La Entrada Discovery~~Sensario Gardens ~~and~~ Entrada, Destino Hotel Resort, and ~~expansions of the existing Oaks Hotel and Oak Tree~~Fairfield Inn.

C. Why Locate the New Substation within 2.2 Miles of the SR-46 230 kV Line Intersection?

The California Independent System Operator Corporation (CAISO) conducts a Transmission Planning Process each year, which builds upon the previous year's plan and studies the reliability of the electric system over a 10-year window. CAISO approved the development of a new 230/70 kV substation—Estrella Substation—and a new 70 kV power line to interconnect to the substation to improve reliability in San Luis Obispo County in its *2013–2014 Transmission Plan, Estrella Substation Project Description and Functional Specifications for Competitive Solicitation* (CAISO 2014). The project also included a distribution component. Through a competitive solicitation process, CAISO awarded the transmission-level substation project to NextEra Energy Transmission West LLC (NEET West) in its *Estrella Substation Project, Project Sponsor Selection Report* (CAISO 2015).

During this process, CAISO identified the location for the new substation as being within a 2.2-mile radius from the intersection of SR-46 and the Morro Bay-Gates/Templeton-Gates 230 kV transmission corridor, about 5 miles east of Paso Robles Substation. (*See* Figure 3. 2.2-Mile Substation Location Area.) This location was a result of a recommendation from PG&E's distribution planning engineers, based upon the siting principles described in Section II.A and the following considerations:

1. The anticipated growth areas are north and east of Paso Robles Substation, so the new distribution substation should be north and east of Paso Robles Substation in order to place the new distribution substation near the growth and keep new distribution feeders at a reasonable length.

2. Since the new distribution substation would be fed from the 230 kV transmission source, the new substation should be located along the Morro-Bay Gates 230 kV Transmission Lines to minimize costs and potential project impacts.

3. The locality known as "Estrella" offered the operational advantage of being located where long distribution lines from four existing substations ended. These substations are San Miguel, Paso Robles, Cholame, and Templeton. (*See* Figure 2. Current Distribution System.) Placing the substation in Estrella would make it possible to back feed and split in half long existing distribution lines from these four sources. (*See* Figure 4. Future Estrella Substation Distribution System.) Of the potential sites in Estrella, sites north of Estrella Road would place the new substation off in a northeast corner of the DPA, too far from the growth areas near Paso Robles Airport and Golden Hill Industrial Park, just south of the airport. For this reason, the northern-most site considered was a site where the 230 kV lines cross Estrella Road, approximately 2.2 miles northeast of SR-46 along the 230 kV right-of-way.

4. The southern-most site that distribution planning engineers felt was acceptable (not too close to Templeton or Paso Robles substations and not too far from the growth areas) was a site where Union Road comes close to the Morro Bay-Gates 230 kV Transmission Lines. This southern-most site, which NEET West ultimately selected, is within 2.2 miles south of the SR-46 and 230 kV line intersection.

In summary, from a distribution perspective, the Estrella Substation site location is near the Dry Creek Road area south of Paso Robles Airport and the Golden Hill Industrial Park in northern Paso Robles, where large-demand businesses are expected to be constructed. It is also at a location very well-suited for connecting to existing distribution feeders. Adding distribution capacity at or near the Estrella Substation site will improve service reliability by allowing feeders from Templeton, Paso Robles, San Miguel, and Cholame substations to be significantly reduced in their reach and therefore significantly reduced in their exposure to outages. The new, high-growth areas can be served directly from the new distribution substation. The Estrella Substation site is far closer to the anticipated growth areas than Paso Robles Substation, and has largely established feeder routes already in place. (*See* Figure 4. Future Estrella Substation Distribution System.) Templeton Substation is several miles farther south from Paso Robles Substation and far from the expected load growth. Neither Paso Robles nor Templeton substations would provide favorable locations for additional distribution capacity.

If distribution facilities are built at the proposed Estrella Substation site, PG&E proposes to install three 21 kV feeders from Estrella Substation. (*See* Figure 4. Future Estrella Substation Distribution System.) However, only two new segments of distribution line would need to be constructed. These two segments are specifically identified on Figure 4 because they are the only gaps in the existing distribution system necessary to create one of the new feeders (Mill Road Central). All other distribution lines that make up this feeder, and the other two Estrella feeders, are existing lines. The new feeder locations shown on Figure 4 are approximate locations, preliminary and subject to change. The segment of new line extending from Estrella Substation, the southern segment, is an accessible route along a farm road, and the northern segment is within a franchise location. (Geographic Information Systems [GIS] data provided to the California Public Utilities Commission (CPUC) follows the centerline of these roadways, since the line locations are not yet known.) These routes appear feasible based on a preliminary review of land and environmental factors. The southern segment is 0.6 mile of new distribution line installed in a utility easement on private property to the north of the Estrella site to connect the Mill Road Central feeder to existing distribution on Mill Road. An additional segment of new line will be installed to extend the reach of the Mill Road Central feeder to serve the new load anticipated in northern Paso Robles. This northern segment would be approximately 1.1 miles long if installed along SR-46. New overhead distribution lines are typically supported by 18 poles per mile; therefore, a total of 1.7 miles of new distribution line would typically require about 31 new wood poles.

Figure 3. 2.2-Mile Substation Location Area

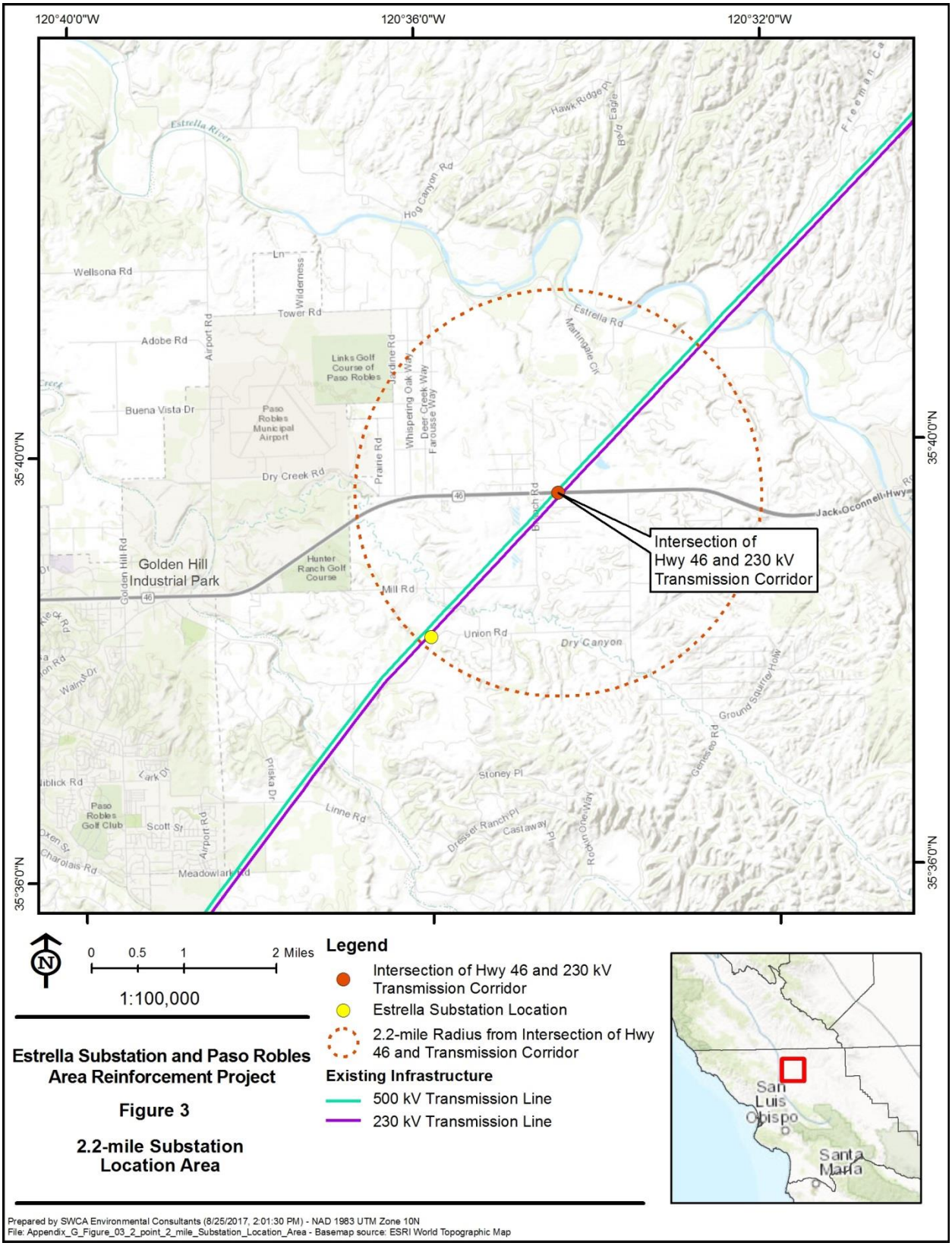
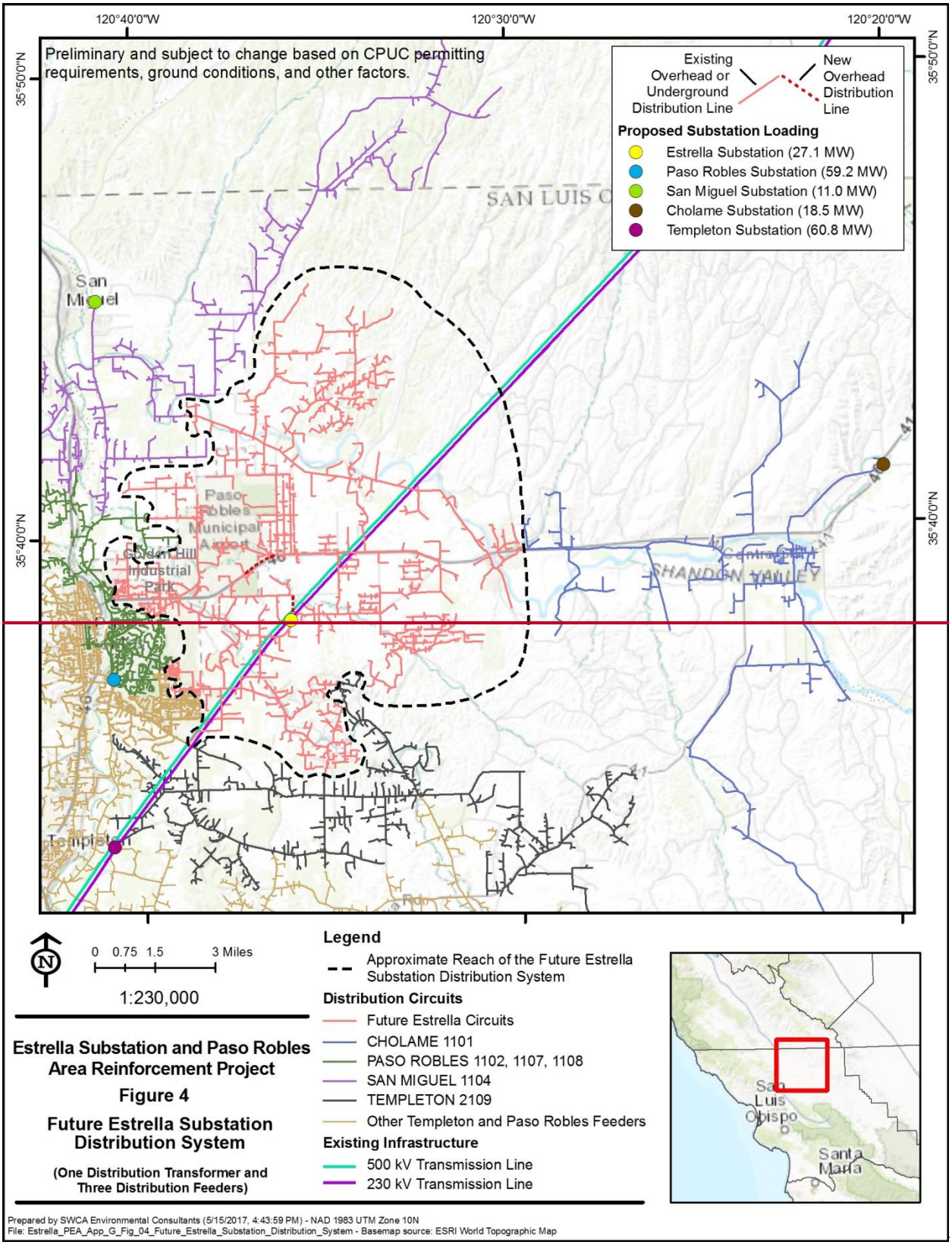
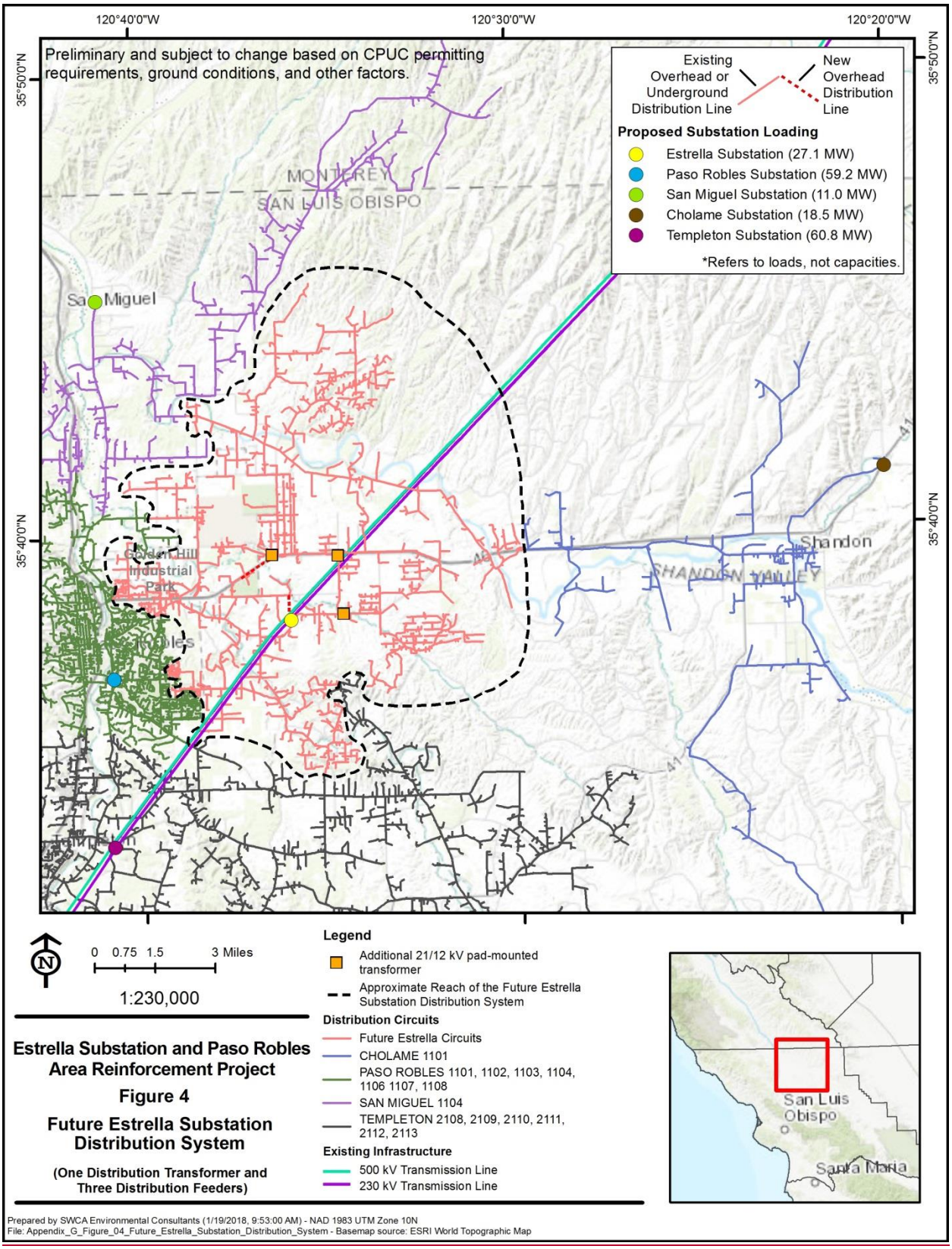


Figure 4. Future Estrella Substation Distribution System





Estrella Substation and Paso Robles Area Reinforcement Project

Figure 4

Future Estrella Substation Distribution System

(One Distribution Transformer and Three Distribution Feeders)

Prepared by SWCA Environmental Consultants (1/19/2018, 9:53:00 AM) - NAD 1983 UTM Zone 10N
File: Appendix_G_Figure_04_Future_Estrella_Substation_Distribution_System - Basemap source: ESRI World Topographic Map

III. TIMING OF NEW DISTRIBUTION SUBSTATION

A. Predictive Factors for Electrical Load Growth

Two primary factors will drive the timing for construction of the new distribution substation: 1) normal growth in area electrical demand; and 2) large block loads. Modeling is used to predict normal electrical demand growth within a DPA, based upon many factors, including historic growth patterns, pending business service applications, and—for the first time in 2017—distributed energy resources (DER) estimates. Large block loads, which are generally associated with new business interconnections of 1 MW or more, are difficult to predict accurately due to short lead times and must also be considered because they can significantly accelerate the need for new distribution capacity.

PG&E ~~uses~~utilizes the LoadSEER forecasting tool to predict growth in area electrical demand within a DPA for a 10-year period into the future. LoadSEER incorporates the most-recent 13 years of substation historical peak-load data. The Paso Robles DPA forecast uses non-coincident peak-load data for each substation bank taken in the field from within a 2- to 3-day window during the most severe heatwave of each summer. The 1-in-10 forecast assumes a 90th percentile hot summer with higher-than-average temperatures and intense heat waves. PG&E's goal is to maintain a distribution system that is capable of serving its customers during hot summers without overloads and outages. The Paso Robles DPA is an interior area, sensitive to summer heat with very significant residential and commercial air-conditioning load as well as industrial refrigeration load for the wine industry. Consequently, the 1-in-10 DPA forecast for the DPA must be used to adequately predict DPA capacity needs.

The LoadSEER forecast does not account for all large future block loads; unfortunately, large block loads associated with new business interconnections often have short lead times that cannot be anticipated in the LoadSEER modeling. Thus, distribution planners not only review electric demand modeling, but also watch and plan for the possibility of large-demand business applications that will exceed predicted electrical demand.

B. LoadSEER Forecasts

~~At the request of the California Public Utilities Commission (CPUC), PG&E has updated the previous LoadSEER forecast for the Paso Robles DPA, for the first time incorporating 100% of the DER forecast in the model as proposed by the CPUC and California Energy Commission. The DER forecast is based upon the estimates in PG&E's 2015 Distribution Resource Plan (DRP) for the expected growth rate of DERs, submitted to the CPUC in compliance with Public Utilities Code Section 769. Section 769 defines distributed resources as "distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies."~~

~~After application of 100% of the DER forecast, the LoadSEER tool indicates that load within the Paso Robles DPA will stay within the available capacity of 212.55 MW beyond the 10-year forecast period. An extrapolation of the forecast suggests that load will reach the available DPA capacity in the 2031–2032 timeframe, 14–15 years from now. However, excluding the effects of the DER forecast, load within the Paso Robles DPA would reach available DPA capacity in 2020, only 3 years from now—a very substantial difference in timing. The accuracy of the LoadSEER forecast is thus highly dependent on the accuracy of the DER estimate. Using 25% of the DRP estimate for DER growth, the DPA would reach available capacity in 5–6 years (in 2022–2023); using 50% of the DER forecast, the DPA would reach available capacity in 8 years (in 2025); and using 75% of the DER forecast, the DPA would reach available capacity in 11 years (in 2028). Therefore, if DER peak demand reduction is less than 100% of the DER forecast, the need for an increase in DPA capacity will be much sooner than 2031–2032.~~

~~PG&E distribution planning engineers agree that DERs will lower electrical demand to some degree, although they believe that when and how much is uncertain. Based on the assumption that at least 25% of the DER forecast will be realized, these engineers estimate that the need for Estrella distribution facilities will be within the next 5 to 15 years. (*See* Table 2, 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast, and Figure 5, 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast, below for the 1-in-10 LoadSEER forecast for the Paso Robles DPA with varying amounts of demand reduction from DERs.)~~

~~The LoadSEER forecast provides only part of the picture because it cannot include unanticipated large block load additions. (*See* Section III.C.)~~

~~Table 2. 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast~~

In a ruling on August 9, 2017, the CPUC provided direction to PG&E and other utilities on how to integrate DER[3] growth scenarios into their distribution planning forecasts in order to better determine the need and timing for new distribution projects. CPUC President Michael Picker, who issued the ruling, is the Assigned Commissioner in several proceedings involving distribution resource plans that utilities are required to submit under Public Utilities Code Section 769. His ruling described the current practice in which the California Energy Commission (CEC) uses utility distribution load and DER growth forecasts to prepare and adopt the California Energy Demand forecast in its biannual Integrated Energy Policy Report (IEPR). Due to what the ruling refers to as a "current misalignment of their schedules," the most recently adopted IEPR forecast is the 2016 Update, which relies on 2015 DER forecast data. Nevertheless, because "the CEC's IEPR process is structured to thoroughly vet forecasting issues of a technical, and sometimes contentious, nature," and in order to be consistent and transparent in planning assumptions, the ruling finds that "the most suitable and defensible forecast data available at this time is the 2016 adopted IEPR forecast update." The decision also allows the utilities to make certain adjustments to the IEPR forecast based on the latest public data concerning local load growth, solar energy, and other factors. (*See gen'ly* Assigned Commissioner's Ruling on the Adoption of Distributed Energy Resources Growth Scenarios (Application (A.) 15-07-002 though A.15-07-008.)

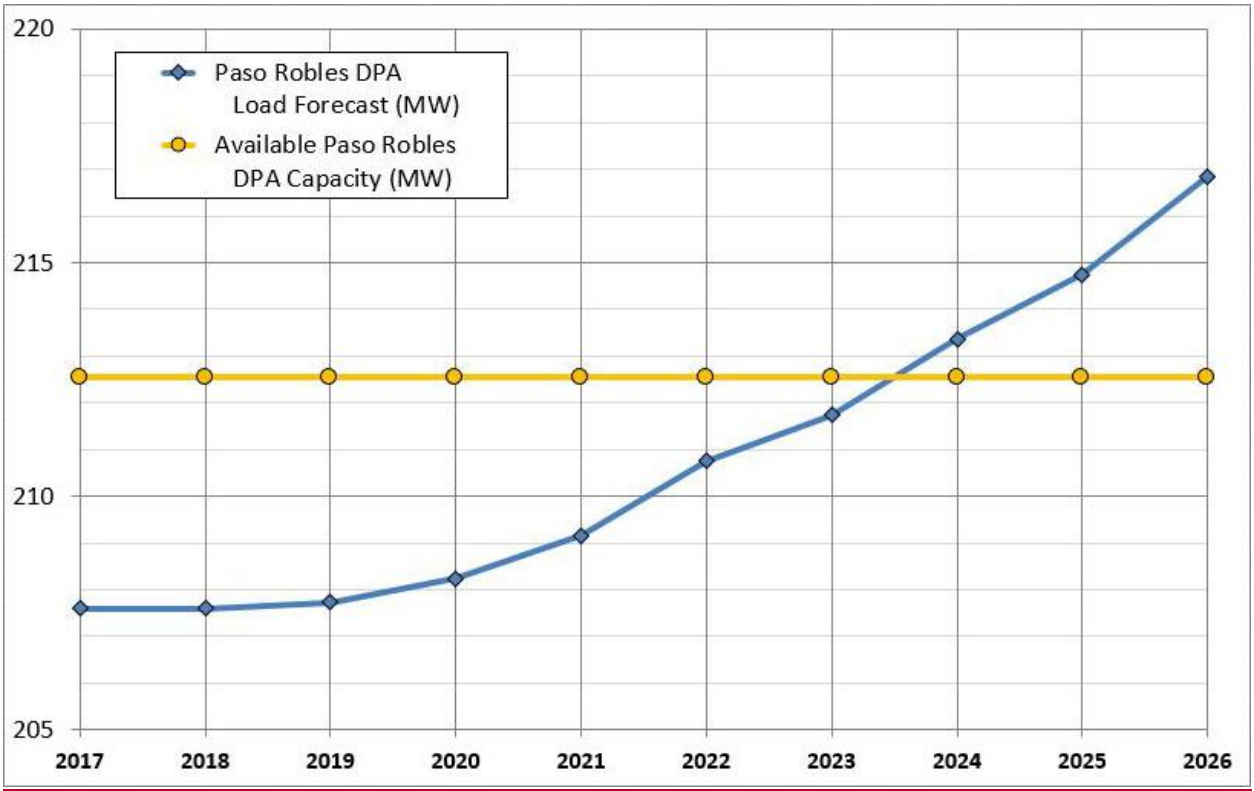
Applying the CPUC's guidance, PG&E's distribution planning engineers used the following methodology to update their earlier forecast. Using LoadSEER, they began with the 2016 adopted IEPR Update, which incorporated the mid-case of the 2015 DER forecast and substantially lower values for photovoltaic generation in the Paso Robles area than PG&E had previously utilized. They then added recent public data on planned new load, as listed in Table 6. (*See* Table 6, Section III.C below.) The adjustments included an annual load adjustment for loss of the largest distributed generator on line at the time of the DPA peak to account for the worst-case N-1 contingency for the potential loss of this generation source. PG&E engineers then re-ran the LoadSEER forecast with the adjustments. The resulting LoadSEER forecast is shown in Figure 5.[4] Table 3 provides a breakdown of the Updated LoadSEER Forecast, and Table 4 provides a detailed load forecast by substation.

[3] Public Utilities Code Section 769 defines DERs as "distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies."

[4] Note that, other than the N-1 contingency described above, PG&E planning engineers included no further negative adjustments to the LoadSEER forecast for solar generation as part of the adjustments made for the 2016 IEPR forecast. Most solar is already accounted for in the IEPR forecast, so only an unusually large new project would merit inclusion. Moreover, the peak demand in the area has gradually moved from 4 or 5 p.m. to 5 or 6 p.m. over the last 10 years. In fact, the 2016 DPA peak occurred at 7 p.m. in late June, when the contribution of solar generation was only 2% of its maximum noon-time output. As peak shifts to later hours, the contribution of solar generation at the time of DPA peak becomes more and more negligible.

Figure 5. Updated LoadSEER Forecast, Paso Robles DPA

Description of Forecast	Forecasted Load (MW)									
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Available Capacity	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55
LoadSEER Forecast	207.60	207.59	207.73	208.24	209.15	210.75	211.74	213.37	214.74	216.85



The Paso Robles DPA has an available capacity limit of 212.55 MW. (*See* Section II.B, above.) The updated LoadSEER forecast provided in Table 3 indicates that distribution demand in the Paso Robles DPA will outpace this capacity between 2023 (211.74 MW) and 2024 (213.37 MW), so that new distribution capacity will be needed in 2024.

Table 3. Breakdown of Updated LoadSEER Forecast

Description of Forecast	Forecast (MW)									
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Available Capacity	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55	212.55
IEPR Initial Demand Forecast	206.73	208.34	208.81	210.02	211.85	215.02	218.71	221.72	224.59	228.11
IEPR Total DER Adjustments	-2.07	-4.18	-6.35	-8.77	-10.66	-12.99	-16.31	-18.27	-20.02	-21.67
Total New Business Adjustments	2.92	3.41	5.25	6.97	7.94	8.70	9.32	9.90	10.15	10.39
Loss of Largest DG Adjustment	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total LoadSEER Forecast	207.60	207.59	207.73	208.24	209.15	210.75	211.74	213.37	214.74	216.85

The Assigned Commission's August 9, 2017, ruling validates earlier concerns of PG&E planning engineers about relying on an aggressive DER forecast to predict when new distribution would be needed (*See* Appendix G at UG-11). According to the ruling, "the 2016 adopted IEPR forecast mid-case is the best source for 2017 Distribution Resource Plan Growth Scenarios trajectory case," which means using

substantially lower DER forecast assumptions for the Paso Robles DPA than the CPUC had previously supported. The ruling also confirms that additional forecasting data will be needed to better predict distribution needs and timing going forward. The CPUC is continuing to study forecasting issues in the Section 769 proceedings and indicated its intent to obtain additional load data and other information from the CEC, CAISO, utilities, and other parties over the next few months. Ultimately, the CPUC aims to "establish a framework for establishing a consistent and reliable forecast on an annual basis." The ruling sets out the next steps to achieve that goal.

Table 4. Breakdown of Substation Capacities and Forecasted Loads, Paso Robles DPA

Substation / DPA	Available Capacity	Forecast (MW) 2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Atascadero Substation	29.70	29.63	29.73	29.57	29.62	29.89	29.77	29.70	29.68	29.69	29.76
Paso Robles Substation	89.10	81.04	81.00	81.09	81.54	81.54	82.63	83.38	84.65	85.82	85.48
Templeton Substation	89.10	81.74	81.70	82.01	82.37	83.05	83.66	84.12	84.45	84.58	86.93
San Miguel Substation	15.84	15.19	15.16	15.06	14.71	14.67	14.69	14.54	14.59	14.65	14.68
Paso Robles DPA	**212.55**[1]	**207.60**	**207.59**	**207.73**	**208.24**	**209.15**	**210.75**	**211.74**	**213.37**	**214.74**	**216.85**

[1] The Aggregate Capacity of the four substations is 223.74 MW; however, a 95% utilization factor is applied to determine Available Capacity (also called Normal Area Capability). (*See* Section I.B and the Guide for Planning Area Distribution Facilities, document 050864, attached as Exhibit C.)

Please note that the MW values shown in the legends in Figure 2, Figure 4, and Figure 7 are loads, not capacities. These loads are only preliminary, based on 2016 distribution load flow studies, to illustrate project feasibility. Actual loads for the proposed circuit configurations will be higher at the time that new distribution facilities are needed.

At the CPUC's request, PG&E also provides the following Figure 6. Comparison of LoadSEER Forecasts, Paso Robles DPA, which provides the LoadSEER forecast with and without the latest CPUC guidance on distribution planning forecasts.

Figure 6. Comparison of LoadSEER Forecasts, Paso Robles DPA[5]

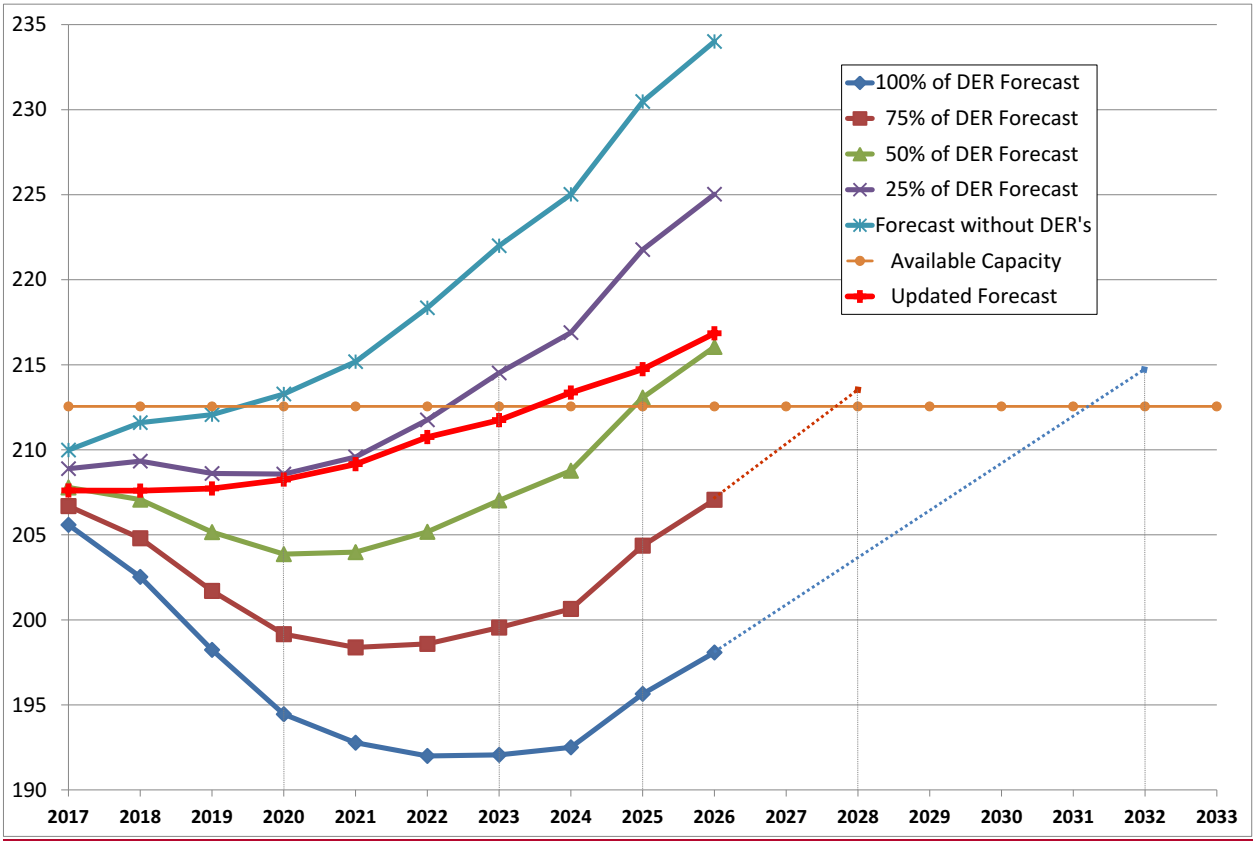


Table 5. Previous 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast

Description of Forecast	Available Capacity	Forecasted Load (MW)									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
100% DER Forecast	212.55	205.59	202.53	198.24	194.45	192.78	192.00	192.06	192.51	195.65	198.08
75% DER Forecast	212.55	206.69	204.80	201.70	199.16	198.38	198.59	199.55	200.64	204.36	207.06
50% DER Forecast	212.55	207.79	207.07	205.16	203.87	203.98	205.18	207.03	208.77	213.07	216.05
25% DER Forecast	212.55	208.89	209.33	208.61	208.57	209.58	211.76	214.52	216.89	221.77	225.03
Non-DER Forecast	212.55	209.99	211.60	212.07	213.28	215.18	218.35	222.00	225.02	230.48	234.01

C. Large Block Loads

As recommended by the CPUC ruling, the updated LoadSEER forecast provided here incorporates additional large new business loads that were not included in the 2016 IEPR Update forecast. (*See* Table 6.) These new large loads, based on publicly available data from the City of Paso Robles, include business development applications that have been filed, are in process, or were recently approved.

[5] The first five forecasts in Figure 6 used the previous 1-in-10 LoadSEER forecast for the Paso Robles DPA and then incorporated 100%, 75%, 50%, 25%, and none of the DER forecast estimates in PG&E's 2015 Distribution Resource Plan (DRP). The forecasts using 25% and none of the DER forecast estimated when available capacity would be reached by following a rough trajectory based on the last 3 points in each projection. (See also Table 5, which provides the data numerically.) The updated forecast in Figure 6 follows the CPUC's ruling of August 9, 2017, concerning how utilities should integrate DER growth scenarios into their distribution planning forecasts in order to better determine the need and timing for new distribution projects.

~~As indicated in Section I.B, the Paso Robles DPA has an available capacity limit of 212.55 MW. The most recent DPA peak was 190.15 MW on June 27, 2016, within 23 MW of matching available capacity. This peak was reached during a summer with relatively mild temperatures – not a 1-in-10 summer. All of the substations within the Paso Robles DPA, with the possible exception of San Miguel, are very temperature sensitive, with load rising substantially on hot summer days. A warmer summer would result in a higher peak, much closer to the available capacity limit. As indicated in Table 2, the 1-in-10 LoadSEER forecast incorporating 100% of the DER forecast predicts a DPA peak of almost 206 MW for this summer, 2017; the same forecast incorporating none of the DER forecast predicts a DPA peak of 210 MW for this summer. Using 25% of the DER forecast results in a 209 MW DPA peak, leaving 4 MW of available capacity. Thus, the 1-in-10 forecast predicts only 3 to 7 MW of available capacity in the DPA for 2017. With this small margin, the addition of one or two large-load applications could quickly deplete the remaining capacity, creating an immediate need for more.~~

~~It is true that the LoadSEER forecast using the 100% DER forecast indicates a steady reduction in net load during the 5-year period between 2017 and 2022; the forecasted peak demand is 13.59 MW lower in 2022 as compared to 2017. PG&E distribution planning engineers caution against placing too much weight on this forecast because it incorporates 100% of a DER estimate that is being used for the first time and results in a substantial negative electrical growth rate, which is not consistent with past history or recent operating experience. While it is likely that some demand reduction due to DERs will occur within the Paso Robles DPA, the timing and amount is highly uncertain.~~

~~Relying on LoadSEER data with 100% DER estimates is particularly risky because underestimating the amount of available power could threaten sensitive industrial customers with major business losses. These manufacturing- or process-oriented businesses are very sensitive to interruptions in electric power that can interrupt assembly processes and cause damage to assembly equipment, costly delays for clean-up and restart, and losses of entire batches of product.~~

~~Large block loads present another risk to electric system capacity; they are difficult to predict accurately and can significantly accelerate the need for new distribution capacity. As members of the local communities it serves, PG&E employees meet with government and business leaders to keep abreast of general plan amendments, building permit trends, and economic indicators. These activities assist in predicting large increases in business electrical demand.~~

~~City planners have indicated that a substantial amount of industrial growth is expected to occur south of the Paso Robles Airport within Golden Hill Industrial Park and along Dry Creek Road, including in Aerotech Industrial Park. Wine production is leading industrial growth, with San Antonio Winery's 1 MW facility in Golden Hill Industrial Park nearing completion, and Justin Vineyards' plans to expand when Golden Hill Industrial Park expands. Golden Hill's expansion plans have already been approved by the City. Other large business loads on the horizon include several new hotels or hotel expansions, which may suggest that additional hotel development will follow. (*See* Section II.B.).~~

Future load centers, incorporating this latest public load data, are shown on Figure 7, which also illustrates the proposed Estrella distribution system designed to serve this load. The challenge with these types of fast-paced developments is the short lead-time in planning for the increased electrical demand. ~~The effects of large block loads are very difficult to accurately include in the LoadSEER forecast for this reason.~~ In most cases, PG&E learns of these large-load interconnections only 18 to 24 months in advance of operation, from receiving an application to providing service. Of the factors that affect DPA capacity, large new business growth is the most likely to ~~make an impact on~~accelerate the need for new distribution capacity and is the most difficult to predict.

Table 6. Large-Load Adjustments for Paso Robles DPA

Project Identification Number	Project Name and Description	Year Received/ Approved	Expected Completion Date	Estimated Demand (MW)
1	Beechwood Specific Plan (SP) – 862 Dwelling Units (DUs); 64,000 square feet (commercial)	Received 2016	Information Not Available (INA)	1.357
2	Furlotti Annexation (Paso Robles Gateway Project) South Vine Street – 97 DUs; 464,000 square feet (commercial); 425 hotel rooms	Received 2016	INA	1.035
3	San Antonio Winery Production Facility – 85,951 square feet (commercial)	Approved 2015	2016	0.987
4	South Chandler Ranch General Plan Amendment (GPA)/SP – 560 DUs	Received 2017	INA	0.840
5	Erskine Industrial GPA/Map/Water Supply Evaluation (WSE) – 622,000 square feet (commercial)/Justin Winery Expansion	Received 2015	INA	0.622
6	Tract 2549 – 41 DUs	Received 2013	INA	0.522
7	Firestone Warehouse Development Plan Amendment – 59,000 square feet commercial	Received 2016	INA	0.300
8	River Oaks 2 GPA/SP Amendment/WSE – 271 DUs	Approved 2016	INA	0.407
9	Rancho Fortunato Event Center	Received 2014	INA	0.343
10	Vina Robles Vineyards – 80,680 square feet (commercial)	Approved 2014	INA	0.343
11	Meridian Winery Red Tank Farm Expansion	Pending	INA	0.300
12	Mission Gardens – 85 DUs	Received 2015	INA	0.295
13	Erskine GPA/Rezone of 38 Highway 46 and Paso Robles Blvd – 250,000 square feet (commercial)	Received 2017	INA	0.250
14	Southgate Center (Paris Precision) Building and Site Modifications – 215,000 square feet (commercial)	Approved 2017	INA	0.215
15	Templeton Ranch – 100 DUs	Received 2014	2017	0.214
16	Vina Robles Amphitheater/Hotel – 95,000 square feet (commercial), 80 hotel rooms	Received 2003	INA	0.175
17	Arjun (Blue Oaks) Apartments – 142 DUs	Approved 2017	INA	0.142
18	Oaks Assisted Living – 101 bed, 89,000 square feet (commercial)	Received 2015	INA	0.140
19	Terra Linda Farms – 200 horsepower agricultural pump	Received 2016	INA	0.120

Project Identification Number	Project Name and Description	Year Received/ Approved	Expected Completion Date	Estimated Demand (MW)
			Subtotal:	**8.806**

Source: City of Paso Robles Community Development Department, Project "Pipeline" Report, July 19, 2017

Figure 7. Future Estrella Substation Distribution System, Large-Load Adjustments, and Future Load Centers

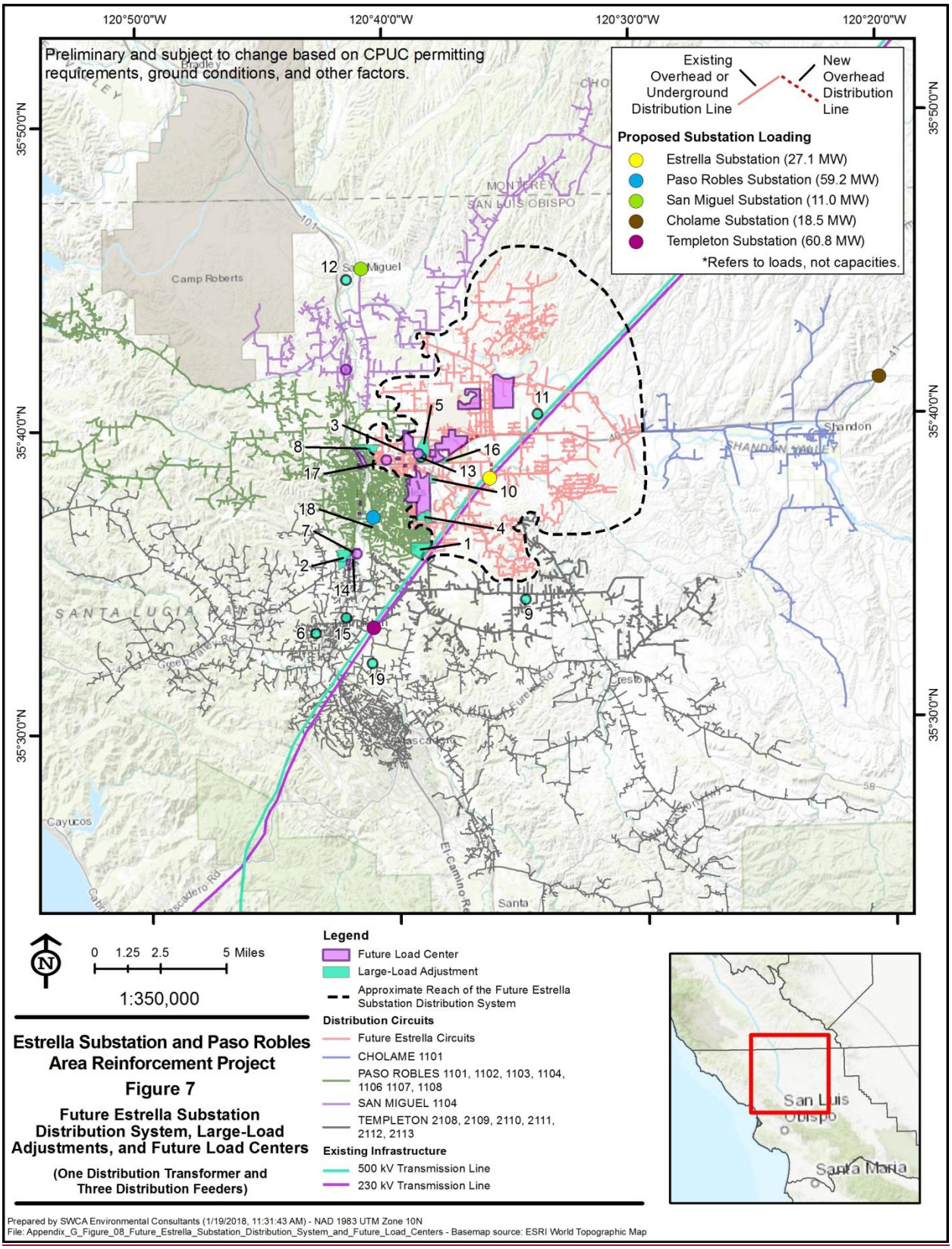


Table 7 below indicates substation capacities and loads for the Paso Robles and Cholame DPAs before and after distribution facilities are added at Estrella Substation. The loads correspond to the proposed circuit configurations indicated in Figure 2, Figure 4, and Figure 6 of the August 2017 Appendix G and are based on 2016 distribution load flow studies to illustrate project feasibility. Actual loads for the proposed circuit configurations will be higher at the time that new distribution facilities are needed.

Table 7. Approximate Breakdown of Substation Capacities and Loads Before and After the Addition of Estrella Substation

Substation	Available Capacity (MW)	Substation Load Before (MW) [1]	Load Transfers (MW) [1]				Substation Load After (MW) [1]
Estrella	29.70	-----	+11.20	+3.10	+2.10	+10.70	27.10
Paso Robles	89.10	70.40	-11.20	-----	-----	-----	59.20
San Miguel	15.84	14.10	-----	-3.10	-----	-----	11.00
Cholame	24.75	20.60	-----	-----	-2.10	-----	18.50
Templeton	89.10	71.50	-----	-----	-----	-10.70	60.80

[1] Substation loads and load transfer amounts are based on 2016 CYMDIST Load Flow Data. Distribution Load Flow studies in the PowerWorld PWD format or in GE EPC format are not available. PG&E uses CYMDIST from CYME for distribution load flows. The latest CYME load flows are based on Summer 2016 peak loads and model load conditions for Summer 2017 through Summer 2019.

Underestimating the amount of available capacity to serve such loads could threaten sensitive industrial customers with major business losses. Manufacturing- or process-oriented businesses are very sensitive to interruptions in electric power that can interrupt assembly processes and cause damage to assembly equipment, costly delays for clean-up and restart, and losses of entire batches of product. Wineries, a growing industry in the area, are particularly sensitive to power outages. ~~The City Public Works Director has confirmed that the area south of Paso Robles Airport, including Golden Hill Industrial Park and along Dry Creek Road, is anticipated to be the area of highest growth within the Paso Robles area.~~ If PG&E receives a new business application for a large load in this area, it may exhaust all of the remaining area capacity, or initiate other commercial-industrial load growth that together could quickly outpace capacity. If this were to happen without the Estrella project in place, PG&E may be unable to permit, secure necessary land rights, and construct additional distribution capacity in time to prevent significant overloads throughout the DPA—at Paso Robles and San Miguel substations in particular.

IV. ESTRELLA PROJECT DISTRIBUTION BENEFITS

A. DPA Capacity Increase

Since the Paso Robles DPA is reaching the limits of its distribution substation capacity, the distribution system is vulnerable. Two unknowns will drive the timing of the need for additional distribution capacity: the amount of DER demand reduction and the addition of large-load interconnections. If DER demand reduction is slow to materialize or if new, large business load is added in Paso Robles, the DPA capacity limits could quickly be reached or exceeded. PG&E's new 70 kV substation at Estrella Substation provides a location for future 21 kV distribution facilities where they are most likely to be needed, and can most easily be constructed and integrated with the existing system. Without the Estrella Substation location, there may be insufficient time to put new distribution capacity in place to prevent significant overloads throughout the DPA, especially at Paso Robles and San Miguel substations.

Adding a new 70/21 kV transformer with three new distribution feeders connected to existing feeders near Estrella Substation can be accomplished in only 4 months and provide approximately 28 MW[6] of additional capacity. The new distribution facilities at Estrella Substation will alleviate overloads within the DPA by

[6] Assumes a 95% utilization factor.

creating additional distribution capacity, thus enabling distribution planning engineers to appropriately load substation transformer banks and transfer distribution load throughout the DPA to address needs as they arise.

No other distribution is planned within the foreseeable future, although there will be room at Estrella Substation for an additional two distribution banks as needed. If these two additional distribution banks and six feeders were added, the ultimate distribution capacity would be approximately 85 MW, assuming a 95% utilization factor.

While large block loads and DER estimates both inject uncertainty into the planning process, one thing is certain: distribution substation facilities will be needed sometime within 5 to 15 years, and could be needed very quickly in response to one or more large-load interconnections that could materialize at any time. The Estrella project supports this critical future need.

B. Distribution System Reliability Improvements and Operational Flexibility

The addition of a future 70/21 kV source in the Paso Robles DPA at Estrella Substation will not only increase the available capacity of the DPA, but will also allow a feeder configuration from the new substation that will reduce feeder length and provide back-ties to existing distribution feeders from San Miguel, Paso Robles, and Templeton substations. (*See* Figure 4. Future Estrella Substation Distribution System.) Estrella Substation is located near the growth areas south of Paso Robles Airport, enabling the future distribution substation to serve the expected load growth directly through much shorter distribution feeders than could be extended from existing substations. Moreover, with three feeders from the new distribution bank connected into the existing distribution system, Estrella Substation will have direct feeder ties to all substations within the Paso Robles DPA except Atascadero Substation, providing valuable system redundancy. The Paso Robles DPA benefits from the central location of Templeton Substation, with six 21 kV feeders extending north and south to provide strong ties to both Paso Robles and Atascadero substations. The future 21 kV substation at Estrella will also provide a strong tie to Templeton Substation, which will allow cascading transfers north to south or south to north through Templeton Substation to take advantage of available capacity wherever it exists within the DPA.

The future distribution substation at Estrella will also provide a new distribution source closer to Cholame Substation, which serves 1,500 customer connections within the Cholame DPA through a 27-mile radial transmission line from Arco Substation in the San Joaquin Valley. The proposed project provides a future opportunity to add an additional transmission line to Cholame Substation to create a looped circuit to improve reliability and operational flexibility on the 70 kV system. This line would likely be constructed within 2 to 3 years after Estrella Substation is built. The existing 27-mile radial line must be cleared for maintenance every 18 to 24 months, requiring most of the 1,500 customers to be notified of multiple planned outages over a several-day period because there is no alternate 70 kV transmission source for the substation. The alternative to planned outages is to install temporary generation at Cholame Substation during these maintenance periods; however, the cost to do this is approximately $1 million every 18 to 24 months. Moreover, aside from the maintenance periods, the service reliability for all 1,500 customers is negatively impacted during normal system configuration (when all facilities are in service) because of the single transmission source. The Estrella 230/70 kV substation would provide a second transmission source approximately 17 circuit miles from Cholame Substation that could be used to eliminate the maintenance clearances and improve service reliability for all customers served by Cholame Substation. In addition, a future 21 kV distribution feeder from Estrella Substation to Cholame Substation could provide a cost-effective temporary solution to the transmission maintenance problem until such time that the 70 kV line could be built.

The ability to establish strong circuit ties and load relief from a new substation to multiple existing substations ~~from a single new source~~ will provide uniform load relief as well as optimize operating flexibility and emergency restoration throughout the Paso Robles and Cholame DPAs.

C. Distribution System Renewables Hosting Capacity

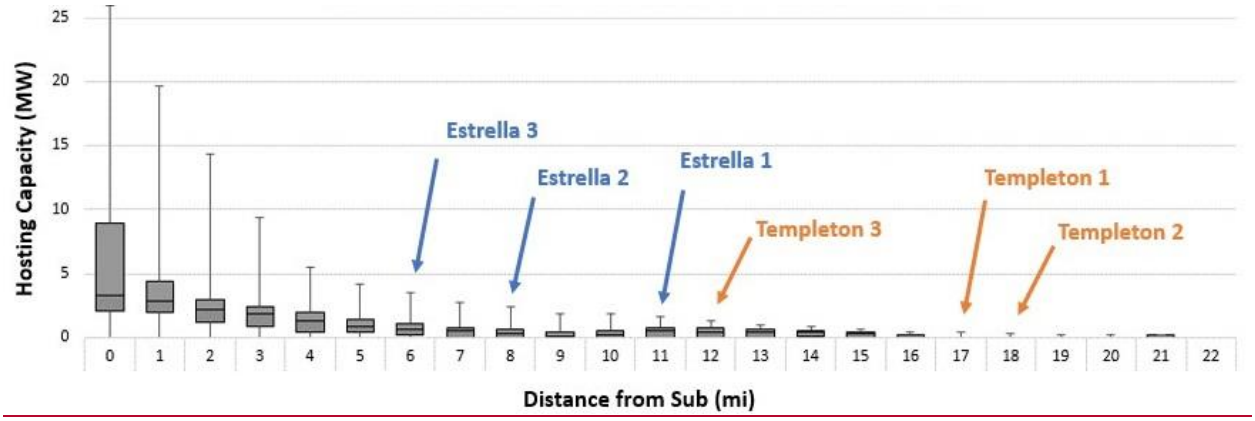
The addition of a distribution substation at the Estrella site would have the additional benefit of supporting DER hosting capacity for the Paso Robles DPA. Hosting capacity, which is the ability to integrate DER with limited investments, significantly decreases with electrical resistance and/or circuit distance from a substation and, thus, has a strong dependency on circuit length. Demonstration projects in R.14-08-013, the Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769, have shown that increases in circuit length can significantly impede hosting capacity and limit new DER. (*See, e.g.,* PG&E's Demonstration Projects A and B Final Reports, filed December 27, 2016, at 78, 87 and 91, filed December 27, 2016, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M171/K806/171806890.PDF.)

Templeton circuits currently have more than double the average electrical resistance compared to the average circuits for all PG&E substations in the service area. The proposed Estrella circuits (average length 9 miles) would average approximately 56% less electrical impedance across all circuits than the proposed Templeton circuits (average length 16 miles). (*See* Figure 8). Serving new growth areas by extending distribution lines from Templeton Substation would limit new opportunities for DER.

Figure 9 illustrates the available DER hosting capacity at the end of each proposed distribution circuit coming from Estrella and from Templeton. Note, circuits coming from Templeton would have very little ability to add DER at the end of the circuits due to the length (resistance) of these circuits, while circuits originating at Estrella would have considerably more DER hosting capacity.

Figure 8. Average Electrical Impedance across Circuits

Figure 9. Circuit DER Hosting Capacity versus Distance from Substation



As seen in Figure 9, the proposed Templeton circuits can have near zero hosting capacity due to the distance from the substation. Establishing a new substation at Estrella, in which existing circuit lines (Templeton and Paso Robles substations) can be broken up and have shorter lengths, will ensure additional hosting capacity for the Paso Robles DPA and lower integration costs to adopt future DER in this area.

V. ADDITIONAL DISTRIBUTION QUESTIONS AND ANSWERS

A. Why Not Expand Distribution at Paso Robles Substation?

Placing additional distribution facilities at Paso Robles Substation is not a viable option. Although the growth in demand is in Paso Robles, load in many northern areas of Paso Robles is currently being served with lengthy feeders from Templeton Substation; Paso Robles Substation has limited capacity and its existing 12 kV feeders cannot accommodate future growth in northern Paso Robles.

Adding a fourth distribution bank at Paso Robles Substation is not possible due to space constraints. For the same reason, replacing the 30 MVA banks with 45 MVA banks is not feasible because there is insufficient space to install additional feeders. PG&E has no existing mobile transformer support or emergency replacement transformers for 70/12 kV 45 MVA banks in any event.

Even if Paso Robles Substation had additional capacity and could install feeders within the substation, there is no easy route for new feeders to extend beyond the substation to reach the northern growth areas in Paso Robles. This is a congested urban area with existing 12 kV distribution lines. New feeders would likely be of an express nature, with most of the load being sensitive industrial customers at the ends of the feeders. Because of the congestion, new feeders would either need to be combined with existing overhead feeders on double-circuit overhead routes, increasing the likelihood and extent of outages for new and existing customers served by those lines, or placed in lengthy, expensive underground routes. Either choice would be challenging and costly.

B. Why Not Expand Distribution at Templeton Substation?

While it would be possible to serve additional distribution load from Templeton Substation, this would result in increased costs and decreased reliability. PG&E's distribution planning practices caution against adding distribution capacity at a location that will degrade service reliability. Since reliable distribution systems consist of substations located at regular intervals and sized correctly for the surrounding load between substations, adding more capacity and more 21 kV feeders at Templeton Substation would be a large step ~~backwards~~in the wrong direction. While the existing 21 kV Templeton 2109 Feeder serves areas well north of Paso Robles Substation, it does not serve the growth areas near Paso Robles Airport. ~~-~~This feeder is forecasted to be loaded at over 80% of its capacity in ~~2017~~2018, limiting its ability to be extended to serve the additional load near the airport. This means that additional long or longer new feeders from Templeton Substation would be required to serve the anticipated growth areas north of SR-46. (*See* Figure 1. Approximate Reach of the Existing Templeton Substation 21 kV Distribution Feeders.)

Both the Estrella and Templeton options provide two feeders that extend to the area of anticipated growth north of SR-46 and south of Paso Robles Airport. The Estrella option provides two new 21 kV feeders, Union Road South and Mill Road Central, that meet near the intersection of Golden Hill Road and Wisteria Lane: 35º 39' 0.5" North (N) and 120º 39' 29" West (W) (35.6501,-120.6581). The Templeton option also would provide two 21 kV feeders that meet at this intersection, the Existing Templeton 2109 and a longer version of Mill Road Central. For comparison purposes, Golden Hill and Wisteria will be considered the "growth area." The precise location of potential new feeders is estimated for this discussion.

PG&E proposes to install three 21 kV feeders from Estrella Substation when the distribution substation facilities are constructed (*See* Figure 4. Future Estrella Substation Distribution System). Based on preliminary design, the first Estrella feeder—"Estrella 1"—will consist of 1.67 circuit miles of new or reconductored distribution line and a total main-line length of 11.76 circuit miles (including 10.09 circuit miles of existing line). The second Estrella feeder—"Estrella 2"—will consist of 6.14 circuit miles of new or reconductored distribution line and a total main-line length of 8.54 circuit miles. The third Estrella feeder—"Estrella 3"—will consist of 3.54 circuit miles of new or reconductored distribution line and a total main-line length of 5.96 circuit miles. [7]

If distribution facilities were to be added at Templeton Substation when additional capacity becomes necessary, an equivalent system would include three new 21 kV feeders as well as 4.35 circuit miles of new or reconductored distribution line on the existing Templeton 2109 Feeder, which is already routed toward the area of anticipated growth north of SR-46. The new and reconductored line on the Templeton 2109 would be required to clear a route for two of the new 21 kV feeders and to extend Templeton 2109 capacity further into the anticipated growth area. The first new 21 kV feeder from Templeton—"Templeton 1"—would consist of 15.41 circuit miles of new or reconductored distribution line and a total main-line length of 17.12 circuit miles (including 1.71 circuit miles of existing line). The role of the Rural Areas East feeder would be to absorb 11 MW of existing Templeton 2109 load to free up 2109 capacity since the 2109 Feeder already extends to the growth area. The second new feeder from Templeton—"Templeton 2"—would consist of 10.57 circuit miles of new or reconductored distribution line and a total main-line length of 18.13 circuit miles. The third new feeder from Templeton—"Templeton 3"—would consist of 12.20 circuit miles of new or reconductored distribution line and a total main-line length of 14.60 circuit miles.[8]

The construction of Estrella Substation will also require three additional 21/12 kV pad-mounted transformers in the field to provide circuit ties between 21 kV and 12k V feeders (*See* Figure 4. Future Estrella Substation Distribution System). The equivalent distribution system from Templeton Substation would require four additional 21/12 kV pad-mounted transformers.

The shorter route from Estrella to the growth area, Union Road South, is 4.58 circuit miles and the longer route, Mill Road Central, is 7.77 circuit miles. The Templeton option provides one new 21 kV feeder to the growth area and does circuit work to release capacity on an existing Templeton 21 kV feeder, 2109, that extends from Templeton to the growth area. The shorter route to the growth area at Golden Hill and Wisteria from Templeton Substation is the Existing Templeton 2109, which is 11.70 circuit miles and takes much of the same route as the Union Road South feeder from Estrella. The longer route from Templeton to the growth area, also called Mill Road Central, is 13.83 circuit miles and follows much of the same route as the Mill Road Central route from Estrella.

Both shorter routes from Estrella and Templeton to the growth area, Union Road South from Estrella and Existing 2109 from Templeton, meet at the intersection of Union Road and Penman Springs Road: 35º 37' 48.5" N and 120º 36' 51.5" W (35.6302,-120.6143). From this point onward, the routes are identical all the way to the growth area. The route from Templeton to the meeting point at Union and Penman Springs is 7.12 circuit miles longer than the route from Estrella to the meeting point. This is a significant difference, 155% longer, making Estrella far closer to the growth area.

Similarly, both longer routes to the growth area, Mill Road Central from Estrella and Mill Road Central from Templeton, meet at a common point on Mill Road: 35º 38' 41" N and 120º 37' 12.5" W (35.6447,-120.6202), and from this point on the routes are identical all the way to the growth area. The

[7] All estimates are provided for purposes of discussion, based upon preliminary design and subject to change.

[8] All estimates are provided for purposes of discussion, based upon preliminary design and subject to change.

route from Templeton to the common point on Mill Road is 6.02 circuit miles longer than the route from Estrella. This is also a significant difference, 78% longer, again making Estrella far closer.

Long feeders are problematic for several reasons. First, as explained previously, long feeders are less reliable simply because of their length and potential for outages that affect many customers (see Table 1). Adding new long feeders from Templeton Substation to northern Paso Robles would further degrade system reliability. Second, in this case, the new feeders would likely be mainly express feeders with much of their load at the end of the line, which would result in most or all customers on the line experiencing an outage if there is trouble anywhere along the lengthy feeder. Third, accessible and maintainable distribution routes north out of Templeton Substation to Paso Robles are limited, and would require lengthy double- or possibly even triple-circuit overhead lines in order to reach areas in Paso Robles. While it is sometimes necessary to place distribution lines on double-circuits, it is not ideal because distribution poles are wood and typically close to roadways. When cars hit wood poles, they generally knock out service; when cars hit poles carrying double- or triple-circuits, customers on multiple circuits may lose power. In ~~rural~~ areas along busy roadways, such as some areas north of Templeton Substation, cars travel at high speeds and wood poles close to roadways are especially vulnerable. With poles carrying multiple lines, a single car-pole accident could take out two or three 21 kV feeders, knocking out power to a significant number of customers.

In theory, new electric demand south of Paso Robles Airport could be served from Paso Robles Substation, with new distribution feeders out of Templeton Substation taking over additional load in Paso Robles to free up capacity for the new growth. Cascading load within a well-connected DPA can be a useful tool in many circumstances, so long as service reliability is maintained; however, service reliability is substantially reduced whenever one substation's feeders are overextended and another substation's feeders are either underutilized or doubled-up because they are confined to only one direction of travel. In this case, although cascading load from Paso Robles Substation to Templeton Substation and then adding load at Paso Robles Substation is a possible option, it would once again require long feeders from Templeton Substation to pick up load well north of Paso Robles Substation and then require existing Paso Robles feeders to be rerouted to the new growth areas near the airport. As explained previously, rerouting feeders northeast from Paso Robles Substation to the growth areas near the airport would be especially challenging.

In either case, installing additional, lengthy distribution feeders from Templeton Substation would further compromise reliability in a distribution system that is already out of balance. As explained in Section IV.C, longer feeders also negatively affect power quality due to power impedance. Templeton Substation circuits currently have more than double the average electrical resistance compared to the average circuits for all substations in the PG&E service area.

PG&E is aware of no distribution planning standard that determines whether a feeder is too long to provide reliable service, or how much risk of car-pole accidents is acceptable. However, car-pole accidents can cause sustained outages affecting thousands of customers, presenting a serious threat to service reliability. Distribution planners strive to minimize this risk.

C. What Solar Projects Have Been Developed or Will Come Online within the Next 10 Years in the Paso Robles DPA?

Table 8 indicates the expected solar projects to come online in the next 10 years, as well as those that have been connected within the last 5 years. The table identifies the projects that connected to the transmission system, as well as those that have connected or will connect to the distribution system. As indicated in Section IV.C, extended circuits coming from Templeton Substation would have very little ability to add new renewable energy generation at the end of the circuits due to the length and resistance of these circuits, while circuits originating at Estrella Substation would have considerably more solar generation hosting capacity.

Table 8. Solar Projects in Paso Robles DPA

Queue	Project	Fuel	Actual In-Service Date	Size (MW)	Distribution / Transmission	Substation
Projects in Paso Robles DPA – In Service within the Last 5 Years						
166	California Valley Photovoltaic (First Solar)	Solar	9/5/2013	210	Transmission	Templeton
239	Carrizo Solar Farm II (California Valley Solar Ranch)	Solar	1/7/2013	250	Transmission	Templeton
0397-WD	2103 – Hill (Pristine Sun)	Solar	1/8/2015	0.75	Distribution	Templeton
0443-WD	2059 – Creston 2 Scherz (Pristine Sun)	Solar	1/30/2014	0.5	Distribution	Templeton
0384-WD	Vintner Solar Project	Solar	1/6/2014	1.5	Distribution	Templeton
0394-WD	2056 – Jardine	Solar	3/3/2014	1.0	Distribution	Paso Robles
Projects in Paso Robles DPA – In Service within the Next 10 Years						
1596-RD	Firestone Walker Inc.	Solar	To Be Determined (TBD)	1.7	Distribution	Templeton
1529-RD	City of Paso Robles	Solar	TBD	3.7	Distribution	Paso Robles
Not Applicable (NA)	Airport 4 MW Solar Project	Solar	TBD	4	Distribution	Paso Robles/ Future Estrella
NA	Firestone Walker Inc. 1.68 MW Solar Project	Solar	TBD	1.68	Distribution	Templeton
NA	Vitner Solar LLC 1500 kW Solar Project	Solar	TBD	1.5	Distribution	Templeton
NA	Pristine Sun Fund 7 LLC 996 kW Solar Project	Solar	TBD	0.996	Distribution	Paso Robles
NA	Paso Robles Public Schools 786 kW Solar Project	Solar	TBD	0.786	Distribution	Paso Robles
NA	J Lohr Winery Corporation 642.8 kW Solar Project	Solar	TBD	0.6428	Distribution	Paso Robles/ Future Estrella
NA	Templeton Unified School District 636 kW Solar Project	Solar	TBD	0.636	Distribution	Templeton
NA	Meridian Vineyards 620 kW Solar Project	Solar	TBD	0.620	Distribution	Templeton
NA	Paris Precision LLC 504 kW Solar Project	Solar	TBD	0.504	Distribution	Templeton
NA	Niels Udsen 500 kW Solar Project	Solar	TBD	0.5	Distribution	San Miguel

VI. REFERENCES

CAISO. 2014. *2013-2014 CAISO Transmission Planning Process, Estrella Substation Project Description and Functional Specifications for Competitive Solicitation.* June 26, 2014. Online: www.pge.com/includes/docs/pdfs/safety/pasorobles/PasoRobles_CAISO_ProjectDescription.pdf. Accessed November 5, 2016.

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