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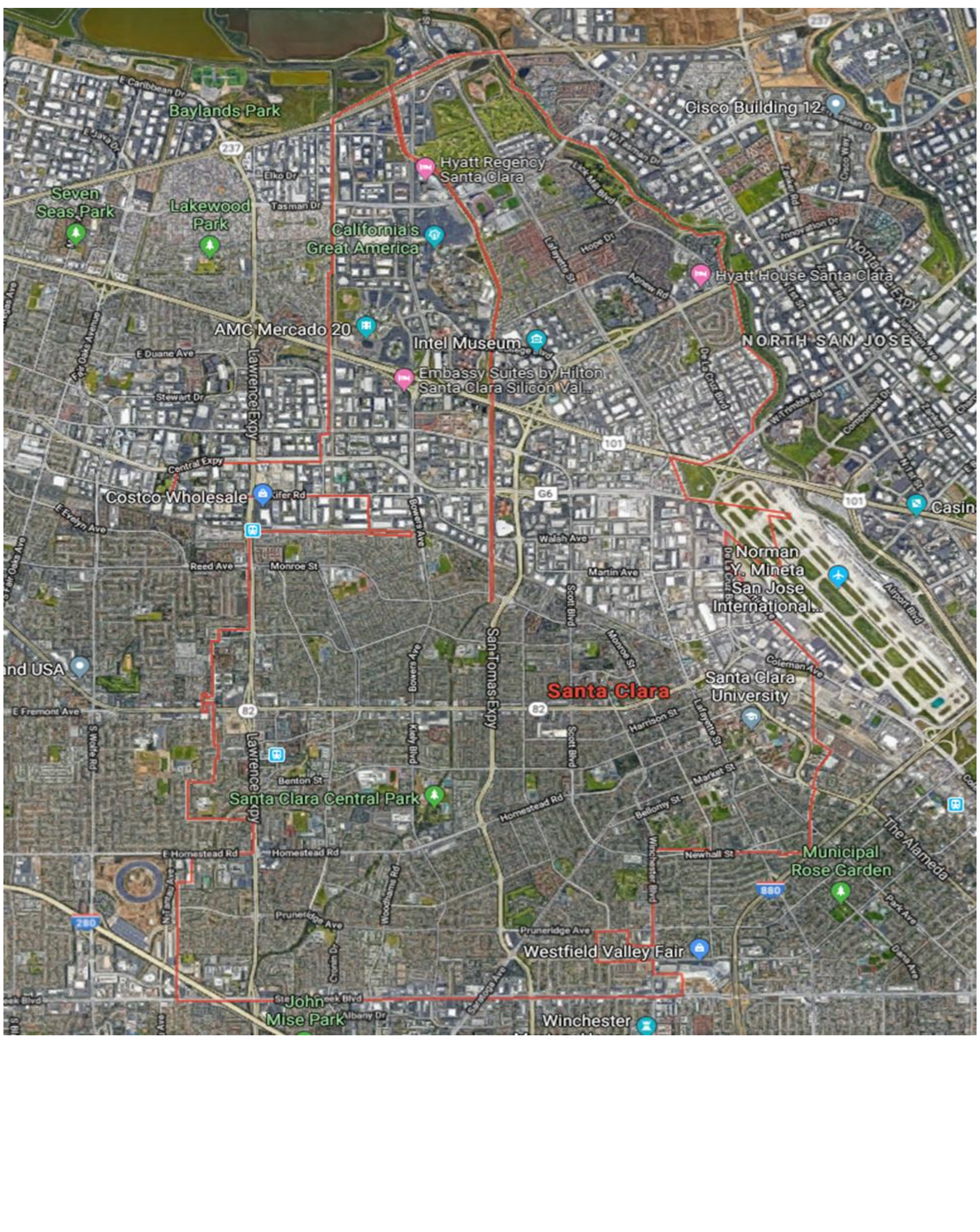
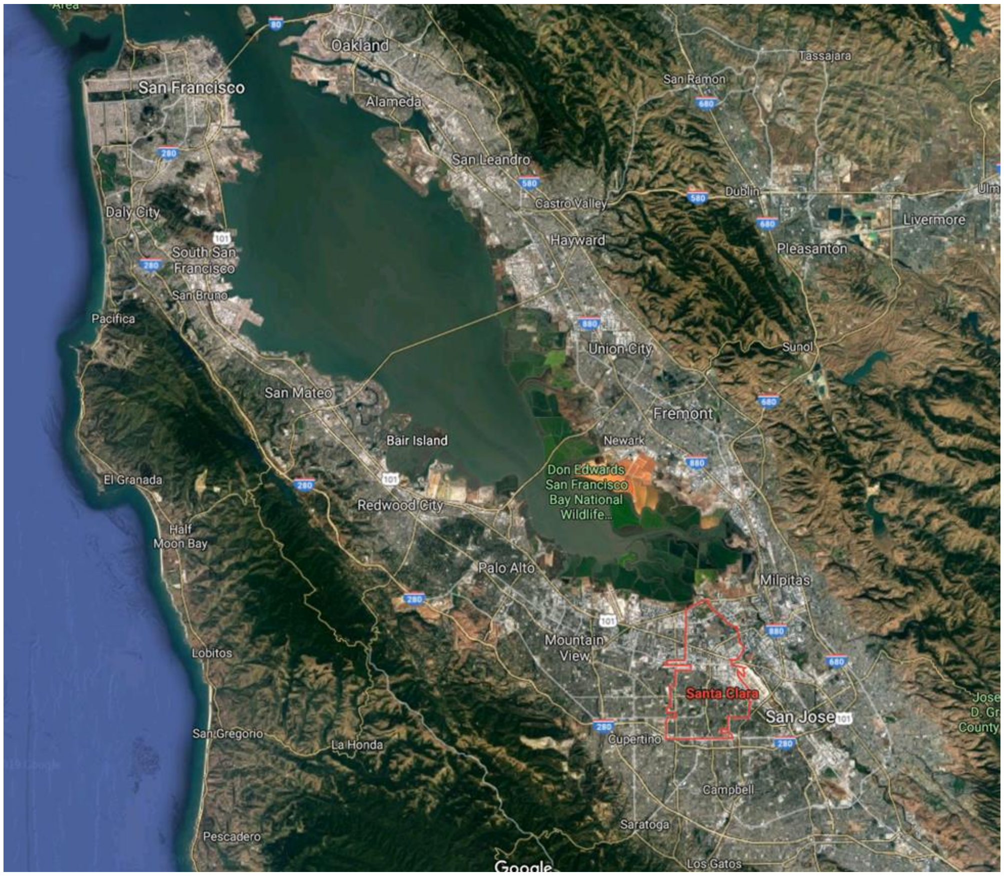
**City of Santa Clara d.b.a. Silicon Valley Power (SVP)**
**California Energy Commission Integrated Energy Policy Report (“IEPR”) 2019**
**Form 4: Demand Forecast Methods and Models**

The City of Santa Clara is located at the southern tip of the San Francisco Bay and consists of 18.41 square miles of urban development with little undeveloped open space. From a climate perspective Santa Clara weather is moderated by ocean temperatures that tend to keep temperatures mild in the summer and warm in the winter compared to many other cities in California. Santa Clara’s border extends to the east right up against the San Jose Norman Y. Mineta International Airport providing an excellent source of historical weather data for the entire Santa Clara service territory since no location within this service territory is more than 4 miles from the weather station (KSJC).






The City of Santa Clara is growing both from residential high-density development and large industrial/commercial customer's redevelopment projects. The load forecast is based on future loads derived from historical base data and assessment of future system load growth potential. SVP works through the City of Santa Clara's Community Development project clearance process, as well as, engaging large customers directly to assess impacts of the large development projects, and the timing of those projects to SVP's system, to model the load forecast. Data Centers submit projected load forecasts in a block load format, usually in 12 to 60 month forecasts. SVP manages the large customers through dedicated Key Account Representatives who track and update the loads. The load forecast builds upon SVP's baseline projection, and applies a growth rate to the base load energy trend, and projects a forecasted growth rate that is tied to each additional load segment. Each segment is analyzed separately to differentiate between growth patterns and load profiles. In the near-term SVP's growth is dependent on mixed-use growth and data center growth, but in later years it is more heavily weighted to data centers due to their much higher potential in energy usage density.

SVP's base load is determined from actual recorded demand in the previous 3 years. Each of these year's data sets produce a scatter plot of daily peak demand vs. maximum daily temperature. A best fit polynomial trend line is determined from each years scatter data, and the historical data is normalized to reflect known additions of new customer demand. A single temperature dependent polynomial equation is then determined to describe SVP's peak demand.

Peak Demand = $0.0494 * T^2 – 4.3053 * T + 525.21$ + Peak Demand Block Load Growth Forecast

Where:

T = Temperature in (F) at KSJC

Peak Demand Block Load Growth Forecast is determined by Key Customer Account reps working with City Planning, Engineering, and Customers to determine the magnitude and timing of new growth as it comes on line.

In total the three segments include: 1. existing load in which growth is determined as a function of temperature, and new block loads divided into two segments: 2. commercial and mixed-use segment, 3. and hyper-scale and mid-tier data centers. SVP assumes the block loads from data centers are temperature agnostic. SVP applies different load factors to each of the segments, and monthly specific load factors to adjust for each end-user type.

Load Forecast Assumptions and Input Considerations
Weather:

- Normal Weather for Energy and Peak (1 in 2 weather event based on the last 66 years of KSJC temperature data)
- 1 in 2 Temperature for KSJC = 96 degrees F, 1 in 5 Temp (100 F), 1 in 10 Temp (103 F), and 1 in 20 Temp (106 F)

Economics:

- Average load factors: City of Santa Clara Development Projects
- High, Mid and Low growth cases
- Data Center Block Load Forecast

End Use Equipment Saturation & Efficiency/ New Technology:

- Energy Efficiency and Demand Response Forecast
- Distributed Generation Adoption Forecast

SVP’s demand forecast is highly dependent on the construction schedule of new customer loads (Data Centers) and eventual leasing and loading of this data center space as they have been forecasted. A single new data center can be more than 5% of SVP’s annual peak and energy demand, so periodic adjustments to this forecast are made when delays are communicated to SVP’s Key Customer Account Rep’s.

As described earlier, industrial customers are the largest component of SVP’s customer base. As a result, SVP’s load factor is significantly higher compared to other utilities at over 70 percent. A load factor is a measure of the variability in utility load over time. A load factor measures total energy requirements on a utility system as a percentage of the theoretical maximum energy requirements that would result if the energy requirements at the time of peak demand were required all hours of the year.

The near-term accelerated growth observed in the load forecast is primarily due to the growth from data centers which are already in the City’s planning and development processes and secondarily due to commercial and residential mixed-use housing growth. Numerous data centers have been established in SVP’s service territory to support the data needs of corporate offices and internet related businesses. SVP’s growth is more heavily weighed to data centers due to interest and demand from this consumer base to locate in SVP's service territory and because of technological advances which allow for a higher potential energy usage density. The data centers in SVP's service area are categorized into two tiers, hyper-scale and mid-tier data centers. These data centers operate with a load factor of 85 percent or greater. Significant energy efficiency improvements in the design and operation of data centers over the past decade has allowed data center energy use to remain nearly constant while simultaneously meeting a drastic increase in demand for data center services. Because of the large percentage of server farm load, which is by nature almost unity load factor, the delta between off-peak and peak loads is much lower than a typical utility. Of the total retail load, approximately 47 percent was driven by data centers. The concentration of data centers and their high load factor in SVP's service territory contributes to the high forecasted load factor for the utility.