1. Purpose and Need

The purpose and need for upgrading the existing Downs Substation, and an evaluation of the potential options for electrical system modification, is provided in this chapter.

1.1 Project Overview

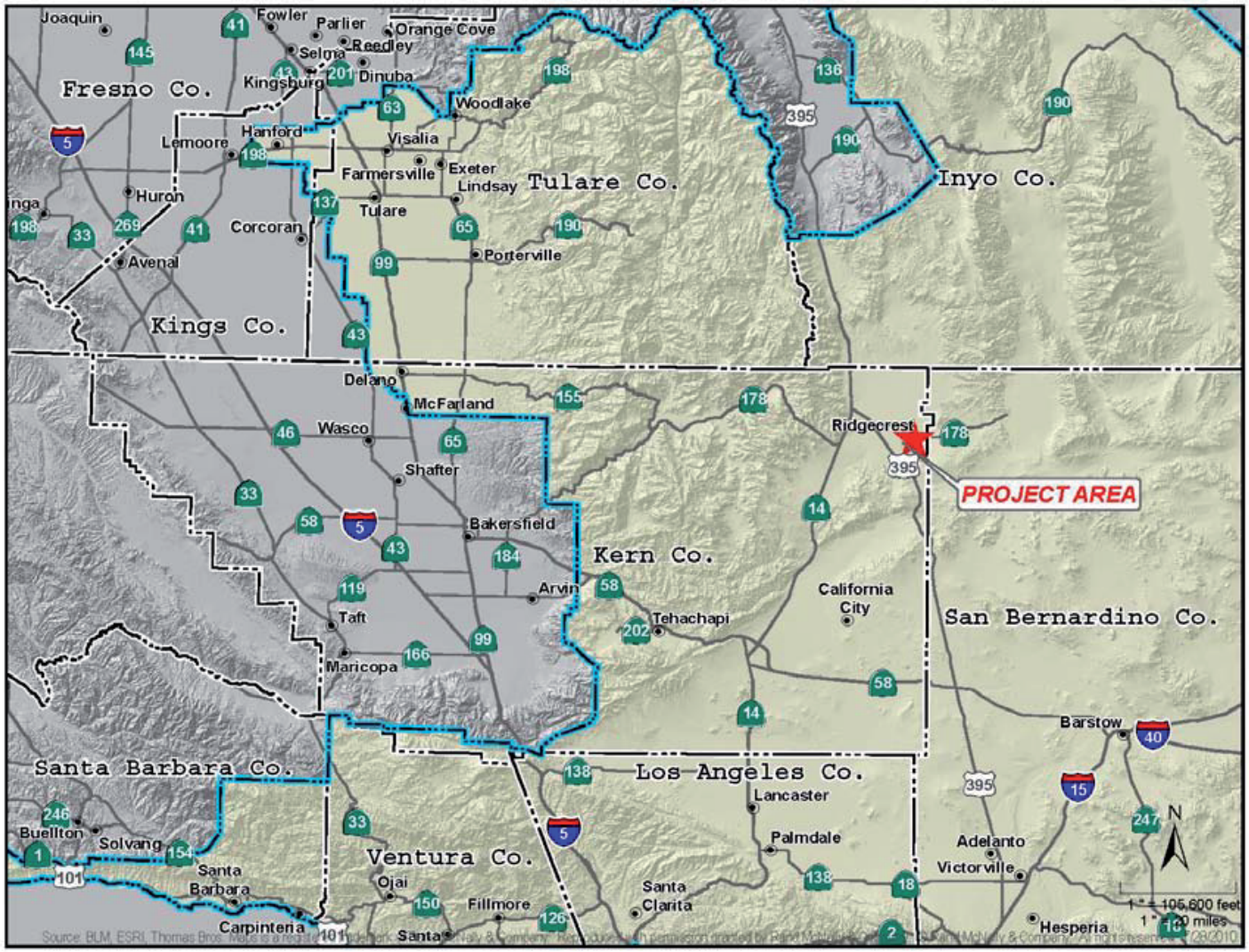
SCE proposes to upgrade the existing Downs 33/12 kV Substation (Proposed Project) to meet forecasted electrical demand and to maintain safe and reliable service to customers in portions of the City of Ridgecrest and the surrounding areas of unincorporated Kern County and San Bernardino County (Electrical Needs Area) (see Figure 1.1-1).

In addition to serving the forecasted electrical demand within the Electrical Needs Area, the Proposed Project would improve system reliability and enhance operational flexibility.

The Proposed Project would increase capacity at the existing Downs 33/12 kV Substation by replacing transformers and upgrading the Downs 33/12 kV Substation to a 115/12 kV substation. The Proposed Project would be served by looping[1] an existing 115 kV subtransmission[2] line into and out of Downs Substation. Portions of the existing 115 kV subtransmission pole line are shared by both 33 kV and 12 kV distribution circuits (see Figure 1.1-2).

[1] A loop is when two or more lines connect one or more substations to a source. A loop-feed is a substation with two or more sources of power.

[2] 50 – 200 kV circuits are defined as subtransmission by SCE.



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VICINITY MAP

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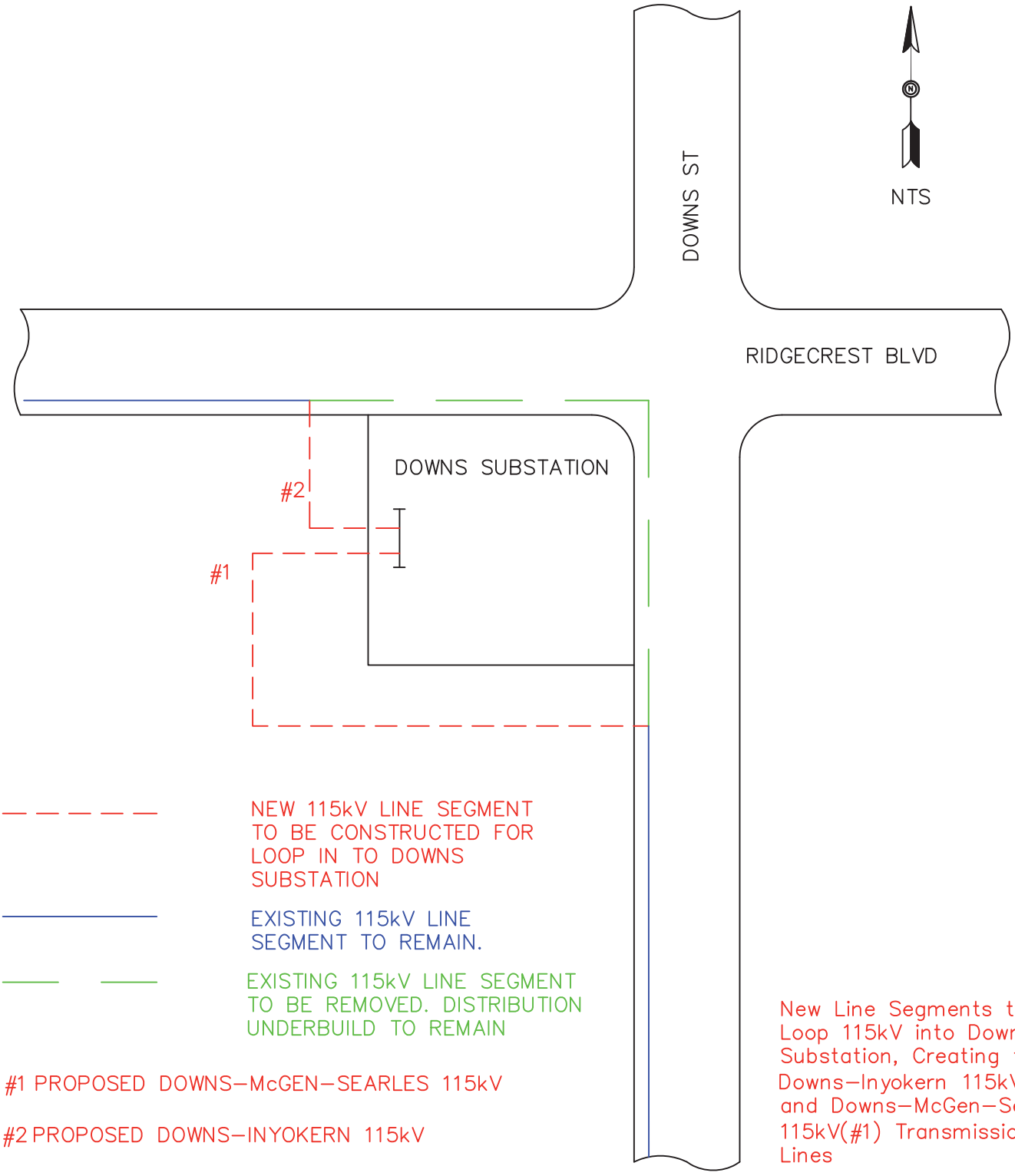
FIGURE
1.1-1

Proposed 115kV Loop



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NEW DOWNS 115/12 kV SUBSTATION
115 kV LOOPED CONFIGURATION

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FIGURE
1.1-2

The Proposed Project is planned to be operational by June 2014 and would include the following major components:

- Upgrading and expanding the existing Downs 33/12 kV Substation to a 115/12 kV substation containing a 33 kV switchrack.

- Routing an existing 115 kV subtransmission line into and out of the substation.

- Installing a fiber optic telecommunication system (including 58 miles of fiber optic telecommunication cable) to provide communication circuits for the protection, monitoring, and control of subtransmission and substation equipment.

The Proposed Project components listed above are described in more detail in Chapter 3.

1.2 Project Purpose

The purpose of the Proposed Project is to ensure the availability of safe and reliable electric service to meet customer electrical demand within the Electrical Needs Area.

Under the rules, guidelines and regulations of the Federal Energy Regulatory Commission (FERC), North American Energy Reliability Corporation (NERC), Western Energy Coordinating Council (WECC), and CPUC, SCE has the responsibility to ensure that electrical transmission, subtransmission, and distribution systems have sufficient capacity to maintain safe, reliable, and adequate service to customers. The safety and reliability of the systems must be maintained under normal conditions when all facilities are in service. In addition, they must be maintained under abnormal conditions when facilities are out of service due to equipment or line failures, maintenance outages, or outages that cannot be predicated or controlled as caused by weather, earthquakes, traffic accidents, and other uncontrollable events.

To ensure the availability of safe and reliable electric service, SCE utilizes a multi-step planning process to ensure the development of appropriate facilities is undertaken in time to meet reliability concerns and electrical demand. The planning process begins with the development of a peak demand forecast for each substation. Peak demand forecasts are developed using historical data and trends in population data, urbanization data, and meteorological data. Results of energy efficiency and conservation measures are also implicit in this historical load data used to annually update demand forecasts. Usually, such measures have a greater impact on total annual energy consumption than in the peak demand forecast, since peak demand represents the single highest peak usage event in a year. SCE forecasts peak demand under both normal and 1-in-10-year conditions. Because electrical systems have certain loading limits, technical engineering studies

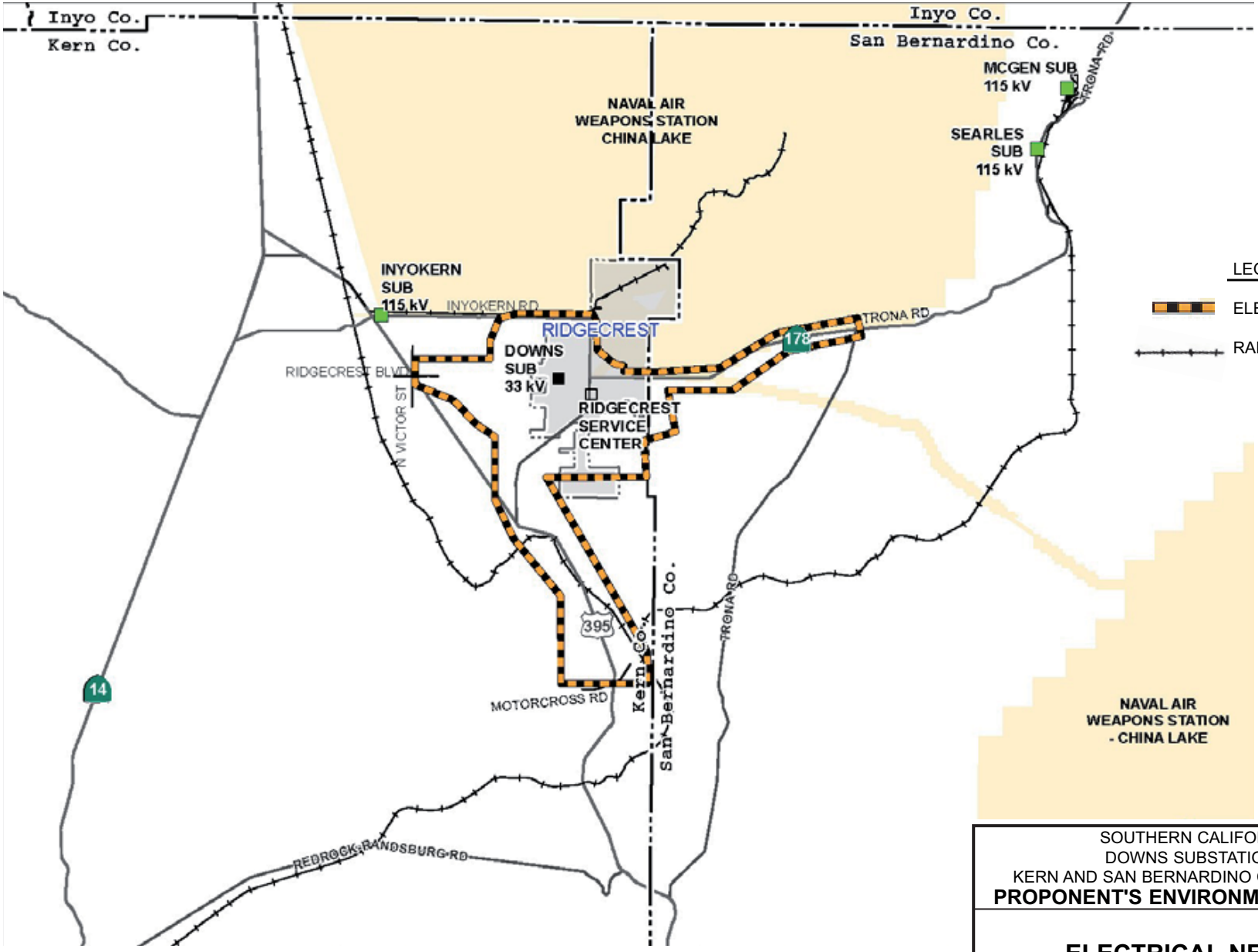
are then conducted to determine whether the forecasted peak demand can be accommodated on the existing transmission, subtransmission, and distribution systems. When projections indicate that these limits would be exceeded within an appropriate planning horizon, a project is proposed to keep the electrical system within designed loading limits. In addition to considering the operating limits of a single substation, SCE evaluates the ability to transfer load from that single substation to adjacent substations in the system. This process has identified the need for the Proposed Project, as described in the next section.

1.3 Project Need

Currently, the existing Downs 33/12 kV Substation, located in the City of Ridgecrest, serves portions of the city and surrounding areas of unincorporated Kern County and San Bernardino County. However, as discussed below, the Downs 33/12 kV Substation cannot accommodate the anticipated load growth in the area. Therefore, an upgrade of the existing Downs 33/12 kV Substation to 115/12 kV (Proposed Project) is needed to serve increased electrical demand in the Electrical Needs Area, as well as to improve system reliability and enhance operational flexibility.

1.3.1 System Capacity and Need

The Electrical Needs Area is defined by the area where customers are served from the 12 kV distribution circuits originating from the Downs 33/12 kV Substation. The Electrical Needs Area encompasses approximately 13,000 SCE metered customers and is roughly bounded by North Victor Street to the west, the China Lake Naval Air Weapons Station (CLNAWS) to the north, Trona Road to the east, and Motorcross Road to the south, as shown in Figure 1.3-1.



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ELECTRICAL NEEDS AREA

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FIGURE
1.3-1

Downs 33/12 kV Substation reduces voltage from 33 kV to a distribution voltage of 12 kV with two 22.4 megavolt ampere (MVA) transformers. The amount of electrical load that can be served from Downs 33/12 kV Substation is limited to the total thermal maximum operating limit of 50.8 MVA.[3,4]

Downs Substation currently receives its power from a 33 kV source at Inyokern Substation. Power is transmitted from Inyokern Substation to Downs Substation via a network of three 33 kV circuits. Two of these 33 kV circuits feed Downs Substation directly. These two 33 kV distribution circuits also feed the Ridgecrest 33/4.8 kV Substation and the CLNAWS customer substation (NWC Substation), where they are joined with a third 33 kV source distribution circuit. As discussed in Section 1.3.2, this arrangement offers very limited operational flexibility.

Based upon recorded historical peak demand, SCE has determined that the Electrical Needs Area has seen load growth averaging approximately two percent per year over the past five years, despite the intervening economic recession (see Table 1.3-1 below).[5] According to SCE's annual 10-year peak demand forecast, it is anticipated that this load growth will continue to drive the need for the Proposed Project.

CLNAWS, located north of Ridgecrest, is expected to see major growth starting in 2010. This growth is attributed primarily to the Base Realignment and Closure Act (BRAC) initiated by Congress in 2005. Under BRAC, the U.S. military plans to relocate additional personnel to CLNAWS. Extensive construction is already underway on and around CLNAWS. While Downs Substation does not serve CLNAWS directly, the growth on the base will impact the City of Ridgecrest, which provides many support services to CLNAWS.

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[3] Due to an existing protection setting requirement (as mentioned in Section 1.3.2), when load exceeds 37 MVA, there is an increased risk of dropping all substation load.

[4] The load that is served by the Ridgecrest 33/4.8 kV Substation is not included in the Electrical Needs Area, because it is served at a lower serving voltage of 4.8 kV.

[5] Although this table reflects data beginning in year 2005, it should be noted that Historical Peak Demand in year 2004 in the Electrical Needs Area was 35.3 MVA. Accordingly, between 2004 and 2009, the Historical Peak Demand in the Electrical Needs Area grew from 35.3 MVA to 39.5 MVA (a growth of 4.2 MVA). This growth of 4.2 MVA represents an increase of approximately 11.9 percent over that time (i.e., an average growth of more than 2 percent from year to year).

Employment patterns in the area are illustrative of the degree to which the area population and economic activity are associated with CLNAWS. The City of Ridgecrest General Plan (October 2008) shows that CLNAWS employs 6,589 people, compared to 2,770 people for the next 9 largest employers combined. Additionally, eight of the nine next largest employers represent support enterprises for those employed at CLNAWS (e.g., retail, medical, education, and government contractors). Only the second largest employer, a mining enterprise which is roughly 10 percent of the size of CLNAWS, is independent of CLNAWS. Based on the most recently completed SCE analysis of the Electrical Needs Area, the area demand is expected to grow by more than 10 percent in 2010 and then over 4 percent per year in the following two years.[6] SCE bases its projections for area demand on information concerning planned development projects, increases in electrical usage by existing customers, and recovery in demand due to increased economic activity. As discussed in Section 4.13.1, the Base Closure and Realignment Commission anticipated up to 2,100 new personnel being located at CLNAWS. Given that personnel at military bases rely upon adjacent cities for many of their non-base needs, the personnel increase at CLNAWS is expected to contribute to continued growth in the City of Ridgecrest, and some portion of the new personnel would be expected to reside within the City of Ridgecrest.

In Table 1.3-1, SCE's forecast shows that demand in the Electrical Needs Area under a 1-in-10 year heat storm would exceed the maximum operating limit (50.8 MVA) of Downs 33/12 kV Substation as early as 2011.[7] (Data presented in Table 1.3-1 are graphically represented in Figure 1.3-2.)

Because the Proposed Project would not be in service by 2011 when the forecasted demand for a 1-in-10-year heat storm exceeds the Downs 33/12 kV Substation's maximum operating limit, a contingency project has been proposed for 2011 to provide additional, interim substation capacity when load is at risk of being dropped. The contingency project consists of installing one normally de-energized 115/12 kV, 28 MVA contingency transformer that would be placed within the existing fence line of Downs Substation without a concrete foundation. The transformer would be connected

[6] Based on preliminary information from the first ten months of 2010, SCE's projected increase in demand for 2010 may not be realized.

[7] It should also be noted that SCE's 1-in-10 year heat storm projection exceeded the maximum operating limit in 2006, 2007, and 2008. In response to this, as discussed in further detail in footnote 9, SCE initiated a project to reequip the 12 kV bank and bus-tie positions (including breakers), which resulted in a higher maximum operating limit of 50.8 MVA in 2009. During the period when the 1-in-10 year heat storm projection exceeded the maximum operating limit, SCE had a mitigation plan but did not have to implement it.

to the 115 kV subtransmission line adjacent to the existing Downs 33/12kV Substation.[8] This contingency project would not be sufficient to provide long-term reliable service to customers and meet future load growth because it reduces operational flexibility and substation protection. Operational flexibility would be limited because the 12 kV load would have to be dropped to switch between the 33 kV and 115 kV source circuits. Reliability would also be compromised because one of the two systems of relay protection for the 115 kV subtransmission line would have to be disconnected while the 115 kV subtransmission line is connected to the 12 kV equipment at the existing Downs Substation. Additionally, the configuration of the contingency project would result in the Inyokern-McGen-Searles No. 2 115 kV subtransmission line failing to conform to SCE's internal standard which does not allow for 4 point connections on subtransmission lines. However, the contingency project would address the capacity need under brief abnormal conditions until the Proposed Project can be licensed and constructed.

Therefore, the Proposed Project is needed for reliability and capacity as a permanent solution to meet forecasted demand. Components of the contingency project would be able to be reused as part of the Proposed Project.

[8] The interim configuration would be limited, the transformer would be limited to a 13 MVA capacity circuit limitation. Under brief abnormal conditions, the 115/12 kV contingency transformer can be energized using a remote control switch and connected to a single existing 12 kV circuit breaker in isolation. This is an abnormal arrangement which does not adhere to multiple SCE standards and criteria for normal operation, and would be operated on a contingency basis only.

Table 1.3-1 Electrical Needs Area Substation Capacity and Peak Demand

Actual	**2005**	**2006**	**2007**	**2008**	**2009**
Maximum Operating Limit (MVA) [9]	43.5	43.5	43.5	43.5	50.8
Protective Device Reliable Operating Limit (MVA)**	37.0	37.0	37.0	37.0	37.0
Historical Peak Demand (MVA)	37.7	39.6	37.1	39.0	39.5
Temp Adjusted Peak Demand (MVA)	38.6	41.4	39.2	40.3	41.4
Prior Year Projected Peak Demand 1-in-10-Year Heat Storm	40.4	47.1	48.4	44.4	48.4
Planned Capacity and Projected Demand	**2010**	**2011**	**2012**	**2013**	**2014**
Planned Maximum Operating Limit (MVA)	50.8	50.8	50.8	50.8	50.8
Protective Device Reliable Operating Limit (MVA)**	37.0	37.0	37.0	37.0	37.0
Planned Contingency Capacity (MVA)*	NA	63.8	63.8	63.8	63.8
Projected Peak Demand Normal Conditions (MVA)	46.3	48.5	50.7	51.5	52.3
Projected Peak Demand 1-in-10-Year Heat Storm (MVA)	50.8	53.2	55.5	56.5	57.4
Planned Capacity and Projected Demand [10]	**2015**	**2016**	**2017**	**2018**	**2019**
Planned Maximum Operating Limit (MVA)	72.8	72.8	72.8	72.8	72.8
Projected Peak Demand Normal Conditions (MVA)	52.8	53.2	53.6	54.1	54.5
Projected Peak Demand 1-in-10-Year Heat Storm (MVA)	57.8	58.3	58.8	59.3	59.8

Notes:

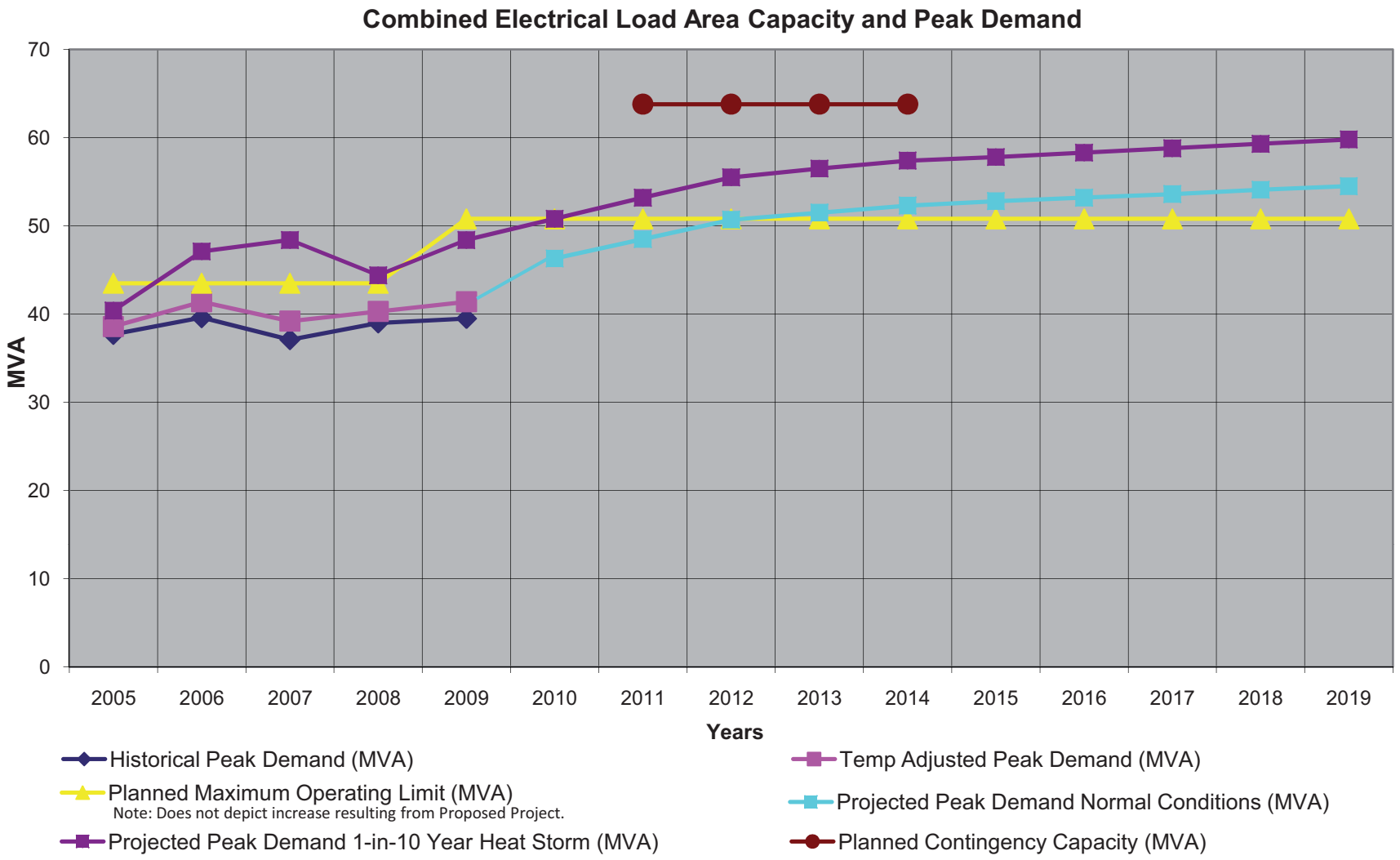
NA = Not Applicable

* The amount of 12 kV load that can be served with the contingency transformer is approximately 13 MVA, even though the transformer is rated at 16.8 MVA.

** When load exceeds 37 MVA, an existing protection setting increases the risk of involuntarily de-energizing customers. A change in setting cannot reduce this risk without unacceptably increasing the risk of failure to clear a fault within Downs Substation.

[9] In 2009, SCE increased the maximum operating limit (thermal loading) at Downs 33/12 kV Substation from 2000 amps (43.48 MVA) to 2339 amps (50.8 MVA) by re-equipping the 12 kV bank and bus-tie positions. The circuit breakers and the position disconnects were also replaced.

[10] Table 1.3-1 assumes that the Proposed Project would be built by 2014, therefore figures for Protective Device Reliable Operating Limits and Planned Contingency Capacities are not shown for the years 2015 and beyond.



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SUBSTATION CAPACITY AND ELECTRICAL NEEDS AREA PEAK DEMAND

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FIGURE
1.3-2

1.3.2 Reliability and Operational Flexibility

The Proposed Project would also help address other reliability and operational flexibility issues within the Electrical Needs Area, as described below.

1. Downs Substation is currently fed from two 33 kV distribution circuits out of Inyokern Substation as part of a 33 kV network configuration. With the current system configuration, during an N-1 event [11] (i.e., either a loss of a single transformer at the source Inyokern 115/33 kV Substation or a loss of one of the source 33 kV distribution lines that serves Downs Substation), remaining system capacity would be insufficient to serve the entire Electrical Needs Area at peak load conditions. Therefore, a large portion of the Electrical Needs Area would suffer an unplanned outage. Transferring the load served by Downs 33/12 kV Substation to a 115 kV subtransmission source would ensure that SCE can serve the Electrical Needs Area during either of these N-1 events.

2. The current networked arrangement of the 33 kV distribution circuits that feed Downs 33/12 kV Substation is very inflexible operationally.[12] Transferring the load served by the Downs 33/12 kV Substation off of the 33 kV distribution circuits would greatly increase operability of the remaining 33 kV distribution system.

3. The two 33 kV distribution circuits that currently serve Downs 33/12 kV Substation do not provide enough short circuit duty[13] to allow for the necessary protection of the transformer banks at Downs Substation. To avoid major equipment damage due to undetected transformer or bus faults, SCE has set the protective relays to assure that all transformer and bus faults are cleared. However, there is still risk that the relaying equipment could falsely trip the entire Downs 33/12 kV Substation for non-fault events. This is possible when substation load exceeds 37 MVA and, concurrently, a normal voltage dip condition occurs. The probability of these events occurring simultaneously increases as the load

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[11] An N-1 event refers to a loss of a single element, such as a circuit, transformer, or generation. The N-1 criteria require that, during an N-1 event, there would not be a prolonged interruption of service to customers in the area.

[12] Distribution circuitry is generally constructed to allow substantial reconfiguration on a temporary operational basis. This flexibility allows planned and unplanned maintenance outages on various system components to take place without widespread customer outages. Because the 33 kV network feeding the Downs Substation serves primarily several large substations rather than smaller separable loads, and because loading is often greater than can be served by a reconfigured network, this flexibility is largely absent from the network.

[13] Short Circuit Duty refers to a measurement of the strength of an electrical system.

continues to grow. The Proposed Project would eliminate this risk by allowing for proper protection of the proposed Downs 115/12 kV Substation.

4. The existing protection equipment utilized on the Inyokern-McGen-Searles No. 2 115 kV subtransmission line is obsolete. SCE no longer implements this type of equipment for two reasons: (1) certain components of the protection equipment are no longer supported by the manufacturer, and (2) the existing protection operates over a single sideband communication channel that has proven to be unreliable during fault conditions. The Proposed Project would upgrade the existing protection to current SCE standards. The relays would be replaced with standard equipment, and 58 miles of fiber optic telecommunication cable would be installed to provide the necessary digital communication channel between them. Therefore, the Proposed Project would improve 115 kV subtransmission reliability in the Electrical Needs Area.

The Proposed Project effectively addresses all capacity, reliability, and operational flexibility issues described above, while utilizing an existing 115 kV subtransmission line adjacent to Downs 33/12 kV Substation. Because the Proposed Project uses an existing 115 kV subtransmission line, only short 115 kV subtransmission line segments would need to be constructed, minimizing the environmental impact of the Proposed Project. Additionally, existing area 12 kV distribution circuits currently radiate from Downs 33/12 kV Substation, so only minimal 12 kV and 33 kV distribution circuit work would be required.

1.4 Project Objectives

SCE has identified the following objectives to meet the purpose and need described above:

- Meet long-term projected electrical load requirements with additional transformer capacity and a substation that is capable of future expansion.
- Provide safe and reliable electrical service consistent with SCE's criteria and guidelines.
- Meet project needs while minimizing environmental impact.
- Restore capacity reserve and operational flexibility of the existing 33 kV distribution network.