MEMORANDUM

TO: **UTILITIES ADVISORY COMMISSION**

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FROM: **UTILITIES DEPARTMENT**

DATE: **DECEMBER 5, 2018**

SUBJECT: **Staff Update on the Green Acres Rebuild and Request for Feedback on Preparation of a Utilities Rule and Regulation Governing Community-Requests for Fully Undergrounded Systems, Including a Procedure for Assessment Funding**

REQUEST

Staff requests that the Utilities Advisory Commission (UAC) receive an update on the Underground Utility District 15 ("UUD 15" or "Green Acres I") Rebuild and provide feedback on staff's preparation of a Utilities Rule and Regulation governing community-requested fully undergrounded systems, including a procedure for assessment funding.

EXECUTIVE SUMMARY

City of Palo Alto Utilities' ("CPAU") endeavors to build and maintain a safe, reliable, and cost-effective electric system that will minimize the risk of injuries and outages, and keep electric rates as low as possible. In service of this goal, the Rules and Regulations currently require that transformers and associated equipment in underground utility districts be pad-mounted. While it is possible to install this equipment in underground vaults, such an installation is substantially more expensive than a standard pad-mounted installation, and—in the view of CPAU staff—is likely to be less reliable and more costly to maintain and operate.

CPAU needs to replace the 45-year old transformers and cables in Green Acres I because that equipment is at the end of its service life. CPAU would normally use electric funds to replace the existing equipment with a standard pad-mounted installation. However, the existing Green Acres I equipment is fully undergrounded, and a number of residents have strongly opposed the installation of any new equipment that is not fully undergrounded.

In order to avoid burdening other system ratepayers with the added costs associated with a fully undergrounded system, it has been suggested that Green Acres I property owners may be willing to pay for the additional cost of a fully undergrounded system via a voter approved assessment. Existing Rules and Regulations do not provide for this option, which, if implemented, ultimately would require all property-owners in Green Acres I to pay for a more expensive system that is supported by some (but likely not all) property owners. Staff requests guidance from the UAC

regarding the possible preparation of a Utilities Rule and Regulation that would permit such an assessment.

BACKGROUND

Underground Utility District 15 ("UUD 15"), the area bounded by Arastradero Road, Pomona Avenue, Glenbrook Drive, and Los Palos Avenue (also known as Green Acres I), was constructed and completed in 1973. To maintain reliability of the electric system, CPAU needs to replace the 45-year old transformers and cables, and bring the system up to current design standards. In 1973 UUD 15 was constructed using all subsurface equipment in concrete vaults. CPAU's current standard for underground construction is to install pad-mounted equipment (above ground equipment sitting on a concrete pad) with only the cables installed below ground. This design aligns with CPAU's responsibility to build a safe, reliable, and cost effective electric system that will minimize the risk of injuries and outages, and keep electric rates as low as possible. The proposed design using pad-mounted equipment met with opposition from a significant number of residents in Green Acres I, who expressed concerns over aesthetics, safety and property values. Staff presented a report at the August 1, 2018 UAC meeting explaining the safety, reliability and cost justifications for CPAU's standard for pad-mounted equipment. At this meeting the UAC also heard comments from Green Acres I community members. The UAC requested that CPAU staff work with residents on design alternatives to accommodate aesthetics and safety.

DISCUSSION

Over the last three months CPAU staff have presented a design alternative to residents and attempted to answer residents' questions. Please refer to Frequently Asked Questions (FAQs) shown in Attachment A: "FAQs Green Acres Underground Rebuild", which addresses Green Acres specific questions, and Attachment B: "FAQs Utilities Undergrounding and Rebuilds", which addresses more general FAQs about undergrounding and rebuilds. Staff recognizes that the Green Acres community and UAC members have asked for studies about relative safety of pad-mounted vs. subsurface transformers, but such studies have not been found. Staff can attest to the fact that pad-mounts are the industry standard and the number of manufactures supplying subsurface transformers has subsequently declined in recent years. Staff has provided residents information about staff's experience of subsurface equipment explosions in Palo Alto, but we cannot extrapolate this experience to large scale statistics given the City's small sample size and the fact that the City's subsurface equipment tends to be older.

Staff did propose an alternative plan for the pad-mount transformers that reduced the number of those transformers from nine to six and placed them in more discrete locations. We presented the new concept to three of the Green Acres I Association (GAIA) Board Members for review and feedback, and offered to work with property owners on landscaping if a transformer was to be placed somewhere near their property. We also offered to place sample cabinets (the transformer housing) in the proposed locations so that residents could more easily visualize the impact. Finally, we offered to participate in another community meeting to answer further questions. The feedback we have had from community representatives is that any pad-mount

equipment is not an acceptable solution and they want to work with us on a fully undergrounded system.

In response to Green Acre I resident questions, staff provided cost estimates to show the difference in costs between the standard pad-mounted design and the community requested design with all equipment installed below ground in subsurface boxes. The estimate is shown in Attachment A with a modified version shown in Figure 1.

As equipment standards have evolved since 1996, current functional and safety requirements cannot be met by simply reusing existing vaults in the Green Acres I neighborhood. Putting aside the safety and reliability justification for pad-mounted equipment, CPAU's current construction and safety standards require installing no more than one piece of equipment in a vault; multiple pieces of equipment in a single vault results in reduced clearances and increases the chances of disruption of the equipment. As a result, in the Green Acres I neighborhood, simply maintaining the existing load serving capacity would still require extensive subsurface construction to relocate transformers to separate vaults from secondary connections, hence the cost component for new vaults. These engineering estimates are based on recent quotes for equipment and labor costs. This is not the full project cost as it only compares the components that would change between the two designs; the replacement of electrical cables will be a similar scope under both designs. In the Fiscal Year 2019 budget, the estimated construction budget for the UUD 15 rebuild was just over $500,000, with the cable replacement component comprising about $180,000 of the total budget.

Staff's current estimate is that the additional costs associated with the non-standard installation would be approximately $413,000 (see Attachment A and Figure 1). This number is preliminary, and may need revision upon additional engineering study. This amounts to a likely cost in the range of $4,000-$5,000 per customer serviced by the Green Acres I system.

Figure 1: Cost Comparison Provided in FAQs for Green Acres Neighborhood

Unit Cost Estimates for Above Vs. Below Ground Equipment and Installation

Material and Labor Unit Costs		(A) Above ground Pad-mount Equipment (Transformers & Loadbreaks)	(B) Above ground Pad-mount Loop Feed Transformers (No Loadbreaks)	(C) Below ground Submersible Equipment
Materials	Transformer	$ 1,854	$ 4,170	$ 5,719
	Switch	$ 1,277	$ -	$ 536
	Misc. Equipment	$ 2,748	$ 1,056	$ 956
	Pads/Vaults	$ 5,312	$ 1,075	$ 12,552
Labor	Substructure Installation	$ 23,571	$ 10,355	$ 23,571
	Equipment Installation	$ 15,478	$ 9,594	$ 15,478
	Total Unit Cost	**$ 50,240**	**$ 26,250**	**$ 58,812**

Cost Differential Between the Two Green Acres Designs

Design	Description	Cost Components	Total Cost
Utility Standard (Above Ground)	Five Transformers with Loadbreakers = 5 x (A)	$ 251,200	**$ 356,200**
	Four Transformers without Loadbreakers = 4 x (B)	$ 105,000	
Home-owner Requested (Below Ground)	Nine Below Ground Submersible Equipment = 9 x (C)	$ 529,308	**$ 769,301**
	Special Facilities Fee*	$ 239,993	

Cost Differential between Padmount and Submersible Equipment $ 413,101

* Special Facilities Fee is the present cost of ownership (maintenance, operation)
Rule & Regulation #20 Section J https://www.cityofpaloalto.org/civicax/filebank/documents/8208

Note that the Special Facilities fee is an estimate for what may be allocated for such a project as is in the Green Acres I neighborhood. At this time we do not have a precise fee for the situation in which a group of property owners request facilities that differ from the utility's standards. The purpose of the fee is to collect the ongoing operations and maintenance costs of the special facilities.

The calculation of the proposed Maintenance and Operations (Special Facilities Fee) component is illustrated in Figure 2

Figure 2: Proposed Maintenance and Operations Fee Calculation

Item No.	Description	
Differential Cost Between	Materials	$ 96,708
Standard and Requested	Labor	$ 76,400
Facilities	Other	$ -
1	Estimated Job Cost Differential	$ 173,108
	Annual Cost of Ownership Factor	0.067
	Annual Cost of Ownership	$ 11,598
	Term	30
	Discount Rate	3%
2	**Present Value of Annual Cost of Ownership**	**$227,331**
3	**Present Value of Annual Energy Losses**	**$ 12,662**
4	**SPECIAL FACILITIES FEE (2+3)**	**$239,993**

Potential Cost-sharing for Fully Undergrounded System

Section B(3) of City of Palo Alto Rule and Regulation 3 (Attachment C) requires that "all new equipment in underground areas required to provide electric service to a Customer shall be pad-mounted."

However, Rule and Regulation 3 also provides that:

> The Utilities Director, or his/her designee, may authorize…an exception to the above provisions when, in his/her opinion, a pad-mounted equipment installation in any particular instance would not be feasible or practical….

This sort of exceptional or non-standard installation is considered a "Special Facility" as defined in Rule and Regulation 20 (Attachment D). Pursuant to Regulation 5 (Attachment E), the applicant requesting service is responsible for costs associated with the non-standard installation of a Special Facility.

The typical application of this exception occurs, for example, when (as occurs in downtown University Avenue) a new development has zero lot line building construction and would require pad-mounted equipment to be installed in alleys, sidewalks or streets obstructing pedestrians and vehicles.

A full undergrounding in Green Acres I would not fall under the exception to Rule and Regulation 3 because it is feasible and practical to install pad-mounted equipment in Green Acres I. Furthermore, it is unlikely that 100% of the approximately 100 customers in Green Acres I will

support the fully undergrounded installation. Rule and Regulation 3 is not typically used to impose a charge upon an existing customer to fund additional costs associated with a non-standard installation that the City does not consider infeasible or impractical.

Consequently, if it is desired that Green Acres I property owners be able to request a fully undergrounded installation that will be funded through a levy on all property owners served by the installation, it will be necessary to amend the Rules and Regulations to provide a procedure governing such a request. Staff recommends that, if such a procedure is adopted, it require that the request be signed by owners of not less than 75% of the parcels served by such a system. Furthermore, the formal mechanism for imposing the levy would likely be the imposition of a real-property assessment. Under state law, such an assessment can only be levied if the City (i) prepare an engineers' report, and (ii) conducts a property owner mail ballot proceeding—which is essentially a property owner election. Costs associated with the report and proceedings, roughly estimated to be at least $20,000, would be added to the assessment amount. The report preparation and balloting would take several months.

Staff recommends that the procedure provide that the engineer's report and ballot proceeding not be commenced until after the City has received the required request from property owners. Staff also recommends that there be a strict time limit placed on the period in which signatures for the request are collected, in order to ensure that the process, if unable to gain sufficient support, does not cause additional substantial delay to the installation of the pad-mounted option.

NEXT STEPS

After receiving the UAC's feedback, staff will take a recommendation to Council, which could result in the adoption and implementation of a rule governing community requests for fully undergrounded systems. A revised schedule will be set once an approval process is determined.

RESOURCE IMPACT

The resource impact will depend on the allocation of the incremental installation and maintenance costs, and the costs of creating a system to administer and allocate the expense of proceeding with subsurface equipment in Green Acres I.

POLICY IMPLICATIONS

A Council decision to adopt a Rule governing community requests for fully undergrounded systems, including a method of assessing a levy upon property owners, would require changes to Rule and Regulation 3 and 20.

ATTACHMENTS:

A. FAQs Green Acres Underground Rebuild
B. FAQs Utilities Undergrounding & Rebuilds
C. Rule 03 effective 6-27-2016
D. Rule 20 effective 6-27-2016
E. Rule 05 effective 2016-06-27

PREPARED BY: **Debbie Lloyd,** Assistant Director, Utilities Engineering

REVIEWED BY: **Dean Batchelor,** Chief Operating Officer, Utilities

DEPARTMENT HEAD: Dean Batchelor for:
Ed Shikada, Assistant City Manager/Utilities General Manager

Frequently Asked Questions (FAQs)

City of Palo Alto Utilities (CPAU) Underground District Rebuild Projects

Green Acres Neighborhood

1) General FAQs about utilities underground district projects.

2) Why is the City planning to rebuild the utilities underground equipment in the Green Acres neighborhood?
    a. The wires and equipment in Green Acres are 45 years old and past their life expectancy. It is next on the list of older underground systems that require a rebuild based on age of equipment. This is in line with CPAU's policy of proactive infrastructure replacement *before equipment fails.*

3) Have any switches and transformers or other underground electrical equipment in the Green Acres underground district been replaced or repaired? If so, when and where?
    a. CPAU has not performed any major infrastructure work to replace transformers and switches in the Green Acres neighborhood, with the exception of replacing a lid on one of the utility boxes. However, repair or replacement of smaller components (such as a corroded elbow) frequently occur during inspections as part of CPAU's basic maintenance procedures and are typically not recorded.

4) When is the last time the City opened the grates/utility boxes in the Green Acres neighborhood to inspect the condition of the underground utilities equipment?
    a. Full inspection occurs every three years for underground equipment. Operators open subsurface structures/grates, clean out debris, pump out and dispose of liquids, inspect and repair or replace components as needed.
    b. "Walk-by" inspections occur annually. The last detailed inspection in Green Acres was November 2015 and the last walk by visual inspection was November 2017. This year's inspection will be a full detailed inspection.

5) When other underground districts have been rebuilt, has the equipment remained below the surface or was it relocated aboveground?
    a. Underground districts #6 and 7 were recently rebuilt. When rebuilt, the subsurface equipment was relocated to aboveground pad-mounted equipment, per the City's standard requirements.

6) What are the dimensions of pad-mounted equipment required for an underground rebuild project?
    a. The size of pad-mounted transformer enclosures, or cabinets, depends on the type of equipment installed, but the largest cabinet size CPAU proposes is 38" (height) x 48" (width) x 39" (depth). CPAU has installed smaller cabinets at about 35" H x 37" W x 35" D. Note that the installed cabinet size will depend on final design and availability of cabinet inventory in the market. Staff is investigating options for the smallest feasible cabinets for installation in

utilities undergrounding rebuilds. Currently, CPAU staff have identified available cabinet sizes of approximately 36” H x 40” W x 36” D.

b. The concrete pad may add 2-3” but depending on gradient may be able to set flush with ground.

7) Are there any alternatives to the aboveground containments that might be used other than the proposed transformer enclosures?
    a. Staff are exploring alternatives to the proposed transformer enclosures, in response to residents’ concerns that the aboveground padmount transformers are large and intrusive. The original proposal for padmount transformer enclosures, or cabinets, was for the largest cabinet size possible, to provide the greatest electrical system capacity in this neighborhood. However, staff have agreed to evaluate the feasibility of installing smaller cabinets during the design phase of this project and work with residents to identify a mutually-agreeable solution.

8) What is the electrical capacity of the existing underground equipment in the Green Acres neighborhood and what percentage of that capacity does Green Acres currently use? What capacity would the new transformers and switches provide?
    a. The current system load is about 70 percent of total capacity, however there are 4-5 transformers that are either operating at full capacity or are overloaded. Through this utilities underground rebuild, the City has the ability to double the total capacity of the system.

9) How much additional capacity will pad-mounted equipment provide?
    a. It is estimated that pad-mounted equipment can provide an additional 50 percent to 100 percent power capacity.

10) What is the comparative cost estimate of aboveground pad-mounted equipment vs. subsurface equipment?
    a. The following table provides current engineering estimates based on recent quotes for equipment and labor costs. This is not the full project cost as it only compares the components that would change between the two designs.

Unit Cost Estimates for Above Vs. Below Ground Equipment and Installation

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	Special Facilities Fee*	$ 291,472	

Cost Differential between Padmount and Submersible Equipment $ 464,580

* Special Facilities Fee is the present cost of ownership (maintenance, operation, replacement).
Rule & Regulation #20 Section J https://www.cityofpaloalto.org/civicax/filebank/documents/8208

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11) How will the Green Acres neighborhood underground rebuild project be funded?
    a. Based on current standards, CPAU is proposing to rebuild the Green Acres underground equipment by installing aboveground pad-mounted equipment. In this proposal, CPAU will cover the full costs of the rebuild project through funding from the electric utility enterprise.
    b. Funding for any additional subsurface work or below ground equipment installation at the request of property owners is still to be determined. The City is evaluating funding scenarios in which residents may need to pay for such additional work if it is outside of the scope of the City's current standards for rebuilding utilities equipment in underground districts.

Frequently Asked Questions

City of Palo Alto Utilities Undergrounding & Underground District Rebuild Projects

1) What is a "utilities undergrounding" project?
    a. Utilities undergrounding involves relocating overhead electrical, telephone and cable TV wiring and equipment to below-ground vaults and/or aboveground padmounts to house the equipment.

2) How is the City of Palo Alto involved in utilities undergrounding?
    a. Since 1965, the City of Palo Alto Utilities (CPAU) has administered an ongoing program to convert overhead utility lines, including electric, telephone, and cable TV facilities, to underground. This staff report provides some historical background on the City's undergrounding program.

3) Who approves an underground district?
    a. City Council creates an underground district by passing an ordinance which amends the Underground District into Municipal Code. This occurs after a Public Hearing to take comments from the public.

4) Are there different types of underground districts?
    a. Yes. There are 3 types of underground districts: 1) General Public Interest and Benefit district where CPAU pays for all construction in the Public Right-of-way; 2) Primarily for Local Public Benefit district where the construction costs in the Public Right-of-way are shared equally between the utility and the residents; and 3) Insufficient Public Benefit, where the requester pays at least 75% of the cost of the undergrounding in the Public Right-of-way.

5) What type of districts have been formed in the City?
    a. Over the years, each type of underground district has been formed and constructed. However, the overwhelming majority of the districts have been General Public Interest and Benefit districts.

6) When will my neighborhood be undergrounded?
    a. The City prepares a 5-year budget each year. This document shows the next several planned underground districts. Planning is not done beyond the 5-year planning horizon. This is because the decision to underground is based, in part, on the condition of the electric system which constantly changes due to renovations and new construction.

7) How long will it take to underground the entire City?
    a. At the current rate of undergrounding it will take in excess of 50 years to complete the entire city.

8) Can the program be sped up?
    a. The rate at which undergrounding can be accomplished is dependent upon the financial participation of our joint partners (telephone and cable TV providers). The telephone company is regulated by the California Public Utilities Commission on how much it must spend on underground projects. Any acceleration of the program would have to be coordinated closely with telephone regulations.

9) How much does the electric utility spend on undergrounding each year?
    a. Approximately 1% of the electric revenues are spent on undergrounding each year. This level of funding will underground approximately 100 homes per year.

10) How much of the undergrounding costs do I pay?
    a. If it is a General Public Interest and Benefit district, the homeowner pays the $3,000 and $8,000 to make the home ready for underground service. In other types of districts, the homeowners pay a greater share of the costs.

11) Is there a program to help customers with the cost of converting their service to underground?
    a. The City has a 10-year loan program where a lien is placed against the property for the amount of the loan and the loan payments are collected on the property tax bill.

12) How much does it cost to underground the electric facilities in front of my home?
    a. The portion of the work performed by CPAU has averaged a cost to the City of between $10,000 and $15,000 per home. In most cases the underground district is determined to be of “General Public Interest and Benefit” where CPAU pays for all construction in the Public Right-of-way, but there are cases where the benefits are more local and the homeowners share some of this cost. In addition to CPAU’s cost, the homeowner can spend from $3,000 to $8,000, or more in some cases, to make their home ready for underground service. The actual cost a homeowner incurs is due to a variety of factors such as the distance from the City's electrical service box in the sidewalk or street to the homeowner's meter panel, whether the trenching work is under a paved walkway or driveway versus in the yard, the variations in price provided in written bids from licensed electricians or contractors, and which installer is selected by the homeowner.
    b. These FAQs on Homeowner Service Conversions provide more details on what is required on the part of the property owner.

13) How do I select a contractor to do the undergrounding of my home service?
    a. To be certain that your money is well spent, we recommend spending some time before you start your project by asking friends for personal recommendations of contractors they have liked, getting written bids from contractors, checking their references, obtaining a written contract for the terms and work agreed to, and monitoring the project and contractor as the work progresses. A great source of thorough information and free publications about selecting a contractor in our area is the Contractors' State License Board, Northern Region. Visit their website at http://www.cslb.ca.gov or their office at (916) 255-4027 in Sacramento. Complaints can also be registered through this oversight board.

14) Do I have to participate in the underground district?
    a. City Council creates an underground district by passing an ordinance which amends the Underground District into Municipal Code. This occurs after a Public Hearing to take comments from the public.

15) If I do not want to participate in an underground district before it is formed what should I do?
    a. During the formation of the underground district, you will receive a survey to determine interest in the underground district. You should respond that you are not interested in forming a district. In addition, you may write to the City Council letting them know your concerns. You may also attend the Public Hearing for the underground district and speak directly to Council with your concerns.

16) What is the life expectancy or replacement rate for such utilities equipment that has been undergrounded?
    a. The life expectancy of subsurface cables and equipment is approximately 30 years. After that point, the equipment is deemed a risk of failure and therefore needs to be replaced.

17) Why does the City need to rebuild an existing underground district?
    a. Vaults that hold subsurface equipment tend to accumulate water and runoff which includes oils, pesticides and general debris. Oils and corrosives react negatively with the metal shell of the equipment, breaking it down over time. Accumulated debris creates an additional layer of insulation on the equipment, which prevents heat from escaping. This further contributes to the deterioration of the equipment. CPAU has a proactive infrastructure replacement program, which is scheduled around replacing equipment *before* it fails to support reliability of our utility services.

18) What is involved in a utilities underground rebuild project?

a. Utilities underground rebuild projects involve the redesign of the underground electric system to current design practices. This includes replacement, where necessary, of cables, switches, transformers, and associated equipment, as well as conversion of the primary voltage from 4,160 Volt (V) to 12,470 V.
b. Per City policy, Section B (3) of City of Palo Alto Rule and Regulation 3 (Description of Utility Services), aboveground padmount equipment is required for all new underground electric construction. Where possible, submersible equipment will be replaced with padmount equipment which is more reliable, safer to operate, and more easily maintained.

19) What is the reason for installing aboveground pad-mounted electrical equipment?

a. Since 1996, the City's utility standards have required aboveground pad-mounted equipment that is demonstrated to be safer to operate, provides greater reliability and operational flexibility. Pad-mounted equipment is the industry standard for underground utilities construction.

20) Is it possible to replace the existing equipment with new subsurface equipment?

a. Yes, it's possible. However, as equipment standards have evolved since 1996, existing functional and safety requirements cannot be met by reusing existing vaults. Subsurface equipment poses a significant safety hazard to personnel, is highly susceptible to adverse operating conditions, has a lower life expectancy, reduces system flexibility, is more costly to install and maintain.

21) Is there data on the health or safety risks of aboveground vs. below ground equipment?

a. There are no published studies, but based on operating experience and results, it is now accepted as industry practice to install aboveground pad-mounted equipment for all electric system equipment. See example from San Diego Gas and Electric and Pacific Gas and Electric utilities.

22) Have there been any dangerous subsurface transformer-related incidents reported in Palo Alto?

a. Since 1994, a review of incidents attributed to underground equipment identified 30 exploded subsurface transformers and switches. There have been two similar incidents for aboveground pad-mounted transformers. A few reports from CPAU's Electric Operations team related to outages on subsurface transformers include:
    i. Transformer explosion causing damage to cables.
    ii. Transformer case rusted through, oil leaked, transformer exploded.
    iii. Street light transformer exploded in an underground vault, causing damage to the vault and iron plate; leaked oil.

iv. A 25 kilovolt-amp (kVA) transformer supplying power for a water pressure pump in the hills blew up, causing the power line to trip. Three men were injured.
v. A 25 kilovolt-amp (kVA) exploded, causing a feeder breaker to relay to lockout, leak oil.

23) What statistics can CPAU provide about the reliability or failure rate of below ground versus aboveground electrical utility equipment?
    a. Based on review of CPAU's power outage data, 264 outages have been reported on the underground system since 1994. Incidents specific to transformers in subsurface vaults are responsible for 71 outages, while 17 outages are associated with aboveground pad-mounted transformers.

24) Are there other Palo Alto neighborhoods with below ground installations that have been retrofitted with aboveground installations?
    a. Underground Districts #6 (2003) and #7 (1995) were rebuilt and retrofitted with aboveground installations. (*Link to Utilities Underground Districts map)*

25) In Underground Utility District #47 (Charleston/Arastradero/El Camino Real), it appears electrical wires and transformers have been fully undergrounded.
    a. Underground District 47 was constructed with all new equipment installed aboveground. Nearby, a district adjacent to 47 that was constructed before the current standards were adopted had most equipment installed subsurface. In District 47, CPAU converted the existing overhead wiring and equipment to underground, with all new equipment pad-mounted aboveground.

26) Is it possible that the City can connect to previously constructed underground districts and install subsurface equipment?
    a. As the City expands an underground conversion project, we at times will connect to a previously undergrounded system. If that undergrounding occurred prior to 1996 and has not yet been rebuilt it will have below ground equipment. An example of current practices can be observed in Underground Districts #6 and #7 which have both been rebuilt with aboveground pad-mounted equipment.

27) How often are subsurface equipment inspected compared to above ground pad mounted equipment?
    a. Full inspection occurs every three years for underground equipment compared to every five years for above ground pad-mounted equipment. At least every three years, operators open subsurface structures/grates, clean out debris, pump out and dispose of liquids, inspect and repair or replace components as needed. Walk by inspections occur annually for all equipment.

28) Is the City considering technologies that provide built-in flexibility, so that the electrical system can be upgraded over time with minimal disturbance?
    a. In the next five years, the City is planning to deploy advanced-metering infrastructure which will improve CPAU's ability to identify the location of electric faults causing power outages, quickly repair failed equipment, and shorten system recovery times. Rebuilding an underground district can increase capacity and improve system flexibility.

29) What other technological changes does CPAU expect to occur in the future that might require additional electrical capacity and what improvements would they bring?
    a. Continued electrification of transportation mechanisms, such as through electric vehicles, and shifting away from natural gas uses is expected to increase electricity consumption and loading on feeders. The benefits are that costs may come down over time as technologies improve. Conversely, the increased demand and stress on the electrical system may exacerbate the probability of equipment failure and outages if the system is not sufficiently sized to carry an increased load.

DESCRIPTION OF UTILITY SERVICES

RULE AND REGULATION 3

A. GENERAL

Rule and Regulation 3 describes Services that are offered within the jurisdictional boundaries of the City of Palo Alto. For Rules specific to each type of Service, please refer to the following Rules and Regulations:

Rule and Regulation 20 – Special Electric Utility Regulations
Rule and Regulation 21 – Special Water Utility Regulations
Rule and Regulation 22 – Special Gas Utility Regulations
Rule and Regulation 23 – Special Wastewater Utility Regulations
Rule and Regulation 24 – Special Refuse Service Regulations
Rule and Regulation 25 – Special Storm and Surface Water Drainage Utility Regulations
Rule and Regulation 26 – Special Fiber Optics Utility Regulations

B. ELECTRIC SERVICE

1. BASIS OF SERVICE

a. Unless otherwise provided in a Rate Schedule or contract, CPAU's Electric rates are based upon the furnishing of Electric Service to Customer Premises at a single Point of Delivery at a single voltage and phase classification. Unless specified otherwise, each Point of Delivery shall be metered and billed separately under the appropriate Rate Schedule. Any additional Service supplied to the same Customer at other Points of Delivery or at a different voltage or phase classification shall be separately metered and billed.

b. The type of distribution Service (voltage, Secondary, Primary) available at any particular location may be determined by inquiry to a CPAU Engineering representative.

c. If the Customer, for his or her convenience, requests Secondary or Primary Services at an alternate Point of Delivery other than the normal Point of Delivery as determined by CPAU, the Customer is responsible for all cost of providing Secondary or Primary Services at such alternate location.

d. CPAU assumes no duty or liability for inspecting, validating or approving the safe operating condition of the Customer's Service, appliances, or equipment downstream of the Utility Meter.

e. See Rule and Regulation 20. "Special Electric Utility Regulations" regarding special Service requirements.

2. LOCATION OF POINT OF SERVICE

a. SECONDARY SERVICE

1. OVERHEAD SERVICE AT SECONDARY VOLTAGES

The Point of Service for Overhead Service at secondary voltages will normally be located at a power pole on the perimeter of the parcel to be served, which is, in CPAU's judgment, most conveniently located and in compliance with CPAU standards and specifications and applicable building and electrical codes.

2. UNDERGROUND SERVICE AT SECONDARY VOLTAGE

The Point of Service for Underground Service at secondary voltages will normally be located at the Secondary connectors of the transformer serving the Customer's Load, or in the Secondary hand hole, if available.

b. PRIMARY SERVICE

The Point of Service for Primary Service will normally be at the point near the property line of the premises to be served which is, in CPAU's judgment, most conveniently located with respect to CPAU's transmission or distribution facilities.

c. EXCEPTIONS

If several buildings are occupied and used by one Customer in a single business or other activity, CPAU may, at its discretion, furnish Service for the entire group of buildings through one Service connection at one Point of Service.

3. EQUIPMENT REQUIREMENTS

All new equipment in underground areas required to provide electric service to a Customer shall be pad-mounted. In addition, any three-Phase electric service connection

and any electric service connection rated at 400 Amps or greater which is located either in an underground or overhead area must be served from a pad-mounted transformer.

The Utilities Director, or his/her designee, may authorize: 1) an exception to the above provisions when, in his/her opinion, a pad-mounted equipment installation in any particular instance would not be feasible or practical or 2) installation of electric service equipment in locations with limited access by utility equipment. Such installations will be considered "Special Facilities" as defined in Rule and Regulation 20, and the Applicant will be responsible for the costs described in that rule and outlined in the Service Contract as described in Rule and Regulation 5.

If the Applicant wants a Point of Delivery other than at the location determined by CPAU, CPAU will work with the Applicant to assist in the selection of the alternate Point of Delivery location for the electric service equipment within the boundaries of the Applicant's property. When the Applicant chooses a Point of Delivery location other than the location which has been determined by CPAU, the Applicant must acknowledge that such an alternate Point of Delivery location will cause CPAU personnel to incur delays when performing repairs or service restoration during emergencies. In addition to being responsible to pay for the initial cost of installation of such electric service equipment in an alternate location, the Applicant shall also be responsible to pay for any future additional labor, equipment, and material costs incurred by CPAU necessary to facilitate replacement, removal, or relocation of any electric service equipment which has been installed in an alternate Point of Delivery location at the Applicant's request.

Any installation intended to assist in "screening" of electric service equipment by landscaping or structures must be constructed in a manner which meets all of CPAU's clearance standards. The plans for such screening must be approved by the City of Palo Alto and CPAU prior to beginning work on the screening installation.

The Applicant shall provide a Public Utility Easement in recordable form for installation of such facilities within the boundaries of the property. All pad-mounted equipment will be subject to CPAU's aesthetic guidelines.

4. EMERGENCY AND STANDBY SERVICES

CPAU may provide back up Emergency, and other Standby Service to Customers as Special Facilities. See Rule and Regulation 20 "Special Electric Utility Regulations" regarding special Service requirements.

5. SERVICE DELIVERY VOLTAGE

The following are the standard Service voltages normally available. Not all standard Service voltages are available at each Point of Delivery. These Service voltages are available in locations that already have this Service voltage and have sufficient capacity, as determined by CPAU, to serve the new Load. Any equipment installed on 120/240, 3 wire or 240/120, 4-wire Services shall have the capability of converting to a 120/208, 3 wire or 208 Y/120, 4-Wire Service.

a. DISTRIBUTION OF VOLTAGE

Alternating-current Service will be regularly supplied at a nominal frequency of approximately 60-Hertz (cycles per second).

Single-Phase Secondary	Three-Phase Secondary	Three-Phase Primary
120/240, 3 -wire	240/120, 4-wire*	12,470, 3-wire
120/208, 3-wire	240, 3-wire*	
	208 Y/120, 4-wire	
	480 Y/277, 4-wire	

*Only available in special conditions as determined by the Electric Engineering Manager.

b. All voltages referred to in this Rule and appearing in some Rate Schedules are nominal Service voltages at the Point of Delivery. CPAU's facilities are designed and operated to provide sustained Service voltage at the Point of Delivery, but the voltage at a particular Point of Delivery will vary within satisfactory operating range limits.

c. In areas where a certain standard Secondary voltage is being delivered to one or more Customers, CPAU may require an Applicant for new Service in such areas to receive the same standard voltage supplied to existing Customers.

d. CPAU may change the voltage at which Service is delivered, including converting existing 4160 volt Primary Service to 12,470 volt Service. If CPAU notifies the

Customer that a Service voltage change is necessary, the Customer will be required to provide Service equipment capable of accepting the new voltage and meeting other CPAU requirements. Costs to provide suitable Customer's Service entrance equipment and any other associated equipment to receive Service at the new voltage shall be borne by the Customer.

6. VOLTAGE AND FREQUENCY CONTROL

a. Under normal Load conditions, CPAU's distribution circuits will be operated so as to maintain Service voltage levels to Customers within plus or minus 5 percent of the nominal Service voltage at the Point of Delivery. Subject to the limitations above, CPAU will maintain the voltage balance between phases as close as practicable to 2.5% maximum deviation from the average voltage between the three phases.

b. Voltages may be outside the limits specified above when the variations:

1. arise from Service interruptions;
2. arise from temporary separation of parts of the system from the main system;
3. are minor momentary fluctuations and transient voltage excursions of short duration which may occur in the normal operation of CPAU system;
4. are beyond CPAU's control.

c. Due to conditions beyond the control of CPAU, the Customer, or both, there will be infrequent and limited periods when voltages will occur outside of the nominal Service voltage ranges. Utilization equipment may not operate satisfactorily under these conditions, and protective devices in the equipment may operate to protect the equipment.

d. Where the operation of the Customer's equipment requires stable voltage regulation or other stringent voltage control beyond that supplied by CPAU in the normal operation of its system, the Customer, at its own expense, is responsible for installing, owning, operating, and maintaining any special or auxiliary equipment on the Load side of the Service delivery point as deemed necessary by the Customer.

e. The Customer shall be responsible for designing and operating its Service

facilities between the Point of Delivery and the utilization equipment to maintain proper utilization voltage at the line terminals of the utilization equipment.

f. The Customer shall not impose a Load on CPAU's system that will cause the voltage limits in this section to be exceeded for an adjacent Service delivery point.

g. When there is reasonable indication of a problem, CPAU shall test for excessive fluctuations at its own expense. Voltage checks requested by the Customer more than once in any twelve month period shall be paid by the Customer, unless CPAU determines that excessive voltage fluctuation exists.

h. CPAU may institute measures to prevent the continuous operation of equipment detrimental to Service to other Customers or may discontinue Electric Service to the offending Customer. (See Rule and Regulation 20, Special Electric Utility Regulations).

i. Customers are responsible for protecting their connected Loads, audio, video, and electronic equipment, including computers, from sudden voltage or frequency fluctuations outside nominal Service and frequency ranges. Such protection may include, but is not limited to, surge protectors.

7. GENERAL LOAD LIMITATIONS

a. SINGLE-PHASE SERVICE

1. Single-phase Service normally will be 3-wire, 120/240 volts (or 3-wire, 120/208 volts at certain locations as now or hereafter established by CPAU) where the size of any single motor does not exceed 7-1/2 horsepower (10 horsepower at the option of CPAU). For any single-phase Service, the maximum Service size shall be 400 ampere, unless approved by the Utilities Director or his/her designee. If the Load exceeds the capability of a 400 ampere single phase Service the Service shall be three-phase.

2. In locations where CPAU maintains a 120/208 volt secondary system, 3-wire single-phase Service normally shall be limited to that which can be supplied by a main switch or Service entrance rating of 200 amperes. Single-phase Loads in these locations in excess of that which can be

supplied by a 200 ampere main switch or Service entrance rating normally will be supplied with a 208Y/120 volt, three-phase, 4-wire Service.

b. THREE-PHASE SERVICE (480 VOLTS OR LESS)

Normal Voltage	Minimum Load Requirements	Maximum Demand Load Permitted
240/120	5 hp, 3-phase connected	400 Amperes
240	5 hp, 3-phase connected	400 Amperes
208Y/120	Demand Load 75 kVA	500 kVA
480Y/277	Demand Load 112 kVA	2,500 kVA (See *Note 1*)

Note 1. Applicants or existing Customers with a planned or existing single or multiple building development having a maximum Demand in excess of 2500 kVA, as determined by CPAU, will be required to take delivery at the available primary voltage and are required to provide their own primary switchgear and transformer(s). Determination of maximum Demand and Service voltage will be made by CPAU and the decision of the Electric Engineering Manager will be final.

1. Where three-phase Service is supplied, CPAU reserves the right to use single-phase transformers, connected open-delta or closed-delta, or three-phase transformers.

2. Three-phase Service will be supplied on request for installations aggregating less than the minimum listed above, but not less than 3 horsepower (hp), three-phase Service, where existing transformer capacity is available. If three-phase Service is not readily available, or for Service to Loads less than 3 hp, Service shall be provided in accordance with CPAU's applicable Rule 20 on Special Power Service requirements.

3. Residential customers requesting three-phase service shall be responsible for all labor and material costs required to provide service, including the cost of the transformer. These installations are not considered "Special Facilities" as described in Rule and Regulation 20.

4. An Applicant or existing Customer requiring Service with a maximum Demand in excess of 1000 kVA, as determined by CPAU, shall be served by a padmount transformer. No submersible or vault-installed

transformers in excess of 1000 kVA will be installed by CPAU. Where an existing underground Service must be upgraded beyond 1000 kVA, the Customer shall be required to provide adequate space for installation of the padmount transformer. In the event the Customer is unable to provide adequate space for the padmount transformer, then the Customer shall make arrangements at his or her expense to receive Service at primary voltage.

c. THREE-PHASE SERVICE (OVER 2,000 VOLTS)

The following three-phase primary voltage may be available as an isolated Service for a single Applicant; and where that Applicant's Demand Load justifies such voltage. The determination will be made by CPAU.

Normal Voltage	Minimum Demand Bank Installed	Maximum Demand Load Permitted
4,160	500 kVA	3,600 kVA
12,470	1,000 kVA	11,000 kVA

Note: 4,160 volt Services will not be furnished for new Services.

8. TEMPORARY SERVICE

Temporary Service is Electric Service which, in CPAU's opinion, is of an indefinite duration at the same location, or for operations of a speculative character or of questionable permanency, or any other Service which is estimated to last less than one year. CPAU will furnish Temporary Service if the furnishing of such Service will not create undue hardship for CPAU, or its Customers, and the following conditions are met:

a. The Applicant for such Temporary Service shall apply for Service on an Application form provided by CPAU Engineering and shall pay to CPAU in advance the cost of installing and removing any facilities necessary in connection with the furnishing of such Service by CPAU.

b. Each Applicant for Temporary Service shall prepay a Temporary Service Fee in accordance with Electric Service Connection Fees Rate Schedule E-15.

c. Nothing in this Rule and Regulation shall be construed as limiting or in any way affecting the right of CPAU to collect from the Customer an additional sum of

money by reason of the Temporary Service furnished or to be furnished or removed hereunder.

d. If the Temporary Service connection time exceeds one-year, the Applicant shall apply for an extension of the Temporary Service. The Director of Utilities or his/her designee will determine if the Service should be reclassified as a permanent Service.

9. SERVICE DOWNSTREAM OF METER

CPAU assumes no duty or liability for inspecting, validating or approving the safe operating condition of the Customer's Service, appliances, or equipment downstream of the Utility Meter.

C. FIBER OPTIC SERVICE

Fiber Optic Service includes the custom construction and licensing of single mode Fiber routes between points within the City of Palo Alto. It is the Customer's responsibility to establish all electronic devices and networks required to pass data over their licensed CPAU Dark Fiber routes.

1. LICENSING SERVICES

All Dark Fiber routes are licensed in accordance with the currently approved Dark Fiber Rate Schedules, and in compliance with the Utilities Rules and Regulations. See Rule and Regulation 26, "Special Fiber Optic Utility Regulation," regarding special Service requirements. All CPAU fibers terminate within the jurisdictional boundaries of the City of Palo Alto.

2. OTHER SERVICES

CPAU offers custom Dark Fiber construction and ancillary Services such as Fiber Optic cable splicing, engineering feasibility studies, and when specifically requested by the Customer, multimode Fiber cable installations.

3. QUALITY

Dark Fiber routes in the City of Palo Alto comprised of single mode Fiber comply with

generally accepted industrial standards and specifications. All construction is done using industry accepted techniques and procedures. All constructed routes are Performance Tested to assure the industry quality standards are met.

D. WATER SERVICE

1. SOURCE OF SUPPLY

CPAU's primary source of Water is the Hetch Hetchy aqueduct system, managed by the San Francisco Public Utilities Commission (SFPUC). CPAU wells also provide Emergency supply. See Rule and Regulation 21, "Special Water Utility Regulation" regarding special Service requirements.

2. QUALITY

Hardness generally varies between 1 and 4 grains per gallon depending on the source. An analysis of the mineral content of the Water is available upon request from CPAU Engineering.

3. PRESSURE

Water pressure varies from 30 to 125 pounds per square inch. CPAU maintains an average of 50 pounds per square inch, with the maximum and minimum pressures being experienced at the lower and higher elevations of the Distribution System. CPAU assumes no responsibility for loss or damage due to lack of Water pressure but agrees to furnish such pressures as are available in its general Distribution System. If low Water pressure occurs due to additional on-site development, it shall be the responsibility of the property owner to replace the existing Water Service with a new Water Service designed for the current site. All costs of the required new Service upgrade shall be borne by the property owner.

4. TREATMENT

CPAU currently does not treat Water supplied by the SFPUC. The pH of the Water supplied is adjusted by the SFPUC to reduce its corrosive action**.**

5. SERVICE DOWNSTREAM OF METER

CPAU assumes no duty or liability for inspecting, validating or approving the safe operating condition of the Customer's Service, appliances, or equipment downstream of

the Utility Meter.

E. GAS

1. TYPES OF SERVICES

CPAU provides Gas supply, transportation, and Distribution Services.

2. KIND AND HEATING VALUE

CPAU purchases Gas from several/various Gas suppliers. The heating value of Gas supplied varies. The average monthly heating value in British Thermal Units (Btu)-dry basis per cubic foot of the Gas served may vary within the limits of 750 to 1150 Btu. This average heating value is converted to a Therm factor for use as one of the factors used in calculating a composite multiplier for billing purposes. The Therm factor will be based upon the heat factor used by CPAU's supplier of Gas for the preceding month.

Gas is supplied by CPAU either at standard "low pressure" or at "medium pressure". Low pressure Service is available at all points where Gas is supplied. Where available from existing high pressure mains, at the option of CPAU, high pressure Service may be supplied. However, CPAU reserves the right to lower the pressure or to discontinue the delivery of Gas at high pressure.

The standard pressure for low pressure is seven inches of Water Column (WC), which is approximately 1/4 pound per square inch (psi) above atmospheric pressure. In limited circumstances, increased pressure may be provided for domestic use at 14" Water Column. This increased pressure will only be provided for domestic use if the houseline size required is greater than 2" diameter, or CPAU determines, based upon satisfactory information from the manufacturer, provided by the Customer, that an appliance to be located in the residence requires increased pressure at the inlet that cannot be obtained by resizing or relocating the houseline. Increased pressure may be provided for commercial uses only if the use of the houseline size required is greater than 4" diameter, or evidence as described above establishes that equipment on the site requires increased pressure at the inlet that cannot be obtained by resizing or relocating the houseline. For commercial uses, the available pressures are 7" WC, 14" WC (approximately 1/2 psi), 1 psi, 2 psi and 5 psi.

All increased pressure above 7"WC requires review and approval of the Engineering Manager, a plumbing permit and testing of the existing Gas piping with a building

Inspector present in accordance with the latest adopted version of the California Plumbing Code

See Rule and Regulation 22, "Special Gas Utility Regulations" regarding special Service requirements.

3. DETERMINATION OF THERMS TO BE BILLED

The unit of measure for billing is the Therm. Gas Meters measure volume of Gas in ccf at ambient temperature and pressure conditions. Therms are derived from the metered data by subtracting the Meter reading for the previous reading cycle from the current reading. The difference (uncorrected ccf) is multiplied by the pressure factor required to convert the measured consumption volume to a standard volume (at standard temperature and pressure conditions). This standard volume, in pressure-corrected ccf, is then multiplied by the Therm factor (a variable determined by periodic analysis of CPAU's Gas supply) to produce the final number of Therms billed. The composite correction factor (the product of the Therm factor and the pressure correction factor) is shown on bills under the heading "multiplier."

4. SERVICE DOWNSTREAM OF METER

CPAU assumes no duty or liability for inspecting, validating or approving the safe operating condition of the Customer's Service, appliances, or equipment downstream of the Utility Meter.

F. WASTEWATER COLLECTION AND TREATMENT

1. COLLECTION

CPAU operates and maintains a Wastewater Collection System separate from the storm and surface Water Collection System. A connection to the Wastewater Collection System is required for all water users where wastewater service is available.

For the disposal of Wastewater from basements and floors below ground level, it will be necessary for the Customer to provide pumps or ejectors for satisfactory drainage, as approved by the Water-Gas-Wastewater Engineering Manager. If the elevation of the basement floor is above the rim elevation of the next upstream manhole, Applicant shall provide a survey by a licensed Civil Engineer indicating the elevations of the basement floor and the rim elevation of the next upstream manhole. Submission of this survey and

approval by the Engineering Manager is required for exemption from the pump/ejector requirement.

2. REGULATION

Chapter 16.09 of the Municipal Code regulates the discharge into the Wastewater Collection System of substances other than domestic Wastewater. See Rule and Regulation 23, "Special Wastewater Utility Regulations" regarding special Service requirements.

3. TREATMENT

The collection system transports the Wastewater to the Palo Alto Regional Water Quality Control Plant for treatment. At this tertiary treatment plant, the City of Palo Alto processes the Wastewater from Mountain View, Los Altos, Los Altos Hills, Stanford University, and East Palo Alto Sanitary District, as well as its own. The treatment is performed in accordance with the National Pollution Discharge Elimination Permit issued by the San Francisco Bay Area Regional Water Quality Control Board before the treated water is discharged into the San Francisco Bay Estuary.

4. LIMITATION OF SERVICE

CPAU reserves the right to limit the size of connection and the quantity of wastes disposed and to prohibit the use of the sewer for disposal of toxic or hazardous wastes detrimental to the Wastewater system or treatment plant.

G. REFUSE SERVICE

1. REGULATION

All Refuse Services are governed by Chapter 5.20 of the Palo Alto Municipal Code, regulations promulgated by the City Manager pursuant to Chapter 5.20, these Rules and Regulations and the contract between the City and the City's Collector. See Rule and Regulation 24, "Special Refuse Service Regulations" regarding special service requirements.

2. REFUSE COLLECTION

Refuse Service is provided to all Customers by the City's Collector. Customers shall subscribe and pay for Refuse Service and for a number of containers to hold all Solid Waste created, produced or accumulated at or on their Premises during a one-week period, unless a different frequency for a collection schedule has been approved or

directed by Public Works. Each Customer shall receive collection Services on a specified day of each week and use the City Collector's provided Containers for service. Customers wanting to supply their own container must check with the City Collector to ensure compatibility with the collection vehicles. The automatic standard service for Solid Waste Service Charge is one 32-gallon container for Residential Service and one 64-gallon container for Commercial Service. All customers may change service levels to meet their refuse needs as specified above.

Solid Waste in excess of the Service Charge subscribed by the Customer will be removed by the City's Collector for an additional Charge upon Customer request or notification. Customers exceeding their subscribed Service are required to subscribe to additional collection Services at the City-established rates.

H. STORM AND SURFACE WATER DRAINAGE

1. RESPONSIBILITY AND PURPOSE

The City of Palo Alto Public Works Department is responsible for all Drainage Facilities in the street and public right of way that collect storm and surface Water and convey it to the major channels and creeks within the jurisdictional boundaries of the City of Palo Alto. Examples include curbs and gutters, catch basins, pipelines, culverts, street, channels and pumping stations. The purpose of the Storm and Surface Water control facilities is to improve the quality of control, or protect life or property from any storm, flood or surplus waters. See Rule and Regulation 25, "Special Storm and Surface Water Drainage Regulations," regarding special Service requirements.

2. STORM DRAINAGE FEE

A Storm Drainage fee shall be payable to the City monthly by the owner or occupier of each and every developed parcel in accordance with Rule and Regulation 25.

(END)

SPECIAL ELECTRIC UTILITY REGULATIONS

RULE AND REGULATION 20

A. GENERAL

In addition to the general requirements outlined in Rule and Regulation 18 for Utility Service Connections and Facilities on Customers' Premises, the following is required:

B. ELECTRIC SERVICE CONNECTION REQUIREMENTS

1. FACILITIES ON CUSTOMER PREMISES

a. The Customer is responsible for installing and maintaining all substructures on the Customer's Premises for CPAU to provide Electric Service. This will be at the Customer's expense and in accordance with the requirements, standards, and specifications of CPAU. This substructure shall be owned and maintained by the Customer for exclusive use by CPAU. The Customer shall be responsible for repairing or replacing the substructure for any reason, including deterioration to the extent that the existing conductors/cables cannot be removed.

b. The Customer is required to provide all substructure between the Customer's Service entrance equipment and the nearest available Point of Service connection, as determined by CPAU. This Point of Service is typically a splice box located near the street and may be in the Public Right-of-Way. In the case of rear easements, this point is typically at a splice box or at the base of a pole riser.

c. Upon approval by CPAU of the substructure installed on the Customer's Premises, CPAU will install Primary Electric Service conductors and a transformer, if needed. The Applicant/Customer is responsible for the cost of installation in accordance with the applicable sections of CPAU's Electric Service Connection Fees (Rate Schedule E-15). CPAU will determine the type and size of the conductors to be installed by CPAU.

d. CPAU will assume ownership and responsibility for maintenance of the underground Electric Service lateral conductors, as defined in the National Electric Code Article 100, installed by the Customer if the Service meets CPAU specifications and it has been approved and accepted by the Electrical Engineering Manager or his or her designee. Where bus duct or extra flexible cable is required and used, CPAU's maintenance responsibility for conductors ends at the transformer secondary

terminals. The bus duct or extra flexible cable is considered to be the Service entrance conductor for which CPAU assumes no responsibility.

2. MISCELLANEOUS SERVICE EQUIPMENT

a. CUSTOMER'S EQUIPMENT

1. All service switches, fuses, Meter sockets, Meter and instrument transformer housing and similar devices, irrespective of voltage, required in connection with Service and Meter installation on the Customer's Premises shall be furnished, installed, owned and maintained by the Customer in accordance with CPAU requirements.

2. The "service disconnect" is defined by the National Electric Code.

3. Applicant will provide a suitable means for CPAU to place its seal on covers of service enclosures / troughs and instrument transformer enclosures which protect un-metered live circuits installed by the Applicant. Such seals shall be broken only by authorized CPAU representatives. Detailed information will be furnished by CPAU on request.

b. CPAU'S EQUIPMENT

1. CPAU will furnish and install the necessary instrument transformers, test facilities and Meters.

C. SERVICE CONFIGURATIONS

1. OVERHEAD OR UNDERGROUND

a. The standard Service to single family Residential homes in existing overhead areas shall be overhead. The Director of Utilities or his/her designee can require an underground Service for single family Residential Service in areas where system design requires underground Service, or would otherwise require the addition of poles to the system.

b. All new Electric Utility Services to Commercial/ Industrial

Customers and new subdivisions shall be provided by underground facilities on the Customer's Premises. The on-site underground Electric Utility lines shall be provided by the Customer at their expense and shall meet CPAU specifications.

2. NUMBER OF SERVICES PER BUILDING

Only one Electric Service line is allowed for a building or other Premises, except for commercial properties where:

a. Two or more Electric Service Drops or laterals may be extended to a single building provided all wiring, other than metering conductors, supplied for each Service has no common raceway, connection, or service area with wiring supplied by any other such Service. Approval by the Utilities Director, or his/her designee, is required and Special Facilities fees may apply.

b. Two or more sets of Electric Service entrance conductors may be extended to a single switch gear for the purpose of providing additional capacity or for backup protection. Special Facilities and/or reserve capacity fees may apply.

3. SERVICES FOR TWO OR MORE COMMERCIAL BUILDINGS ON ONE PARCEL

Only one Electric Service line is allowed on a parcel with multiple commercial buildings except where the Applicant requests CPAU to install multiple Service Lines, and CPAU agrees to make such an installation. The additional costs, as estimated by CPAU, shall be borne by the Applicant, including such continuing ownership costs as may be applicable. See Special Facilities section below.

4. NUMBER OF ELECTRIC SERVICE PERISCOPES PER SERVICE DROP

Not more than two service periscopes may be served from a single overhead Service Drop. Overhead service connections will not be installed where the Applicants main switchboard is larger than 400 amp.

D. PROTECTIVE DEVICES

1. **1.** The Applicant is responsible for furnishing, installing, inspecting and keeping in

good and safe condition at Customer's own risk and expense, all appropriate protective devices of any kind or character, which may be required to properly protect the Applicant's facility. CPAU shall not be responsible for any loss or damage occasioned or caused by the negligence, or wrongful act of the Applicant or any of the agents, employees or licensees of the property owner in omitting, installing, maintaining, using, operating or interfering with any such protective devices.

2. The Applicant is responsible for installing and maintaining approved protective devices as may be necessary to coordinate properly with CPAU's protective devices to avoid exposing other Customers to unnecessary Service interruptions.

3. Applicants who request Primary voltage Service shall install, at a minimum, circuit breakers with over-current and ground fault relays. Applicants must submit their planned protection scheme to the City for approval prior to installing any equipment.

4. The Applicant is responsible for equipping three-phase motor installations with appropriate protective devices, or using motors with inherent protective features, to completely disconnect each motor from its power supply. Particular consideration must be given to the following:

a. Protection in each set of phase conductors to prevent damage due to overheating in the event of overload.

b. Protection to prevent automatic restarting of motors or motor-driven machinery which has been subject to a service interruption and, because of the nature of the machinery itself or the product it handles, cannot safely resume operation automatically.

c. Open-phase protection to prevent damage in the event of loss of voltage on one phase.

d. Reverse-phase protection where appropriate to prevent uncontrolled reversal of motor rotation in the event of accidental phase reversal. Appropriate installations include, but are not limited to, motors driving elevators, hoists, tramways, cranes, pumps, and conveyors.

5. The Applicant is responsible for installing and maintaining service equipment rated for the available short-circuit current at the Point-of-Delivery. This value varies from one location to another, and can change over time. The Customer shall consult CPAU for the short-circuit current at each Point-of-Delivery.

6. Any non-CPAU-owned Emergency standby generation equipment shall be installed by the Applicant with suitable protective devices to prevent Parallel Operation with CPAU's system. The design must be fail-safe, such as with the use of a double-throw switch to disconnect all conductors. Any exception must include a written agreement or service contract with CPAU permitting such parallel operation.

7. Unprotected Service entrance conductors within a building must terminate at a disconnect switch immediately after entering the building. Installation must comply with the National Electrical Code section 230-70 concerning the location of the disconnect switch and section 230-6 for the definition of conductors considered outside a building.

E. INTERFERENCE WITH SERVICE

1. GENERAL

CPAU reserves the right to refuse to serve new Loads or refuse to continue to supply existing Loads of a size or character that may be detrimental to CPAU's operation or to the Service of its Customers. Any Customer who operates or plans to operate any equipment such as, but not limited to pumps, welders, saw mill apparatus, furnaces, compressors or other equipment where the use of Electricity is intermittent, causes intolerable voltage fluctuations, or may otherwise cause intolerable Service interference, must reasonably limit such interference or restrict the use of such equipment upon request by CPAU. The Customer is required to provide and pay for whatever corrective measures are necessary to limit the interference to a level established by CPAU as reasonable, or avoid the use of such equipment, whether or not the equipment has previously caused interference.

2. HARMFUL WAVEFORM

Customers shall not operate equipment that superimposes a current of any frequency or waveform onto CPAU's system, or draws current from CPAU's system of a harmful waveform, which causes interference with CPAU's operations, or the service to other

Customers, or inductive interference to communication facilities. Examples of harmful waveform include, but are not limited to:

a. Current drawn with high harmonic currents causing transformer or conductor overheating, even if root-mean-square (RMS) loading is within normal limits.

b. Current drawn causing voltage distortion adversely affecting CPAU or other CPAU Customers.

c. Harmonic currents which exceed the harmonic current distortion limits set in the most recent IEEE Standard 519. In most cases, this equates to a maximum limit of 4% harmonic current on any individual odd harmonic or 5% total harmonic current.

3. CUSTOMER'S RESPONSIBILITY

Any Customer causing service interference to others must take timely corrective action. Otherwise, CPAU, without liability and after giving five (5) days written notice to Customer, will take corrective action. Corrective action could include discontinuing Electric Service until a suitable permanent and operational solution is provided by the Customer, at Customer's expense.

4. MOTOR STARTING CURRENT LIMITATIONS

a. The starting of motors shall be controlled by the Customer as necessary to avoid causing voltage fluctuations that will be detrimental to the operation of CPAU's distribution or transmission system, or to the Service of any of CPAU Customers.

b. If motor starting causes or is expected to cause detrimental Service to others, a suitable means must be employed, at the Customer's expense, to limit voltage fluctuations to a tolerable level.

F. PHASE BALANCING

It is the Customer's responsibility to maintain a balanced Load, as nearly as practical, between supplied circuit phases. In no case shall the Load on one side of a three-wire single-phase service be greater than twice that on the other. In no case shall the Load on any one phase of a polyphase service be greater than twice that of any other.

G. POWER FACTOR CORRECTION

The Customer is required to provide, at Customer's own expense, Power Factor correction equipment. This equipment must be sized to improve the average Power Factor to at least the level set forth in the applicable Rate Schedule with respect to avoiding a Power Factor penalty.

H. SERVICE DISCONNECT AND METER TEST DEVICES

1. All service disconnects and similar devices, irrespective of voltage, required by Law in connection with a Service and Meter installation on Customer's Premises must be furnished, installed and maintained by the Customer. A "Service-disconnecting means", as defined in the NEC, must be installed adjacent to the meter(s). Metering equipment must be located on the exterior of the building, unless approved by the Electric Engineering Manager.

2. When instrument transformers are required by CPAU as part of the Meter installation, CPAU will install a Meter test bypass block on a mounting plate that must be furnished by the Customer. When instrument transformers are not required by CPAU, the Customer is responsible for providing the Meter test bypass block. Meter test bypass blocks furnished by the Customer must be approved by CPAU in conjunction with Applicant's plan submittal.

I. SPECIAL POWER SERVICE REQUIREMENTS

1. GENERAL

Where a Customer requires voltage control with less variance than what is specified in Rule and Regulation 3, the Customer must reimburse CPAU for its cost to provide any special or additional equipment to meet the Customer's special needs.

2. NONSTANDARD OR EXCESSIVE CUSTOMER REQUIREMENTS

a. In order to prevent damage to CPAU's equipment and impairment of its service, the Customer shall give CPAU notice before making any additions to the connected Load so that CPAU, at its option, may provide such facilities as may be necessary for

furnishing the increased service.

b. If a Customer's Load is of sufficient magnitude that it exceeds the capacity of

CPAU's Distribution System, the Customer may be required to shift peak loading to off-peak periods and/or receive service from CPAU's 60 kilovolt sub-transmission system.

J. SPECIAL FACILITIES

1. Special Facilities are facilities requested by an Applicant in addition to or in substitution for standard facilities which CPAU would normally provide. Standard facilities are for delivery of Service at one point, through one Meter, at one voltage class under its Rate Schedules.

2. CPAU normally installs only those standard facilities which it deems are necessary to provide regular service in accordance with the Rate Schedules. Where the Applicant requests CPAU to install Special Facilities and CPAU agrees to make such an installation, the additional costs thereof, as estimated by CPAU, shall be borne by the Applicant, including such continuing ownership costs as may be applicable. These costs will be calculated by CPAU based on the net present value, and shall be paid by the Applicant in advance of installation unless alternative payment arrangements are approved by the Director of Utilities.

3. Unless otherwise provided by CPAU's Rate Schedules, Special Facilities will be installed, owned and maintained by CPAU as an accommodation to the Applicant only if acceptable for operation by CPAU and the reliability of service to CPAU's other Customers is not impaired.

4. Installation of Special Facilities will require a contract between the Applicant and the City of Palo Alto.

(END)

SERVICE CONTRACTS

RULE AND REGULATION 5

A. TYPES OF SERVICE CONTRACTS

For all Utility Services provided, the City may require a written agreement for new or existing Customers. Contracts may apply to standard, custom, or special Service offerings. The following is an illustrative list of special Services that may be the subject(s) of a contract. Additional Services may require contracts not listed here, at the discretion of the Director of Utilities.

1. Line Extensions
2. Temporary Service
3. Special Facilities
4. Utility Service to special districts and institutions
5. Work performed for other agencies at their expense
6. Special Metering and/or Billing Services
7. Special Energy Services
8. Long-term Service agreements greater than 3 years
9. Loans and leases to finance efficiency improvements at a Customer's site
10. Loans and leases to improve power quality or reliability at a Customers' site
11. Standby Service
12. Purchase, lease, installation, connection or maintenance of on-site or distributed generation
13. All Fiber Optic Services
14. Reserve Electric Capacity

B. CONTRACT APPLICATION PROCEDURES

1. Customers shall complete and execute applicable form(s) or letter(s), as necessary.
2. Depending on the type of Service contract and at the request of CPAU, Customers shall request consideration for a special contractual agreement in writing to the Director of Utilities and/or the Director of Public Works specifying their objectives, including the desired terms and conditions of the contract.
3. Customers shall pay all applicable fees and deposits in accordance with the terms of the contract.
4. Customers shall comply with the City's insurance requirements.

(END)