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# 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.

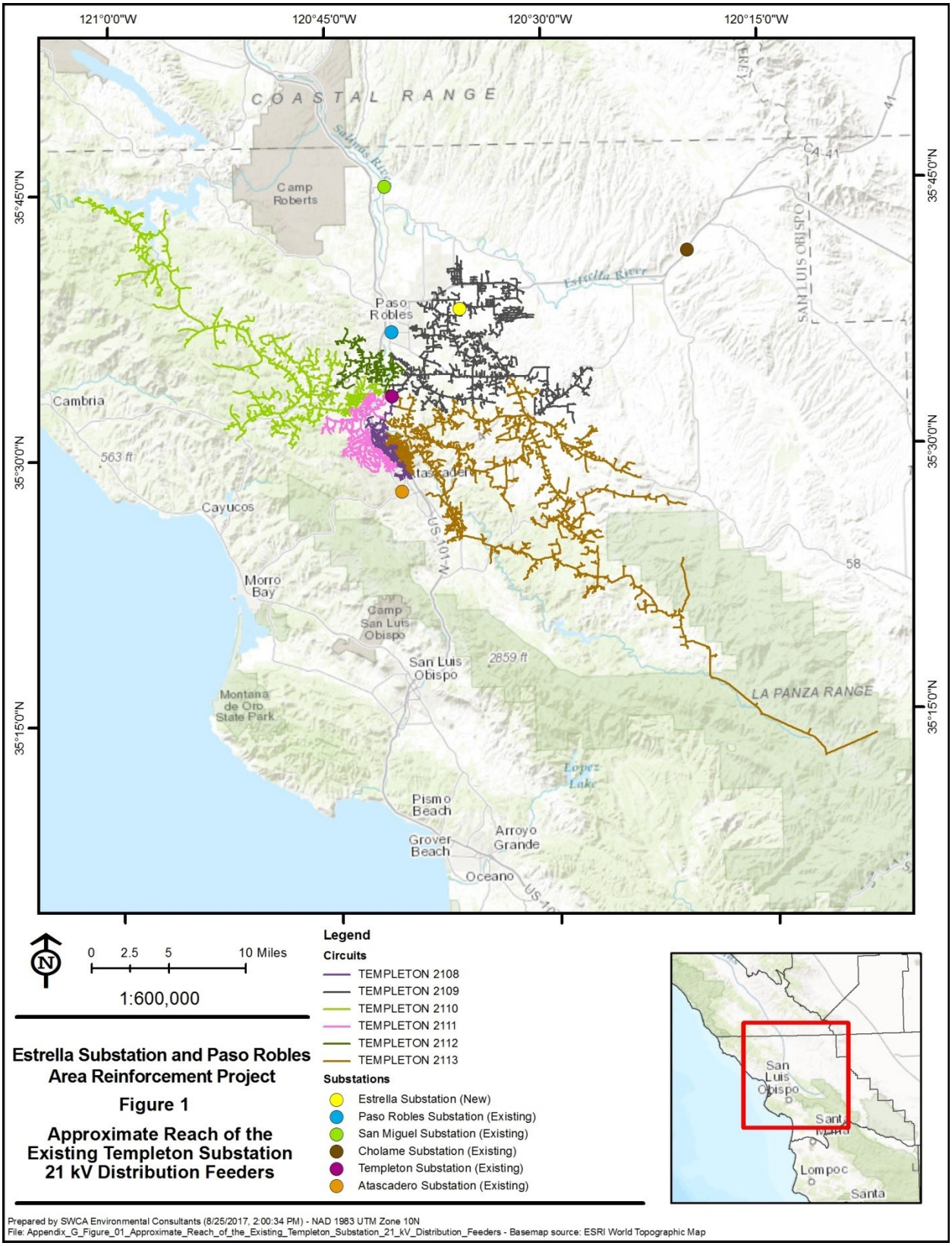
Templeton Substation has lengthy 21 kV ~~distribution lines (~~feeders~~)~~ that can carry ~~roughly~~ 73% more load and experience one-third less voltage drop than the 12 kV feeders from the other area substations because of their higher operating voltage. Even though Templeton Substation is south ~~of 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~~in the ~~past~~ 5 years~~.~~ between February 2012 and February 2017. 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, Five-Year Outage History ~~(Feb 2012 to Feb 2017)~~ of Templeton 21 kV Feeders (February 2012 to February 2017), 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.

[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.)

**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 |

## 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 build-out (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 2017.

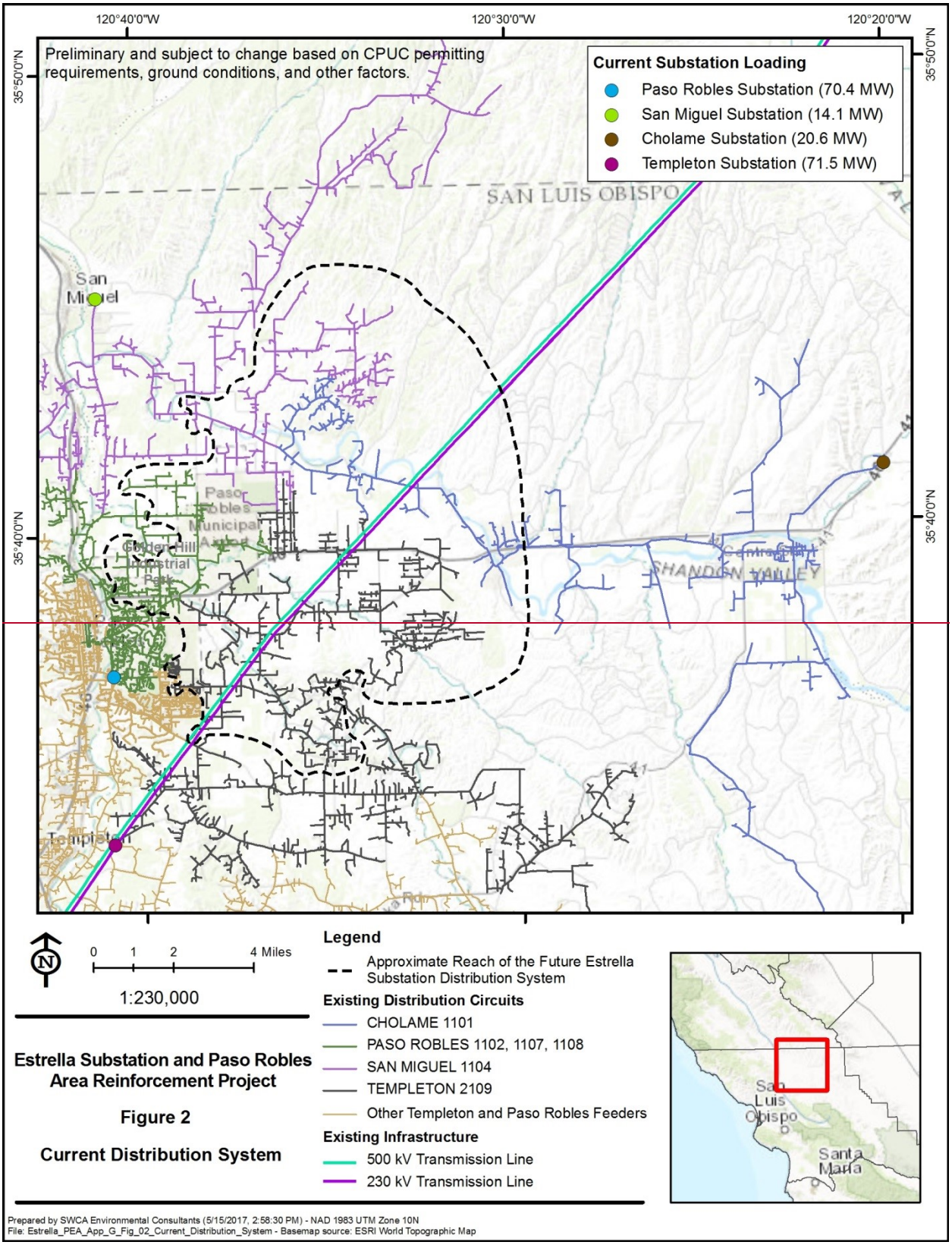
**Table 2. Historical Paso Robles DPA Capacity and Load**

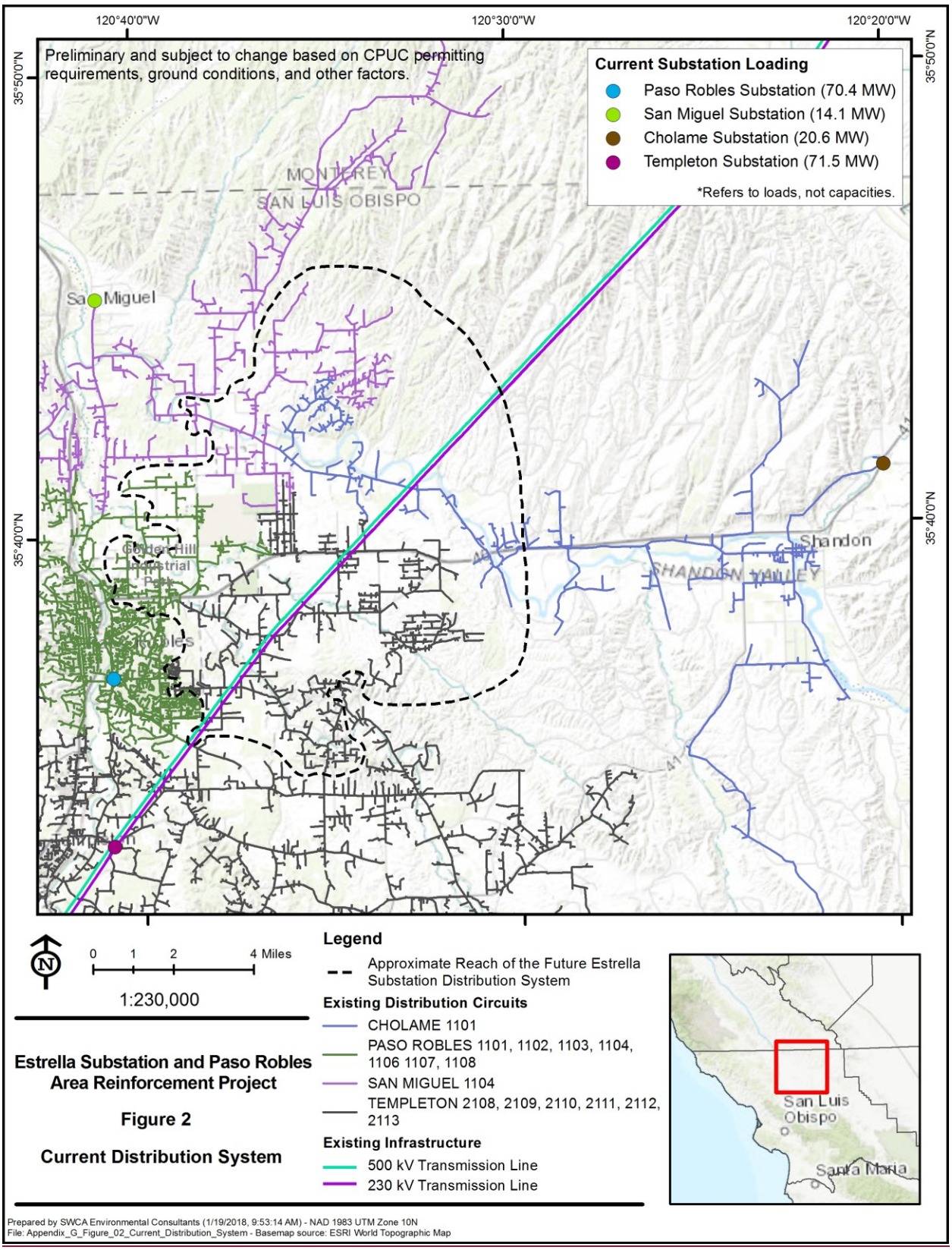
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Historical Available DPA Capacity | 182.46 | 197.51 | 197.51 | 212.55 | 212.55 | 212.55 | 212.55 | 212.55 | 212.55 | 212.55 | 212.55 |
| Historical DPA Peak Load | 179.44 | 169.40 | 164.40 | 158.73 | 150.69 | 173.98 | 180.63 | 164.74 | 169.33 | 190.14 | 195.06 |

Note: Paso Robles Bank 1 was replaced in 2010 with a 30 MVA transformer unit, bringing available DPA capacity to 212.55 MW.

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. This is the future load center that the proposed project is intended to serve. 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).[3] 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 4A, 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

[3] At the request of the CPUC, powerflow data for PG&E's 230 kV system is being provided separately to CPUC staff. This information has been deemed Critical Energy Infrastructure Information (CEII) by Federal Energy Regulatory Commission (FERC). It includes data concerning the local 230 kV system serving this area along with the load modeled for the years 2022 and 2027. Note that the Estrella Substation project is also already included in these models. After PG&E developed these base cases, they were then adopted by the CAISO as part of the 2017-2018 Transmission Planning Process (TPP).

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, the center of the future electric load 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 4A, 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 4A. 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 4A because they are the only gaps in the existing distribution system necessary to create one of the new feeders (Estrella 2). 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 4A are approximate locations, preliminary and subject to change. The segment of new line extending north from Estrella Substation, the southern segment to be added, is an accessible route along a farm road, and the northern segment to be added 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 Estrella 2 feeder to existing distribution on Mill Road. An additional segment of new line will be installed to extend the reach of the Estrella 2 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**

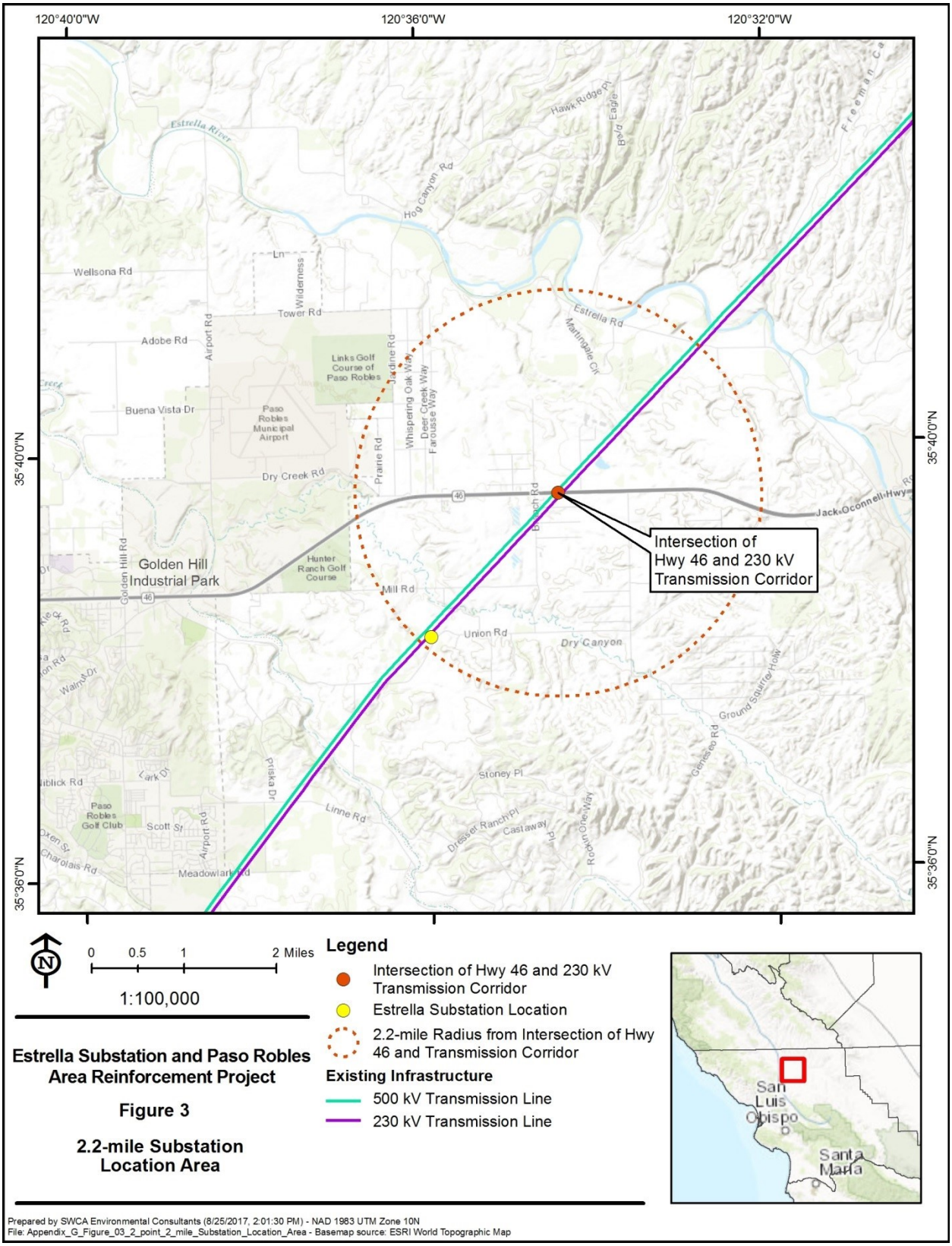
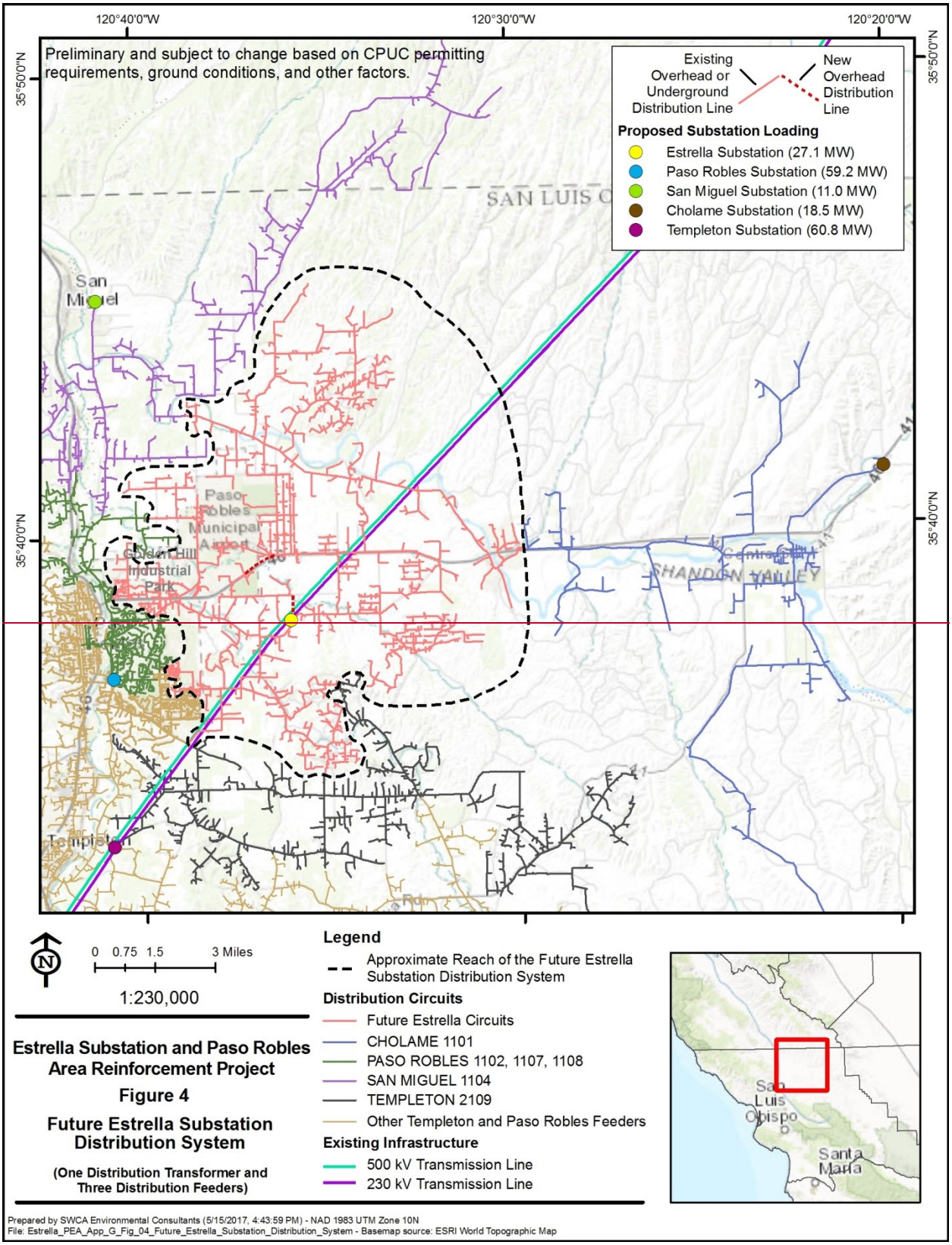
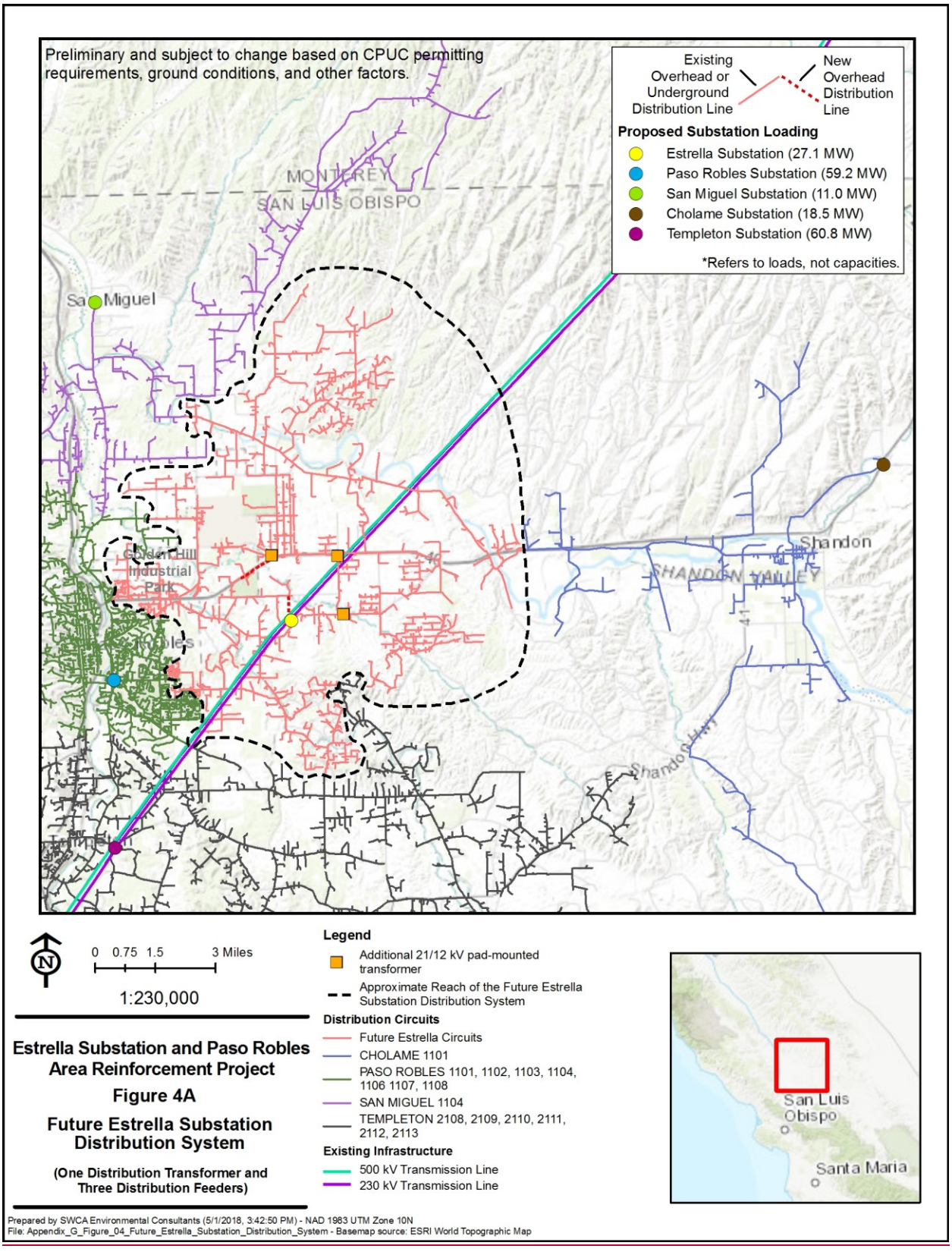


**Figure 4A. Future Estrella Substation Distribution System**




Preliminary and subject to change based on CPUC permitting requirements, ground conditions, and other factors.
Existing Overhead or Underground Distribution Line
New Overhead Distribution Line
Proposed Substation Loading
Estrella Substation (27.1 MW)
Paso Robles Substation (59.2 MW)
San Miguel Substation (11.0 MW)
Cholame Substation (18.5 MW)
Templeton Substation (60.8 MW)
*Refers to loads, not capacities.
MONTEREY
SAN LUIS OBISPO
San Miguel
Golden Hill Industrial Park
Shandon
SHANDON VALLEY
0 0.75 1.5 3 Miles
1:230,000
Legend
Additional 21/12 kV pad-mounted transformer
Approximate Reach of the Future Estrella Substation Distribution System
Distribution Circuits
Future Estrella 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 4A
Future Estrella Substation Distribution System
(One Distribution Transformer and Three Distribution Feeders)
Prepared by SWCA Environmental Consultants (5/1/2018, 3:42:50 PM) - NAD 1983 UTM Zone 10N
File: Appendix_G_Figure_04_Future_Estrella_Substation_Distribution_System - Basemap source: ESRI World Topographic Map

## Figure 4B. Future Estrella Main Distribution Feeders

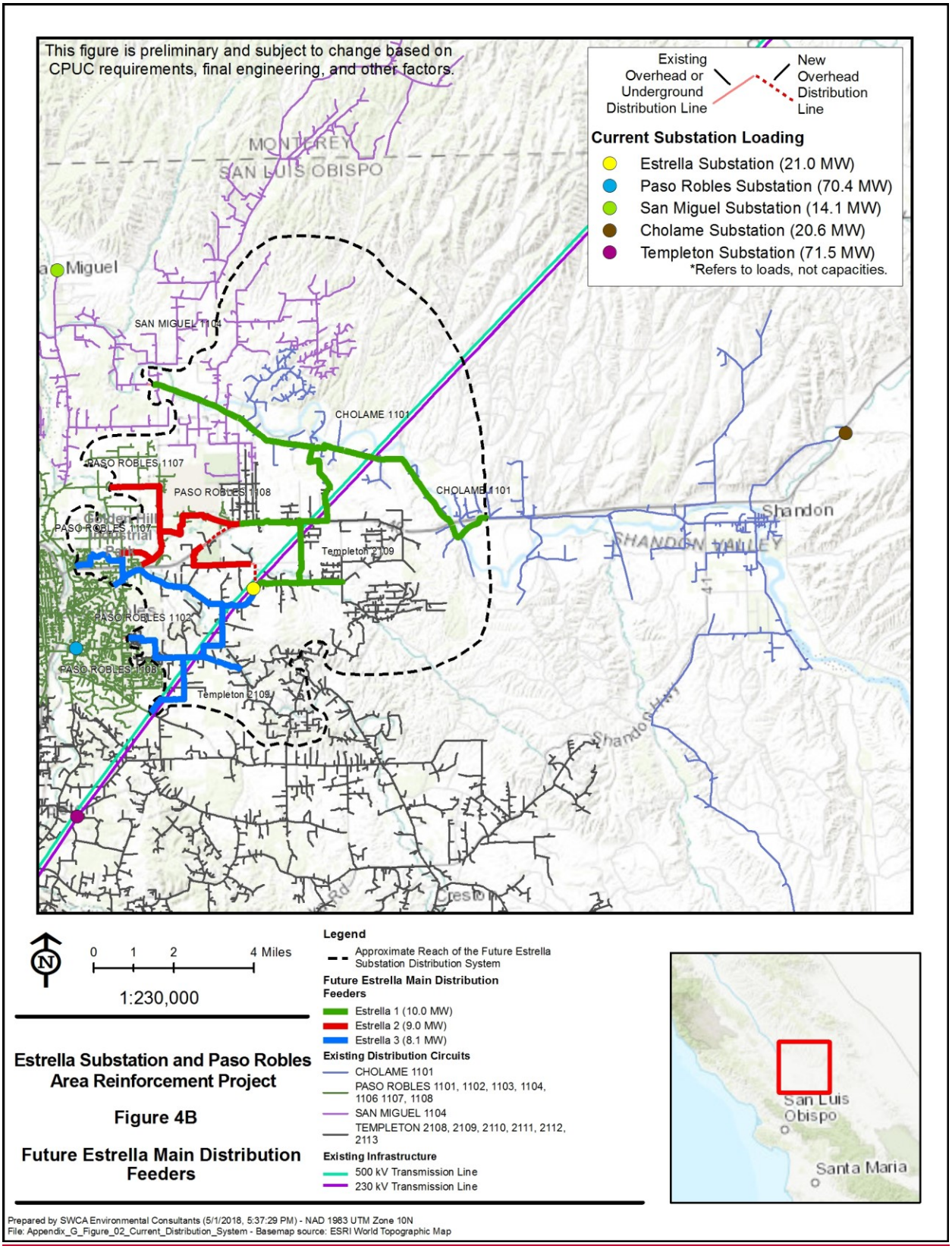
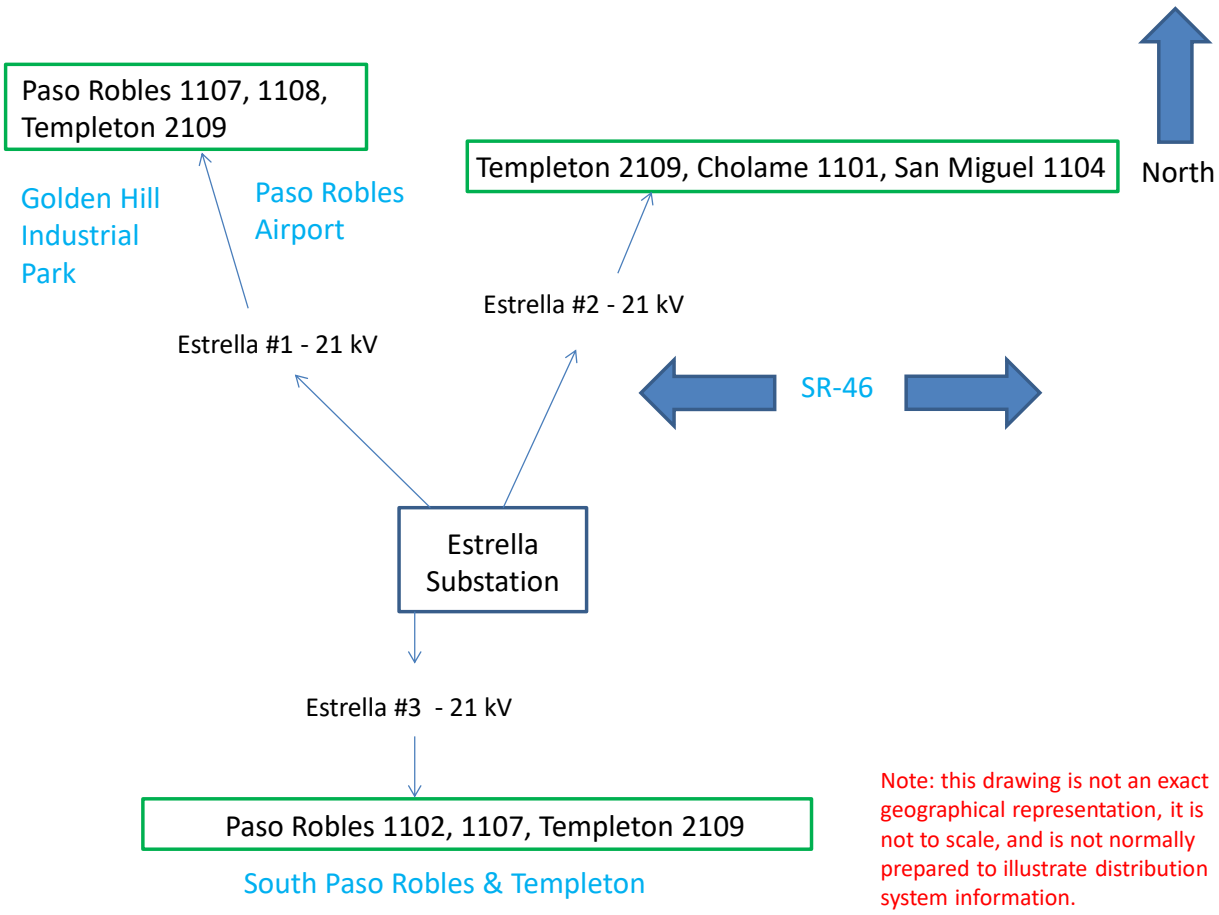


**Figure 4C. One-Line Diagram, Future Estrella Substation Distribution Feeders**



# 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 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

In a ruling on August 9, 2017, the CPUC provided direction to PG&E and other utilities on how to integrate DER[4] 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 through A.15-07-008.)

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

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 6A. (*See* Table 6A, 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.[5] Table 3 provides a breakdown of the Updated LoadSEER Forecast, and Table 4 provides a detailed load forecast by substation.

~~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.)~~

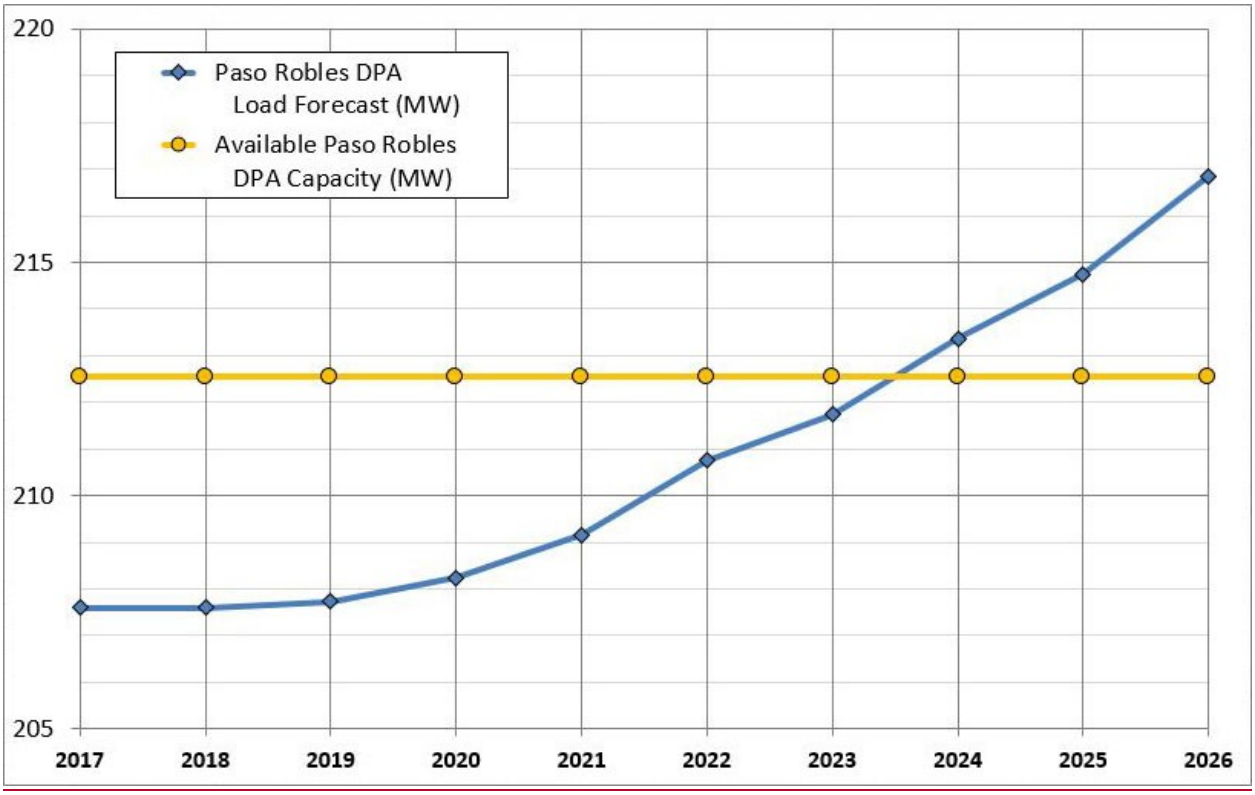
[5] Note that, other than the N-1 contingency described above, PG&E planning engineers included no further negative adjustments to the LoadSEER forecast for solar generation as part of the adjustments made for the 2016 IEPR forecast. Most solar is already accounted for in the IEPR forecast, so only an unusually large new distribution solar 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. Battery storage could potentially extend solar power's hours of operation, although PG&E is not aware of any plans for solar battery storage. (*See* Section V.D.3 for a discussion of solar battery storage as an alternative to a distribution substation.)

~~**Table 2. 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 |

**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[1]**

| Substation/DPA | Available Capacity | Forecasted (MW) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
| Atascadero Substation[2] | 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** | **212.22[3]** | **207.60** | **207.59** | **207.73** | **208.24** | **209.15** | **210.75** | **211.74** | **213.37** | **214.74** | **216.85** |

[1] Except for the total Available Capacity, none of these numbers have been adjusted to account for the 95% utilization factor, which is the basis for determining Available Capacity.
[2] While additional distribution capacity at or near Templeton Substation could be utilized to relieve and serve load presently on Atascadero Substation, doing so would not address growth in and around Paso Robles like the Estrella Substation option. Moreover, all three Atascadero distribution circuits are located south and west of Templeton Substation. Load transfers from one or more Atascadero distribution circuits would require a new, or reinforced existing, Templeton distribution circuit in the direction of Atascadero Substation.
[3] 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 4A, Figure 7A, and Figure 7B 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[6]**

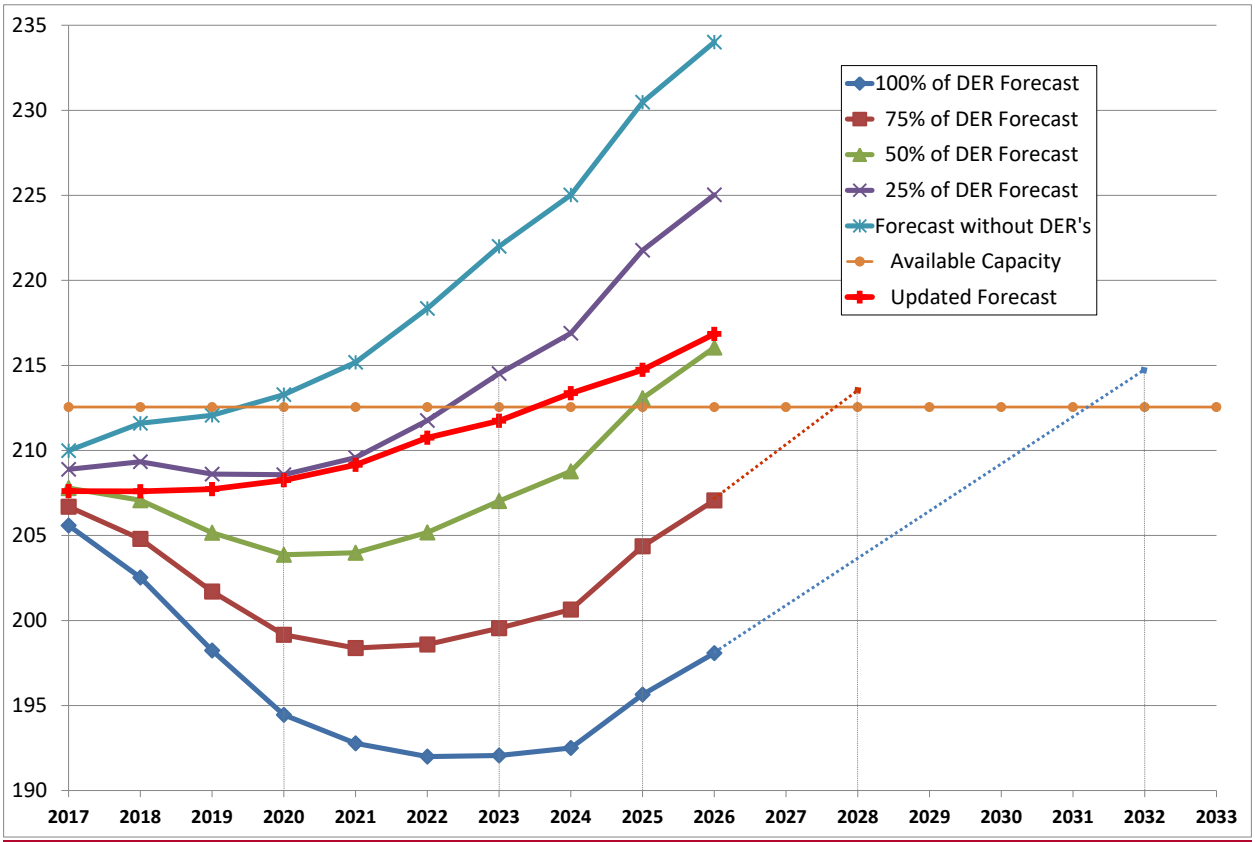
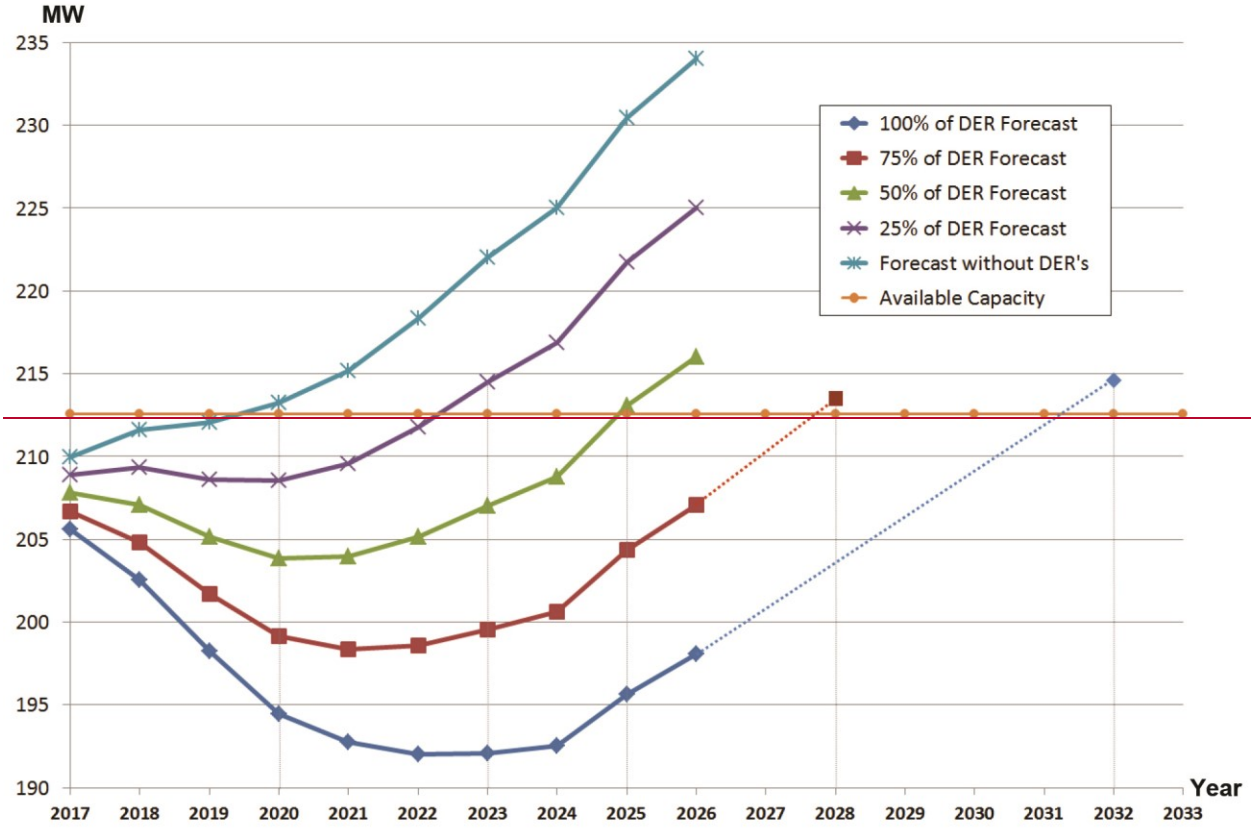



**Table 5. Previous 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast**

| 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 |

[6] 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.

**~~Figure 5. 1-in-10 LoadSEER Forecast Incorporating Varying Percentages of the DER Forecast~~**




~~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. Wineries, a growing industry in the area, are particularly sensitive to power outages.~~

## A. Large Block Loads

~~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.).~~

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 6A.) 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.

They represent specific customer loads that PG&E and city planners believe have a high probability of becoming operational within the timeframe provided by the customers. Large-load adjustments that were added to the LoadSEER forecast are shown on Figure 7A and listed in Table 6A, 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 for an electrical connection 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.

PG&E has also obtained other information from the City of Paso Robles and elsewhere on projects that have been proposed and have the potential to be built in the future. These other future proposed projects are shown in Figure 7B[7] and listed in Table 6B. These projects have not been added as adjustments into the LoadSEER forecast, but could be added in the future. Large block loads and other future proposed projects can occur anywhere in the DPA, and are not always near identified future load centers. Future load centers are the general locations identified by local agencies as likely to have concentrated and sizeable future load growth. Here, the primary future load center identified by the City of Paso Robles is

[7] Earlier versions of Figure 7 mislabeled Other Future Proposed Projects as Future Load Centers. While there is overlap, they are not the same and that error has now been corrected. Several Other Future Proposed Projects were removed in the January 2018 version of Figure 7 in order to eliminate duplications with Large-Load Adjustments (Figure 7A) and solar projects, projects unrelated to the future Estrella Distribution System, and projects for which there was no information. All but the duplicate projects have been added back into the current version, and others have been added based on new information.

near Dry Creek Road south of Paso Robles Airport and the Golden Hill Industrial Park in northern Paso Robles, where city planners expect large-demand businesses to be located. (*See* Sections II.B and II.C.)

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

| Project Identification Number | Project Name and Description | Year Received/ Approved | Expected Completion Date | Estimated Demand (MW) |
|---|---|---|---|---|
| 19 | Terra Linda Farms – 200 horsepower agricultural pump | Received 2016 | INA | 0.120 |
| | | | **Total:** | **8.607** |

Source: City of Paso Robles Community Development Department 2017a

**Table 6B. Other Future Proposed Projects in the Paso Robles DPA**

| Project Identification Number | Project Name and Description | Year Received/ Approved | Expected Completion Date | Estimated Demand (MW)[8] |
|---|---|---|---|---|
| 1 | Alder Creek Apartments – 16 Dwelling Units[9] | Approved 2016 | INA | 0.024 |
| 2 | Ayers Resort[10] | Received 2012 | 2014 | 0.450 |
| 3 | Bellissimo Restaurant and Apartments – 4 Dwelling Units[12,11] | Received 2017 | 2019 | 0.006 |
| 4 | Black Oak Lodge Hotel – 60,000 square feet, 96 hotel rooms[12] | Received 2016 | INA | 0.156 |
| 5 | Buena Vista Village at San Antonio Winery – 4 Dwelling Units, 12,000 square feet[12] | Approved 2015 | INA | 0.018 |
| 6 | Cabernet Links Recreational Vehicle (RV) Resort – 290 RV spaces[12] | Received 2015 | INA | 0.290 |
| 7 | Cava Robles RV Resort – 332 RV spaces[12,13] | Approved 2016 | 2018 | 0.332 |
| 8 | Cuesta Community College North County Campus Expansion – 43,000 square feet[14] | Approved 2014 | 2018 | 0.043 |
| 9 | Destino Hotel Resort Amendment – 291 hotel rooms[12] | Received 2016 | INA | 0.291 |
| 10 | Estrella River Vineyard Agricultural Cluster Subdivision – 24.92 acres[15] | Received 2007 | INA | 0.15 |
| 11 | Fairfield Inn Development Plan Amendment – 119 hotel rooms[12] | Received 2016 | INA | 0.119 |
| 12 | Firestone Coldblock 4 – 10,000 square feet[12,16] | Received 2016 | 2018 | 0.300 |
| 13 | Firestone Waste Water Treatment Facility[12,19] | Received 2016 | 2018 | 0.300 |

[8] PG&E estimated based on available proposed project data.

[9] City of Paso Robles Community Development Department 2017b.

[10] Informal communication between PG&E and City of El Paso de Robles.

[11] The Tribune 2017c.

[12] City of El Paso de Robles 2015a.

[13] Paso Robles Daily News 2017b.

[14] Cuesta College 2018.

[15] County of San Luis Obispo 2017.

[16] The Tribune 2017a.

| Project Identification Number | Project Name and Description | Year Received/ Approved | Expected Completion Date | Estimated Demand (MW)[8] |
|---|---|---|---|---|
| 14 | Future Development (APNs 025-436-004, 025-436-037, 025-436-038, 025-481-020, 025-481-024, and 025-481-075)[13] | INA | INA | INA |
| 15 | Golden Hill Industrial Park – Subdivision of 209 acres into 17 lots[13] | INA | INA | INA |
| 16 | Golden Hill Retirement Project – 125 beds, 140,000 square feet[12] | Received 2008 | INA | 0.203 |
| 17 | Hilton Garden Inn – 168 hotel rooms[12] | Received 2014 | INA | 0.168 |
| 18 | Homewood Suites Dallons Drive – 73,590 square feet, 105 hotel rooms[12] | Received 2016 | INA | 0.179 |
| 19 | Hyatt Place Hotel – 65,500 square feet, 116 hotel rooms[12,17] | Received 2016 | 2018 | 0.182 |
| 20 | Justin Winery (Paso Robles 1108-New Commercial Customer)[13] | Received 2012 | 2013 | 1.600 |
| 21 | Justin Winery Wine Storage Building – 66,000 square feet[13] | Approved 2016 | INA | 0.066 |
| 22 | Marriott Residence Inn – 128 hotel rooms[12] | Received 2013 | INA | 0.128 |
| 23 | New Commercial Customer beyond Fuse 7409[13] | Received 2012 | 2013 | 0.400 |
| 24 | North Chandler Ranch Vineyard Proposal – 300 Dwelling Units[12] | Received 2017 | INA | 0.450 |
| 25 | Oak Park Phase 3 Apartments – 75 Dwelling Units[12,18] | Received 2016 | 2018 | 0.113 |
| 26 | Oak Tree Inn Addition – 50,000 square feet, 66 hotel rooms | Approved 2016 | INA | 0.116 |
| 27 | Oaks Hotel expansion – 66 hotel rooms[12] | Received 2015 | INA | 0.066 |
| 28 | Olive Oil Facility Expansion – 3,445 square feet[18] | Approved 2017 | INA | 0.003 |
| 29 | Oxford Suite Hotel – 127 hotel rooms[12,19] | Approved 2014 | 2019 | 0.127 |

[17] Hyatt 2018.

[18] The Tribune 2016.

[19] The Tribune 2017b.

| Project Identification Number | Project Name and Description | Year Received/ Approved | Expected Completion Date | Estimated Demand (MW)[8] |
|---|---|---|---|---|
| 30 | Paso Robles Inn Expansion – 18,000 square feet, 23 hotel rooms[12] | Received 2016 | INA | 0.041 |
| 31 | Paso Robles Public Market – 16,500 square feet[12,20] | Received 2017 | 2019 | 0.017 |
| 32 | Paso Robles Water Recycling Plant (Expansion of Paso Robles Wastewater Treatment Facility)[21] | Approved 2017 | 2018 | 0.600 |
| 33 | Paso Vista Resort – 2 Dwelling Units, 30,000 square feet, 226 hotel rooms[12] | Received 2015 | INA | 0.259 |
| 34 | Pine Street Promenade Amendment – 15,000+ square feet, 151 hotel rooms[12] | Received 2017 | INA | 0.166 |
| 35 | Sensario Gardens Entrada – 280 hotel rooms[12] | Received 2004 | INA | 0.280 |
| 36 | Tri-West Development – 4 Dwelling Units[22,23] | Approved 2015 | INA | 0.006 |
| 37 | Vines RV Resort – 6,850 square feet, 130 RV spaces[18] | Approved 2012 | INA | 0.137 |
| 38 | Wine Production Facility and Tasting Room – 36,000 square feet[18] | Approved 2012 | INA | 0.036 |
| 39 | Winery with production, tasting room, special events, and hospitality facilities – 23,000 square feet[18] | Approved 2015 | INA | 0.023 |
| 40 | Winery Expansion to include barrel storage buildings and office addition – 20,171 square feet[18] | Approved 2014 | INA | 0.020 |
| 41 | Winery Expansion to increase tasting room operations, production, processing, and storage – 8,080 square feet[18] | Approved 2013 | INA | 0.008 |
| 42 | Winery Expansion to increase special event uses and associated facilities – 920 square feet[18] | Approved 2015 | INA | 0.001 |
| | | | **Estimated Total:** | **7.874** |

Sources: City of El Paso de Robles 2015a, 2015b, 2015c; City of Paso Robles Community Development Department 2017b; County of San Luis Obispo 2017; Cuesta College 2018; Hyatt 2018; Paso Robles Daily News 2017a, 2017b; The Tribune 2016, 2017a, 2017b, 2017c, 2017d

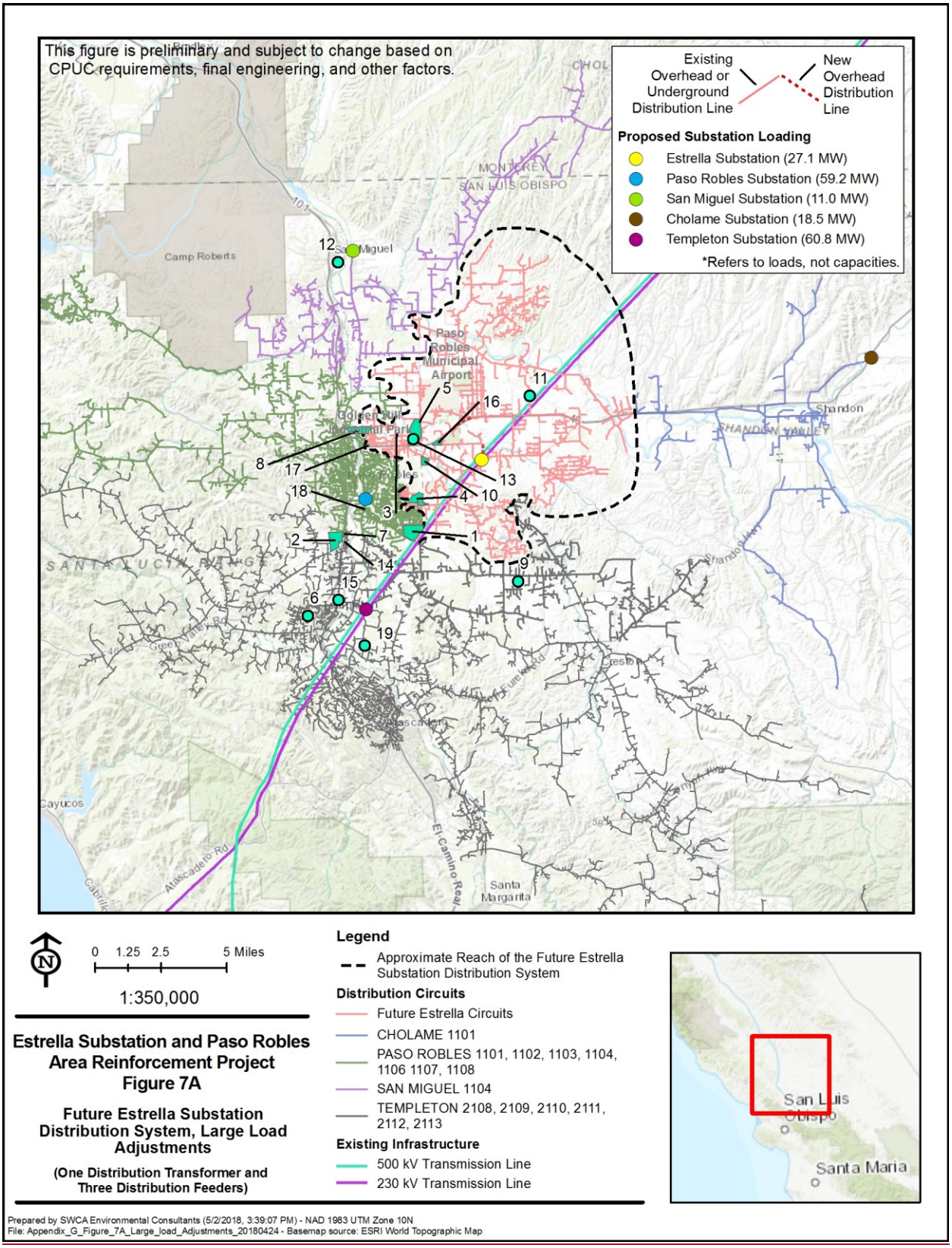
[20] The Tribune 2017d.

[21] Paso Robles Daily News 2017a.

[22] City of El Paso de Robles 2015b.

[23] City of El Paso de Robles 2015c.

## Figure 7A. Future Estrella Substation Distribution System, Large Load Adjustments



## Figure 7B. Future Estrella Substation Distribution System, Other Future Proposed Projects

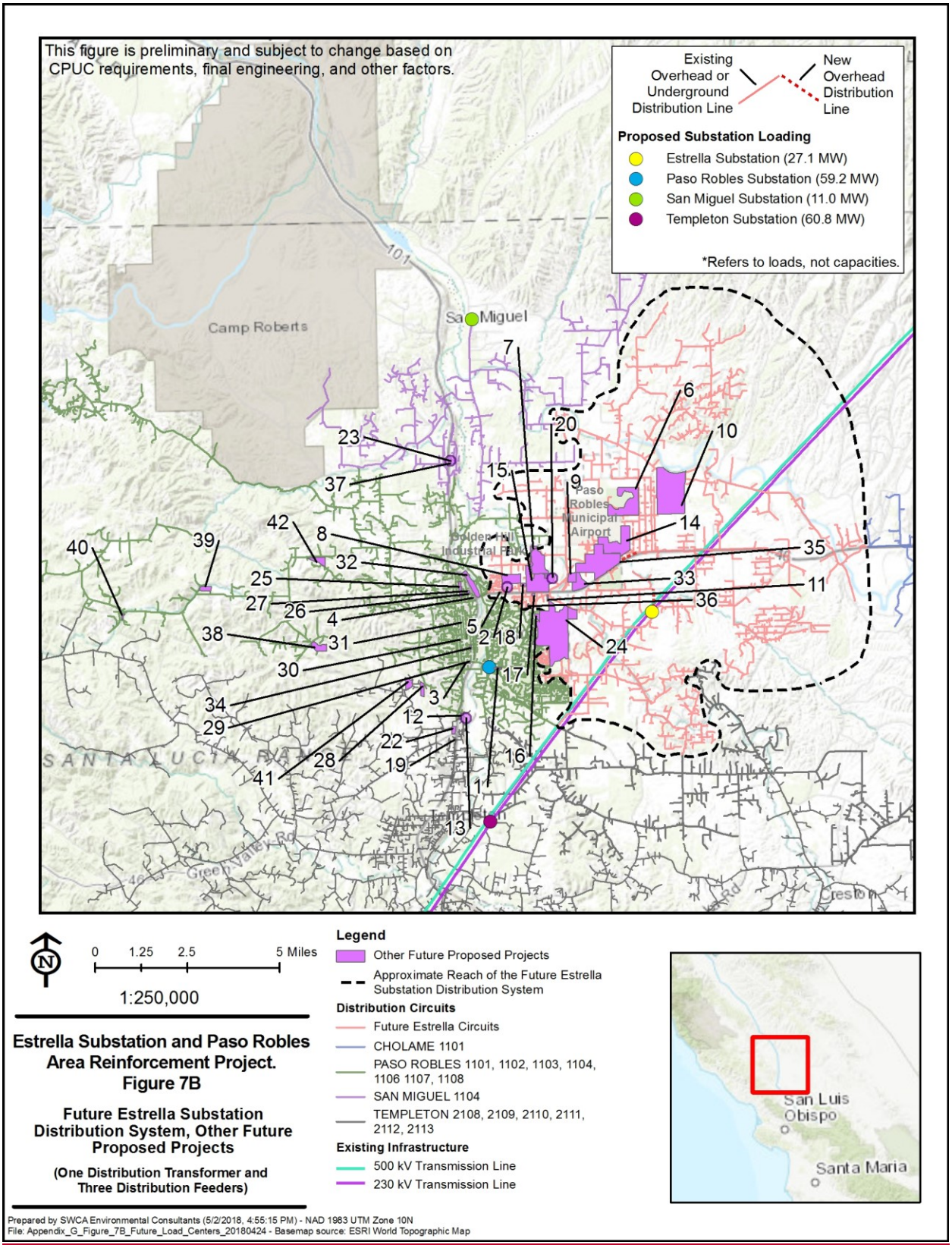


Table 7 below indicates substation capacities and loads for the Paso Robles and Cholame DPAs before and after distribution facilities are added at Estrella Substation. The loads correspond to the proposed circuit configurations indicated in Figure 2, Figure 4A, and Figure 6 of the August 2017 Appendix 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.

While additional capacity at or near Templeton Substation could be utilized to serve existing and planned new loads between Templeton and Paso Robles substations, this would require a new, or reinforced existing, Templeton distribution circuit with which to relieve Paso Robles circuits that currently serve the area south of Paso Robles Substation. Freed-up capacity on Paso Robles Substation could then be used to serve areas of anticipated growth north and east of Paso Robles Substation, but difficulties and complexities of routing new or redirected feeders from Paso Robles Substation to the growth areas do exist, as detailed in Section V.A and B. Additionally, one or more new Templeton feeders would still be required in order to adequately serve known and anticipated growth north and east of the City of Paso Robles, making for more excessively long feeders that would be very expensive to construct and would compound the reliability issues already present in the DPA due to long feeders.

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~~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[24] of additional capacity. The new distribution facilities at Estrella Substation will alleviate overloads within the DPA by 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~~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 4A, 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

[24] Assumes a 95% utilization factor.

substation. The alternative to planned outages is to install expensive temporary generation at Cholame Substation during these maintenance periods. 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, Estrella Substation could also provide a future 21 kV distribution feeder from Estrella Substation to Cholame Substation as a cost-effective temporary solution to the transmission maintenance problem until such time that the 70 kV line could be built.[25]

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.

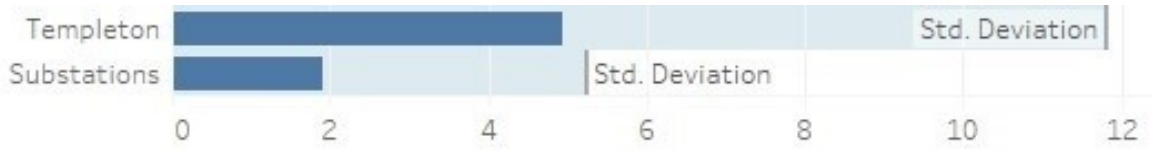
## C. Distribution System Renewables Hosting Capacity

A new 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**




[25] Another solution for the maintenance problem would be to install battery storage at Cholame Substation. While it would not improve operational flexibility on the 70 kV system, it could be a cost-effective answer to the pressing maintenance issue. This option is discussed further in Section V.D.2.

**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 ~~Q&A~~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, along Union Road and Mill Road, 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 along Mill Road. 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 4B and Figure 4C.) Based on preliminary design, the first Estrella feeder—"Estrella 1"—will consist of 1.67 circuit miles of reconductored distribution line, primarily along Union Road north and east, 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, primarily along Mill Road, 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 reconductored distribution line, primarily along Union Road south and west, and a total main-line length of 5.96 circuit miles.[26]

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 northeast 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 Templeton 1 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 northeast 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 northeast 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.[27]

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 4A. Future Estrella Substation Distribution System.) The equivalent distribution system from Templeton Substation would require four additional 21/12 kV pad-mounted transformers.

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

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

The shorter route from Estrella to the growth area, Estrella 1 along Union Road, is 4.58 circuit miles and the longer route, Estrella 2 along Mill Road, 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 Estrella 1 Union Road feeder from Estrella. The longer route from Templeton to the growth area is 13.83 circuit miles and follows much of the same route as Estrella 2's Mill Road route from Estrella.

Both shorter routes from Estrella and Templeton to the growth area, Estrella 1/Union Road from Estrella and Templeton 1/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, Estrella 2/Mill Road from Estrella and Templeton 2/Mill Road 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 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*** | | | | | | |
| 877 | California Flats[1] | Solar | 1/2017 | 130 | Transmission | CalFlats Switching Station |
| 166, 194, 242 | California Valley Photovoltaic (First Solar), Carrizo Plain Solar, Desert Topaz PV2[1] | Solar | 10/21/2014 | 550 | Transmission | Solar Switching Station |
| 239 | Carrizo Solar Farm II (California Valley Solar Ranch)[1] | Solar | 1/7/2013 | 250 | Transmission | Caliente Switching Station |
| 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*** | | | | | | |
| 877 | California Flats[1] | Solar | 12/2018 | 150 | Transmission | CalFlats Switching Station |
| 1596-RD | Firestone Walker Inc. | Solar | To Be | 1.7 | Distribution | Templeton |

| Queue | Project | Fuel | Actual In-Service Date | Size (MW) | Distribution / Transmission | Substation |
|---|---|---|---|---|---|---|
| | | | Determined (TBD) | | | |
| 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 | 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 |

[1] These projects are not in the Paso Robles DPA.

# D. Could Battery Storage Solve DPA Distribution Issues?

## 1. Could Battery Storage Address Distribution Needs More Effectively than a Distribution Substation?

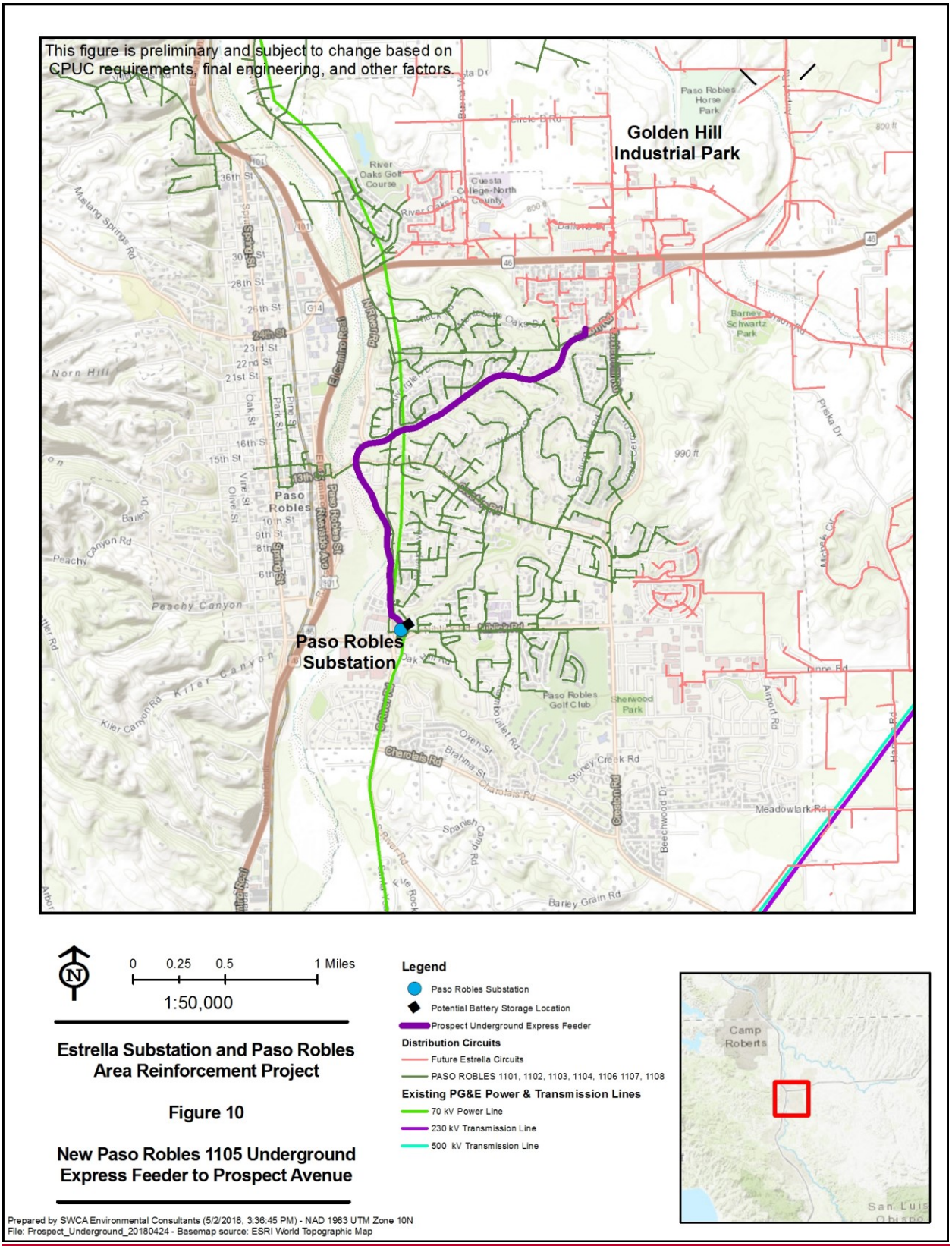
### a. Review of Battery Storage Options

PG&E studied two representative locations for battery storage that could potentially delay the need to add capacity to the Paso Robles distribution system by installing distribution components at Estrella Substation as proposed, or otherwise. First, PG&E studied the option of installing a 4 MW, 24 megawatt hour (MWh) battery bank at Paso Robles Substation, since that is the largest battery that could be installed at the substation (on adjacent land) without taking out neighboring businesses. A 4 MW battery could defer a distribution substation by approximately 2 years. Second, PG&E studied the option of installing a 15 MW, 90 MWh battery bank at the Golden Hill Industrial Park. This battery size is the maximum that could be charged on an express 12 kV distribution feeder, and could delay the need for distribution substation facilities by approximately 8 years. As detailed below, neither of these battery storage alternatives would eliminate the need for a new distribution substation in the foreseeable future, improve operational flexibility in the local distribution area, or increase Paso Robles DPA's circuit reliability – all benefits that distribution components from Estrella Substation would provide.

The first battery storage location studied was at Paso Robles Substation, where PG&E could install a 4 MW, 24 MWh[28] battery bank to the east of the existing substation. (Note that this study area, a vacant triangular parcel east of the substation, would be the same expansion area targeted to install a ring bus at Paso Robles Substation to accommodate a single additional 70 kV line from Templeton Substation. The vacant parcel could not accommodate both options.) A new underground express distribution feeder would be constructed from Paso Robles Substation to connect to the existing distribution system at Prospect Avenue in Paso Robles. (*See* Figure 10.) This battery storage would have the potential to delay the installation of Estrella Substation distribution components, from a capacity perspective, for approximately 2 years. However, as explained further below, it would: (1) provide a solution that is only temporary, (2) limit, rather than improve, operational flexibility, and (3) not increase the circuit reliability of the Paso Robles DPA.

[28] A larger battery was not considered feasible at Paso Robles Substation because it would require obtaining additional property currently occupied by local businesses, which would likely involve eminent domain proceedings and result in significant challenges, time delays and substantial costs.

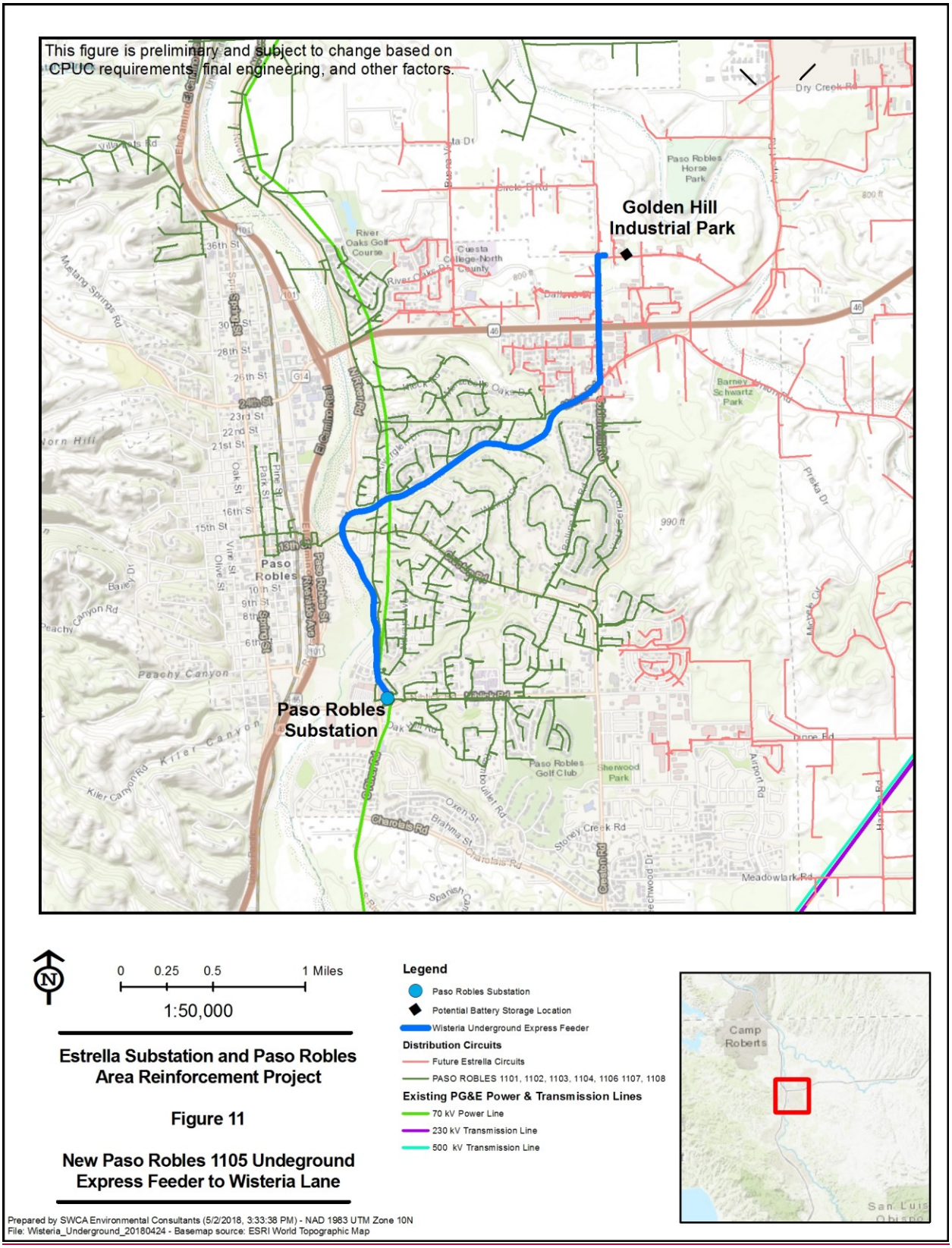
**Figure 10. New Paso Robles 1105 Underground Express Feeders to Prospect Avenue**



The second study location considered for battery storage was a vacant lot in the Paso Robles Golden Hill Industrial Park, on the east side of Golden Hill Road. This location would require installing a new underground express distribution feeder from Paso Robles Substation to the Golden Hill site to provide off-peak charging of the battery. (S*ee* Figure 11.) A battery at this location with a connection to Golden Hill Industrial Park would connect directly to the future load center within the Paso Robles DPA, and be located in an area large enough to accommodate the installation (approximately 2 acres) and already zoned for industrial facilities. Moreover, if Paso Robles Substation or San Miguel Substation overloaded, the battery could "off-load" or take over the load being served by either one of these substations because feeder circuits from the battery would connect to circuits extending from these substations. Since it is unknown at this time which substation could overload first, a battery that could connect to either substation seems more prudent than one located at, or tied to, just Paso Robles Substation. The battery would be sized for 15 MW, 90 MWh, to include a 20% reserve capacity above 12 MW, which is the maximum capacity that can be supplied by a new express 12 kV feeder. The reserve capacity would allow the battery to degrade over time while still maintaining the ability to provide 12 MW of output for 6 hours, 72 MWhs.

This 15 MW battery has the potential to delay the installation of Estrella Substation distribution components, from a capacity stand-point, for approximately 8 years. However, as explained further below, this option would: (1) provide a solution that is only temporary, (2) limit rather than improve operational flexibility, and (3) offer fewer reliability benefits.

**Figure 11. New Paso Robles 1105 Underground Express Feeders to Wisteria Lane**



### b. Comparison of Battery Storage Options with the Proposed Project

**Deferral of Capacity Need**

Even under the 15 MW/90 MWh battery option, the need for new distribution substation facilities would only be delayed for approximately 8 years. The substantial expenditures that would be necessary to install batteries in any or multiple locations would provide only temporary relief, and substantial additional expenditures would be needed to address the capacity needs in approximately 2 or 8 years. Given the capacity projections for the Paso Robles DPA, Estrella or other distribution facilities would be needed in the foreseeable future under either of the battery storage solutions.

**Operational Flexibility**

The Estrella distribution substation build-out will provide significant operational flexibility, allowing the substation to off-load several neighboring substations (Paso Robles, San Miguel, Templeton, Atascadero, Cholame) when needed for planned and emergency outages or equipment repairs. Installing a battery at Paso Robles Substation or Golden Hill Industrial Park would actually limit the operational flexibility of some substation equipment at Paso Robles Substation and the associated battery charging feeder, since this equipment must remain in operation during off-peak hours to recharge the battery. Not having this equipment available would limit the time that maintenance or load transfers involving this equipment, or other related equipment, could be accomplished. As a result, a battery at either Paso Robles or Golden Hill Industrial Park would reduce existing operational flexibility rather than providing the significantly-increased operational flexibility of a new distribution substation. Distribution feeders from Estrella Substation will connect to six distribution circuits within the Paso Robles DPA and four separate substations (*see* Figure 4B), facilitating load transfers between these substations and circuits to support clearances for both planned maintenance and emergency restoration.

**Distribution Reliability**

Estrella distribution feeders will increase Paso Robles DPA circuit reliability by reducing the length of existing circuits that originate at neighboring substations and feed the growing areas of Paso Robles. For example, the Templeton 2109 circuit is currently 45 miles in length and will be reduced to 18 miles in length once a new distribution connection is built from Estrella Substation. Shortening these existing circuits, like Templeton 2109, will make them much less susceptible to weather, fire, and car pole accidents. When outages do occur, fewer customers will be impacted. Time to patrol lines and return customers to service during outages will also be reduced. By comparison, installing battery storage at Paso Robles Substation or Golden Hill Industrial Park will not reduce existing circuit lengths, so those alternatives would not have any beneficial impact on circuit reliability for the Templeton 2109 circuit or other circuits in the DPA.

Battery storage located in the Golden Hill Industrial Park area could provide some limited reliability benefits to the interconnected Paso Robles or San Miguel circuits it would feed. This could happen during outages to these circuits where the normal distribution supplies are lost. The battery storage could conceivably sustain these circuits for a period of time. This emergency back-feed would last only for as long as the battery storage could supply the circuit loads, or as long as the express charging feeder from

Paso Robles is available to keep charging the battery storage. This would not be the normal operating configuration, and would not provide nearly as much reliability to the overall DPA as a new distribution substation at Estrella.

Since neither of the battery storage options can provide the long-term capacity, operational flexibility or same level of reliability benefits as installing a new distribution substation with three new distribution feeders, battery storage would not address DPA distribution needs more effectively than the proposed Estrella distribution substation.

## 2. Could Battery Storage at Cholame Substation Replace the Need to Extend the 70 kV Power Line?

PG&E evaluated installing a 15 MW, 90 MWh battery storage bank at Cholame Substation to see whether a battery could defer or eliminate the need to install a second 70 kV transmission line into Cholame Substation from either the future Estrella or existing Templeton substations. A primary need for the second line is to provide service to customers during maintenance of the existing, single transmission line or 70/12 kV transformer bank. A battery would provide a limited, second 70 kV source into Cholame Substation, but it would not be able to sustain the substation over multiple days like an additional 70 kV line would be able to do. The battery could address critical maintenance needs that can be solved within 9 hours, like change-out of transmission poles, installing new transmission line hardware, or conducting limited transformer bank or 70 kV breaker maintenance.

A new line from Estrella Substation would be about 16.5 miles long and a new transmission line from Templeton Substation would be about 24 miles long. Cholame Substation is currently on a radial 70 kV circuit originating from Arco Substation in the San Joaquin Valley. When maintenance is needed on the existing Arco-Cholame 70 kV line or 70 kV portion of the substation, it has been very challenging to schedule it in the past. Expensive stand-by generation has been used more than once to keep the substation's distribution customers energized while transmission line maintenance was completed. The normal daytime load on the substation is approximately 10MW. Designing the battery bank to accommodate a 9-hour clearance window would allow maintenance crews to schedule daily clearances for transmission line work while keeping distribution customers in service during the maintenance period. The battery would be constructed to discharge into the 12 kV bus, and recharge from the Cholame Substation 70 kV bus. When not needed for other purposes, the battery could provide electricity and market-based services to be sold into the wholesale transmission market to offset the cost of the battery bank installation (although this could limit the availability to use the battery as an emergency back-up to the substation if the single 70 kV transmission line is unexpectedly taken out of service). While battery storage could be installed at Cholame Substation to partially address the existing maintenance problem as opposed to adding a new 70 kV power line from Templeton or the new Estrella Substation, it would not provide the same level of back-up support as installing a 70 kV line from Estrella or Templeton substations. Energy storage might be able to provide adequate MW support during load peaking times, but the support is limited due to the charging/discharging time. The challenge would remain to cover the reliability need during all operating normal and emergency conditions. A looped substation (with two transmission feeds capable of holding the substation load) can remain energized indefinitely as long as one transmission line stays energized. This keeps customers in power during single transmission line outages and during periods of extended (multi-day) maintenance activities.

The decision to install a new 70 kV line or battery storage at Cholame Substation would need to be studied by the CAISO before such a project could be determined valid or warranted.

### 3. Could Battery Storage Connected to Solar Generation Address Distribution Needs More Effectively than a Distribution Substation?

#### a. What are the benefits of one or more battery storage sites with respect to the solar projects in Table 8 and how would battery storage be ideally sited and sized?

Installing batteries at multiple solar/battery storage sites has the advantage of diversity of supply should problems develop with one of the solar locations or battery storage sites. The two largest distribution-level solar installations proposed in Table 8 for the Paso Robles DPA are one for the City of Paso Robles (3.7 MW) and one for the Paso Robles Airport (4 MW). These two sites would be possible candidates for battery storage depending upon their proximity to the necessary connection points in the DPA that could provide capacity relief to transformer banks at either Paso Robles or San Miguel Substation. (*See* discussion about 15 MW battery storage option and distribution interconnection in Section V.D.1.) The closer these solar/battery storage sites could be located to the distribution connection points, the lower the connection costs and the easier the construction. Sizing of the battery storage sites supplied by solar power would need to be designed to match the solar output of the arrays unless utility power is used to supplement the charging cycle. Ideally, the combination of battery storage sites would be close to the 15 MW, 90 MWh site that was studied for the Golden Hill Industrial Park (*see* Section V.D.1) since, from a capacity perspective, this would delay the need for distribution capacity from Estrella Substation for approximately 8 years. It is difficult to see how this would be possible given the low estimates of peak power for the distribution-level solar projects listed in Table 8. In addition, this battery storage solution would not provide a long-term solution to capacity needs or eliminate the need for a future distribution substation. Furthermore, it would not provide the operational flexibility and improved distribution circuit reliability the Estrella distribution project will bring to the Paso Robles DPA.

#### b. Discuss the contribution that a battery storage alternative sized to delay construction of the known and full-build-out distribution components of the proposed project would make with respect to the solar projects listed in Table 8

Based on the analysis in Section V.D.1, if a 15 MW, 90 MWh battery storage facility supplied by solar power could be located at or near the Golden Hill Industrial Park and supply consistent power to the electric grid similar to the 15 MW proposal in Section V.D.1, it could provide enough capacity to delay construction of the Estrella distribution components for approximately 8 years. The challenge here would be to collect sufficient solar resources from Table 8 projects to be able to charge a 15 MW battery. Based on the forecasted growth rate in the Paso Robles area of 1.5 MW per year, a smaller 8 MW, 48 MWh solar/battery storage would provide enough capacity to delay construction of Estrella distribution components for approximately 5 years. The solar projects planned by the City of Paso Robles and the Paso Robles Airport from Table 8 offer a total of 7.7 MW of output at full capacity. If these two sites supplemented the charging of co-located batteries with utility power, they could help provide the deferral benefits of an 8 MW battery. Any battery would need to be designed for 20% over capacity to allow for

battery degradation over time, so would likely need to be near 10 MW, 60 MWh installed size (5 MW at one site and 5 MW at the other site). Since a 5 MW unit is close to the evaluated Paso Robles Substation battery size (4 MW), there would likely be similar benefits for this size of battery, but the battery interconnection costs would be higher due to the longer distance from the needed distribution connection points; the Paso Robles Substation battery was evaluated as being built adjacent to the Paso Robles Substation and not several miles from the distribution connection points.

**Disadvantages of Solar/Battery Storage over Distribution Substation Facilities**

Using solar/battery storage to defer installation of distribution components from Estrella Substation or another distribution source only temporarily addresses the capacity need within the Paso Robles DPA and does not eliminate the need for future new distribution substation facilities in the foreseeable future. In addition, it does not address the operational flexibility and improved distribution circuit reliability the Estrella project will bring to the Paso Robles DPA. Estrella feeders will be connected electrically to the following circuits and be able to off load those circuits and a portion of the associated substations attached to these circuits: Cholame 1101, San Miguel 1104, Paso Robles 1108, 1107, 1102, and Templeton 2109. The Templeton 2109 feeder is currently 45 miles long; after the Estrella distribution feeder connections are completed it will only be 18 miles long. This will provide an improvement to the reliability of this circuit and, as other circuit connections are completed, to the entire Paso Robles DPA. (*See* Figures 4A and 4B for illustrations of this benefit.)

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# Exhibit A. Deficiency Items Update Locations

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| Deficiency Item | Location of Updates in Appendix G |
|---|---|
| Appendix G (1) and (1.1.) | Entire Updated Appendix G |
| Appendix G (2) and (2.1) | Section III.A<br>Section III.B<br>Table 2<br>Table 3<br>Table 4<br>Figure 2<br>Figure 4A<br>Figure 6 |
| Appendix G (3) and (3.1) | Section II.C<br>Section V.B<br>Section V.D<br>Figure 4A<br>Figure 4B<br>Figure 4C |
| Appendix G (4) and (4.1) | Section II.A<br>Section IV.A<br>Exhibit B |
| Appendix G (5) | Section III.B<br>Figure 5 |
| Appendix G (6) and (6.1) | Section IV.C<br>Section B |
| Appendix G (7) and (7.1) | Table 6A<br>Table 6B<br>Figure 7A<br>Figure 7B<br>Footnote 5 |
| Appendix G (8) and (8.1) | Section B |
| Appendix G (9) and (9.1) | Section I.A<br>Section V.B<br>Figure 4A<br>Geographic Information System (GIS) data provided in electronic format. |
| Appendix G (10) and (10.1) | Figure 2<br>Figure 4A |
| Appendix G (11) and (11.1) | GIS data provided in electronic format. |
| Appendix G (12) and (12.1) | Figure 6<br>Footnote 6 |
| Appendix G (13) and (13.1) | Section IV.B<br>Section V.D |
| Appendix G (14) | Section V.D |
| Appendix G (15) | Section V.D |
| Appendix G (16) | Section V.D<br>Table 8 |

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# Exhibit B. Planning Standard TD-3350P-09 (07/14/2014 (Rev.3)) (currently being updated)

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# Exhibit C. Guide for Planning Area Distribution Systems Document # 050864, Dated 9/15/09 and Revised 3/4/2010 (currently being updated), with Appendix A, List of all DPAs and their Area Designations

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