City of Palo Alto  
City Council Staff Report  

Report Type: Consent Calendar  
Meeting Date: 3/21/2011

Council Priority: Environmental Sustainability

Summary Title: Peak Electricity Reduction Program

Title: Peak Electricity Reduction Pilot Program for Commercial Customers

From: City Manager

Lead Department: Utilities

Recommendation
Staff and the Utilities Advisory Commission (UAC) recommend that the City Council approve a two-year pilot electric Demand Response (DR) program.

Executive Summary
Reducing electricity usage during high-demand periods in the summer can help utilities across the state and in the Bay Area limit production from inefficient and polluting electric generation resources. A DR program provides an incentive for customers to reduce their electricity usage when called on by the City of Palo Alto Utilities (CPAU). By reducing customers’ electricity usage during these high-demand periods, CPAU’s annual peak usage and purchase cost for electricity will also be reduced. The objective of the proposed two-year DR pilot program is to evaluate the cost-effectiveness and customer-appeal of DR incentives in Palo Alto. The program is expected to be launched in May 2011 and will run for two years, after which time expanding the program will be evaluated. At its February 2, 2011 meeting, the UAC voted unanimously to recommend that Council approve the DR pilot program.

Background
The Energy Policy Act of 2005 required utilities to offer customers time-based rate options such as: a) time-of-use pricing, b) critical-peak pricing, c) real time pricing, and d) peak load reduction credits. In June 2008, staff communicated to Council the requirements, but recommended against implementing such options based on: 1) low level of community benefit, 2) constraints on the City’s automated customer information (SAP) and billing system software, and 3) insufficient metering capability (CMR: 215:08). While many of these limitations persist to date, the DR pilot program is designed to work with current systems, and the information gained from implementing a small-scale program will yield valuable insight at a relatively low cost. In addition, the Council-approved 2010 Ten-Year Electric Energy Efficiency Plan (CMR: 218:10) identified cost-effective demand reduction as a CPAU initiative.
Electric utilities are increasingly relying on DR and time-based retail rates to reduce supply costs and pass on appropriate price signals to customers for efficient energy use. Large investor-owned utilities (IOUs) in California have implemented DR programs that offer credits to customers for energy use reduction during high-use periods. These programs appeal to large commercial and industrial customers with flexible processes, cooling and lighting use capable of being shifted away from peak periods when called for during an energy use reduction event. In particular, these programs with combined incentives of lower monthly energy costs and credits are attractive to Bay Area technology companies. Utility providers base the energy reduction credits on their estimated avoided costs. Typically, large national service providers manage these DR programs for the utility providers.

Customers participating in a DR program that reduces their electric usage below a baseline level are compensated by utility providers according to the agreed upon terms and conditions. The terms and conditions also specify the method of calculating the baseline usage, which is generally based on a comparison of the customer’s prior usage patterns during similar periods (e.g., afternoon usage during summer months).

Discussion
Pilot DR Program Design Parameters
The pilot program will be limited to two years (summers of 2011 and 2012) and two megawatts (MW) of peak energy use reduction. For the first year of the program, up to four eligible commercial customers with the appropriate metering equipment will be selected. To encourage participation, staff recommends that CPAU compensate participating customers at the rate of 50 cents for every kilowatt-hour (kWh) of energy reduced below a specified baseline when called upon by CPAU to reduce electricity use during high summer demand periods. The program is expected to be cost-neutral for CPAU as staff has proposed the 50 cent/kWh compensation rate based on CPAU’s expected cost savings. The rate is expected to be attractive to customers as it is nearly five times the electric retail rate. Baseline usage will be calculated for each customer based on their prior usage patterns.

Total compensation per customer will vary depending on the energy reduction undertaken by the participant and the number of times that CPAU calls for energy reductions. Staff estimates participant compensation to be between $1,000 (at the minimum participation level of 50 kW) and $20,000 (at a participation level of one MW) per year.

IOU DR Programs vs CPAU
Compared to the popularity of the IOU programs, staff anticipates that the appeal of a DR program will be low in Palo Alto, at least in the near term. Most of CPAU’s commercial customers have limited flexibility to curtail their electric usage. Potential avenues for usage reduction include limiting non-critical lighting and pre-cooling buildings early in the day. In addition, CPAU’s avoided electricity costs are relatively low resulting in lower incentives to participating customers; the avoided costs for IOUs during the peak summer period is between $1 to $2 per kilowatt-hour (kWh), compared to CPAU’s avoided cost of approximately 50 cents per kWh. Staff will use the DR pilot program to test this hypothesis of low program appeal.
from the level of participation interest at the proposed compensation rate and the level of response to CPAU's energy use reduction requests. Staff is also investigating collaborative opportunities with Stanford researchers and students to develop simple and low-cost ways to expand the pilot program to a larger set of customers.

Environmental Benefits and Grid Reliability
In addition to reducing costs to CPAU and providing a small revenue stream for participating customers, DR also has the effect of reducing air pollution by limiting production from inefficient and polluting electric generation resources in California and the Bay Area. Furthermore, demand reduction improves the electric transmission grid reliability during the high use periods. The experience gained under this pilot program will assist CPAU in determining if a CPAU DR program could be designed to effectively participate in these emerging grid reliability market opportunities.

CPAU and Customer Load Profiles and Cost Reduction Potential
Customers' ability to participate and compensation levels are not the only factors for a successful DR program. From CPAU's perspective, the program will be a success if it reduces the City's peak electricity usage with a minimum number of calls for energy use reduction (energy reduction events). Most of the DR value to CPAU is from reducing local capacity costs, which are driven by the City's peak usage in the summer (local capacity costs are payments CPAU makes to owners of electric generation resources located in transmission constrained areas to keep their resource available to meet grid reliability needs).

Each time an energy reduction event is called CPAU has to compensate responding participants, which increases the cost of the program. If the City is close to its peak load over many hours and days in the summer then it is likely that many events would need to be called to achieve a reduction in the summer peak. Staff has analyzed the City's summer peak energy use and determined that a program designed to reduce the City's annual peak by two MW (the proposed limit for the pilot program) will need to target only a limited number of hours over the summer months. Such a program is the most cost-effective and could result in $40,000 in annual savings.

Terms and Conditions of the Proposed Pilot DR Program and an Example
Attachment A describes the terms and conditions of the proposed pilot DR program. Staff is developing a detailed project description and participation application form. Attachment B illustrates how such a program could work in a commercial building, using City Hall’s electrical loads as an example.

Market Potential of DR in Palo Alto and Next Steps
Based on prior experience and an outside assessment, staff estimates a total potential demand reduction of two to eight MW among large commercial customers in Palo Alto. While the cost of local capacity is $20,000 per MW at present, staff expects this to increase to $40,000 per MW within five years because of the anticipated need for new generation resources. At this higher local capacity cost and full DR potential, Palo Alto could save an estimated $320,000 per
year from a DR program at the full potential (8MW × $40,000/MW). Staff expects to gain experience and better understand customer interests through the proposed two-year pilot program and will report back to the UAC and Council in the Fall of 2012 on proposed next steps for a DR program. Results from this pilot will also assist in better defining an Automated Metering Infrastructure (AMI) or smart grid deployment plan throughout the City.

Board/Commission Review and Recommendations
The UAC considered staff’s recommendation for implementing a DR pilot program at its February 2, 2011 meeting. During the discussion, commissioners described the proposal as the type of innovative program they were looking for and were interested to hear about the plan to collaborate with Stanford on the program evaluation. They also described the proposed pilot program as a prudent way to start such a program.

The UAC voted unanimously five to zero to recommend that the City Council approve the Demand Response Pilot Program. Minutes from the UAC’s February 2, 2011 meeting are provided as Attachment C.

Resource Impact
The pilot program is expected to be launched in May 2011. The program administrative budget is estimated to be $15,000 in 2011 and $10,000 in 2012. This amount will cover minimal consulting costs for DR experts, help for staff to launch the program, and develop customer contracts and promotional material. A part-time intern may also be employed to help manage this program. The funds needed for program administration are available in the existing local generation evaluation budget.

The total compensation to participants could be up to $40,000 per year if two MW of DR volumes are achieved during the pilot phase. The compensation payments are available in the existing supply procurement budget since CPAU’s electric supply cost is expected to be lowered by a similar amount. Since the payments to participating customers will be processed outside the automated customer billing system, no billing system upgrades or SAP software modifications will be required.

Policy Implications
Demand Response programs were contemplated in the Council-approved 2010 Ten-Year Electric Energy Efficiency Plan (CMR: 218:10)

Environmental Review
No CEQA review is required for this project.

Attachments:
• A - Summary of Terms and Conditions  (DOC)
• B - Program Example  (DOC)
• C - Excerpted Minutes of February 2, 2011 UAC Meeting (DOC)

Prepared By: Shiva Swaminathan,

Department Head: Valerie Fong, Director

City Manager Approval: James Keene, City Manager
Fact Sheet Outlining Proposed Terms and Conditions of the Demand Response Pilot Program

1. Participant Eligibility Criteria: The pilot program will be open to large commercial customers that have interval metering equipment that can be read remotely. Participants would also need to have a minimum of 50 kW of flexible electrical usage that can be curtailed under this program. The participant will specify the level of flexible usage to which they will commit (Peak Load Reduction Quantity or PLR Quantity).

2. Participation Period: The pilot program extends over two years, covering the summers of 2011 and 2012.

3. Peak Load Reduction Events (PLR Events) and Duration of an Event: A PLR Event is generally a high temperature day when it is likely that the City will reach its annual peak electric consumption. During a PLR Event, CPAU will request that participants reduce their electricity usage. The maximum duration of a PLR Event is five hours, and will occur between the hours of 12 PM and 6 PM. No more than 15 PLR Events will be called in a year, and no more than 10 in any one month.

4. PLR Event Notification by CPAU: CPAU will notify the program participants one day before the PLR Event specifying the hours that electricity usage reduction is requested.

5. Establishing Customer Baseline Usage and Verification of Actual PLR Response: PLR credits or payments to customers will be based on actual curtailment by customers during a PLR Event. A defined algorithm will compute what the participant’s electric usage would have been on the day if the customer had not reduced usage. The difference between this computed load (baseline usage) and actual usage will form the basis for computing customer credits and payments.

6. Definitions of full performance, non-performance, and partial performance by a participant during a PLR Event:
   a. Full performance in response to a PLR Event Notification occurs when a participant responds to each PLR Event Notification during the program year, and reduces their electricity usage by the entire PLR Quantity for the full duration of the PLR Event. Such participant would be compensated at the rate of 50 cents/kWh.
   b. Non-performance in response to a PLR Event Notification occurs when a participant does not respond to a PLR Event Notification by 10:00 a.m. PST on the day of the PLR Event, or participates at less than half-the PLR Quantity committed. Such participant does not receive any payment for that PLR Event.
c. Partial performance in response to a PLR Event Notification occurs when a participant’s response does not meet the standards of full performance described above, but meets 50% or more of the PLR Quantity committed. The compensation rate for this level of participation will be 35 cents/kWh for the event. A participant who fully performs in response to all PLR Event Notifications in a given year will be provided a one-time annual bonus payment of $100 per 50 kW of PLR Quantity.

7. Penalties for Non-Performance: There will not be any penalty for a participant who does not perform in response to a PLR Event Notification.

8. Participants Exiting the Program: A participant can exit the program at anytime by giving CPAU 10 days advance written notice. CPAU can also terminate a customer’s participation at any time.

9. Research Component of the Pilot Program and Maintenance of Confidential Customer Usage Data: Stanford University researchers have expressed interest in working with CPAU staff in to implement the pilot program, and to expand the program to cover a larger number of customers within three years. If CPAU accepts this assistance from Stanford, CPAU will require any research participants to protect the confidentiality of participating customer data via confidentiality and non-disclosure agreements. Customer data within CPAU will be shared strictly on a need to know basis under existing policies.

10. Public Recognition of Participants: Participants in this program will be recognized for their participation and their leadership in environmental stewardship.
Example: The City of Palo Alto’s City Hall as a Prototype Demand Reduction Customer

The figure below demonstrates City Hall’s electric load profile during the week of August 22, 2010. On Thursday August 25, during hour ending 6pm, City Hall’s electricity load peaked for the year at 595 kW. Had City Hall been participating in the proposed DR program, it could have reduced electricity usage by 50 kW, through notification to all city hall employees requesting reduction of lighting levels for the day. The City could also pre-cool the building, allowing the building temperature to drift up later in the afternoon. As a result of this action, the City would have been eligible for a payment of $125 (50kW × 5hours × 50¢/kWh) from CPAU for participating in the DR program for that day. If CPAU designated 10 of these Peak Load Reduction Events over the summer and the City Hall load was reduced by a similar amount each time, then the City would receive a payment of $1,250 from CPAU. In addition, the City could have reduced its electric bill by $30 for each day and or $300 over the summer. Such performance would result in a combined benefit of up to $1,550/yr for the City.

The corresponding supply purchase cost avoided by CPAU is estimated at approximately $1,250, which is a combination of avoided capacity costs and electric energy costs.

\[(50 \text{ kW} \times $20,000/\text{MW}) + (50 \text{ kW} \times 50 \text{ hrs} \times 10 \text{ ¢/kWh})\]

(Capacity Value) (Energy Value)
Although savings are small at present, CPAU expects greater future returns as the cost of meeting the City’s peak electric consumption increases and the California Independent System Operator (the electric grid operator in California or CAISO) offers expanded compensation for DR programs participating in the electricity markets. Customers with ice storage cooling systems could also take advantage of such DR program to optimize their systems. There is currently one commercial customer in Palo Alto with an ice storage system.
ITEM 3: ACTION: Pilot Demand Response Program for Large Electric Commercial Customers
Commissioner Eglash recused himself from the discussion because of the proposed involvement in
the project of his Stanford colleague.

Commissioner Foster stated he would like to see more implementation of this program but
understood the need to start slowly on a new program. Commissioner Keller asked if there were
other plans to encourage commercial customers to manage their own peak usage. Senior
Resource Planner Shiva Swaminathan replied that the Plug-In Program would address that.

ACTION:
Commissioner Foster made a motion to recommend Council approval of the Demand Response
Pilot Program. Commissioner Melton seconded the motion. The motion carried unanimously (5-0)
with Commissioners Cook and Eglash absent.