City of Palo Alto
City Council Staff Report

(ID # 3358)

Report Type: Consent Calendar **Meeting Date: 12/17/2012**

Council Priority: Environmental Sustainability

Summary Title: Update of Ten-Year Energy Efficiency Goals

Title: Finance Committee Recommendation that Council Approve Updated Ten-Year Electric and Gas Energy Efficiency Goals for 2014 to 2023

From: City Manager

Lead Department: Utilities

Recommendation

Staff, the Utilities Advisory Commission (UAC), and the Finance Committee recommend that the Council approve the proposed annual and cumulative Electric and Gas Energy Efficiency Goals for the period 2014 to 2023 as shown in the table below.

Annual Gas and Electric Energy Efficiency Targets
(% of total City customer usage)

	Electric	Gas
2014	0.6%	0.5%
2015	0.6%	0.5%
2016	0.6%	0.5%
2017	0.6%	0.55%
2018	0.6%	0.55%
2019	0.6%	0.6%
2020	0.65%	0.6%
2021	0.65%	0.65%
2022	0.7%	0.65%
2023	0.7%	0.65%
Cumulative 10-year EE Goal	**4.8%**	**2.85%**

Executive Summary

As required by State law, the City must update its ten-year energy efficiency (EE) goals every three years. Since the last updates, there have been dramatic increases in the requirements for energy efficiency through upcoming changes to appliance standards and building codes. However, the potential savings that will be achieved through the increased standards and code requirements cannot be included in the EE achievements from Utilities programs.

The proposed cumulative ten-year electric EE program goal is to save 4.8% of the City's projected electric usage between 2014 and 2023. If the updated electric EE goal is approved, the City's cumulative electric savings since 2006, as a result of both EE program achievements and changes to appliance codes and building standards, will be 8% of the projected load by 2023.

For gas, the proposed cumulative ten-year EE program goal is to save 2.85% of the City's projected gas usage by between 2014 and 2023. If the updated gas EE goal is approved, the City's cumulative gas savings since 2006, as a result of both EE program achievements and changes to appliance codes and building standards, will be 4.8% of the projected load by 2023.

Both the UAC and the Finance Committee unanimously supported the proposed updated EE goals.

Committee Review and Recommendations

At the November 14, 2012 Finance Committee, staff presented the proposed ten-year Electric and Gas Energy Efficiency Goals for 2014 to 2023 (Attachment 1: Staff Report 3211). The report covers an overview of the methodology used to update the energy efficiency goals, the proposed annual and cumulative goals for both electric and gas efficiency for 2014 to 2023, as well as the projected costs and rate impact of the Utility's electric and gas EE programs. During discussion, the Finance Committee pointed out it may be difficult to achieve the increasing annual goals over the ten-year horizon. Staff explained that the cost of emerging EE technologies is expected to come down over the next ten years, thereby lowering the cost barrier to adopt these technologies. Staff also clarified that the model used to develop the EE goals takes into account customer churn and equipment replacement.

The Finance Committee voted unanimously to recommend that City Council approve the proposed 2014 to 2023 electric and gas EE goals. The draft excerpted minutes from the November 14, 2012 Finance Committee meeting are provided as Attachment 2.

Resource Impact

The attached staff report to the Finance Committee contains preliminary estimates of the costs of achieving the proposed electric and gas EE goals. The detailed budget plan and staff needs to meet the annual EE goals will be part of the annual City budgeting process. The Demand Side Management budget will be a part of the entire Utilities Department and City budget request. The annual budget will present the costs for both internally administered and contractor supported efficiency programs.

Policy Implications

Approval of this recommendation conforms to the Council-approved Long-Term Electric Acquisition Plan and Gas Utility Long-term Plan Guidelines, which call for funding programs that maximize the deployment of cost-effective, reliable and feasible energy efficiency as the highest priority resource. The proposed electric and gas efficiency goals will also help achieve the Council-approved greenhouse gas emissions reduction targets by 2020.

Environmental Review

Approval of this recommendation does not meet the definition of a project, pursuant to section 21065 of the California Environmental Quality Act (CEQA). Thus, no environmental review is required.

Attachments:

- Attachment 1: Finance Committee Staff Report #3211 - Update of Ten-Year Energy Efficiency Goal(PDF)
- Attachment 2: Draft Excerpted Minutes of 11-14-12 Finance Committee Meeting (PDF)

City of Palo Alto (ID # 3211)

Finance Committee Staff Report

Report Type: Action ItemsMeeting Date: 11/14/2012

Council Priority: Environmental Sustainability

Summary Title: Update of Ten-Year Energy Efficiency Goals

Title: Utilities Advisory Commission Recommendation to Approve Updated Ten-Year Electric and Gas Energy Efficiency Goals for 2014 to 2023

From: City Manager

Lead Department: Utilities

Recommendation

Staff and the Utilities Advisory Commission (UAC) recommend that the Finance Committee recommend that the City Council approve the proposed annual and cumulative Electric and Gas Energy Efficiency Goals for the period 2014 to 2023 as shown in the table below.

Annual Gas and Electric Energy Efficiency Targets (% of total City customer usage)

	Electric	Gas
2014	0.6%	0.5%
2015	0.6%	0.5%
2016	0.6%	0.5%
2017	0.6%	0.55%
2018	0.6%	0.55%
2019	0.6%	0.6%
2020	0.65%	0.6%
2021	0.65%	0.65%
2022	0.7%	0.65%
2023	0.7%	0.65%
Cumulative 10-year EE Goal	**4.8%**	**2.85%**

Executive Summary

As required by state law, the City must update its ten-year energy efficiency (EE) goals every three years. Since the last updates, there have been dramatic increases in the requirements for energy efficiency through upcoming changes to appliance codes and building standards. However, the potential savings that will be achieved through the increased standards and code requirements cannot be included in the EE achievements from Utilities programs.

The proposed ten-year electric EE program goal is to save a cumulative 4.8% of the City's projected electric usage between 2014 and 2023. If staff's recommendation is approved, the City's cumulative electric savings since 2006, as a result of both EE program achievements and changes to appliance codes and building standards, will be 8%, based on load projections, by the year 2023.

For gas, the proposed cumulative ten-year EE program goal is to save 2.85% of the City's projected gas usage by between 2014 and 2023. If staff's recommendation is approved, the City's cumulative gas savings since 2006, as a result of both EE program achievements and changes to appliance codes and building standards, will be 4.8%, based on load projections, by the year 2023.

These proposed EE goals will update both the ten-year Electric EE goals and the ten-year Gas EE goals approved by the City Council in May 2010 and April 2011, respectively.

Background

City Council adopted the first ten-year electric and gas EE goals in 2007, which were to reduce the City's electric and gas usage by 3.5% by 2017. These goals met the state legislative requirements established by AB 2021 (2006) requiring publicly owned electric utilities to adopt ten-year electricity efficiency savings goals by June 1, 2007 and every three years thereafter. Furthermore, City Council recognized the importance of EE as a low cost solution to reducing greenhouse gas (GHG) emissions. The City's 2007 Climate Protection Plan relies on electric and gas EE to meet the City's GHG emission reduction targets by 2020. These EE goals were used for the City of Palo Alto Utilities' (CPAU's) resource planning as well as for EE program budget planning.

In May 2010, City Council adopted an updated ten-year EE goal to reduce electric usage by 7.2% by 2020 (CMR:218:10). The gas efficiency goals were updated in April 2011 to reduce gas usage by 5.2% by 2020 (Staff Report #1532). To meet these aggressive goals, CPAU contracted with third-party vendors to provide energy efficiency services to both residential and non-residential

customers. The result, beginning July 2011, was an expansion of CPAU's EE program offerings that target various customer segments and end-use technologies. Table 1 provides a summary of the EE goals and achievements since Fiscal Year (FY) 2008. The table shows that actual program achievements have exceed goals for most years.

Table 1: Electric and Gas Efficiency Achievements for FY 2008-2011

	FY 2008 (Actuals)	FY 2009 (Actuals)	FY 2010 (Actuals)	FY 2011 (Actuals)
Electric Efficiency – Goals				
Annual electric savings (MWh)	*2,500*	*2,800*	*3,500*	*5,799*
Percent of Annual load	*0.25%*	*0.28%*	*0.31%*	*0.60%**
Electric Efficiency – Achievements				
Annual electric savings (MWh)	4,399	4,668	5,269	5,457
Percent of Annual load	0.44%	0.47%	0.55%	0.58% (adj.)
Gas Efficiency – Goals				
Annual gas savings (therms)	*76,800*	*86,400*	*99,200*	*122,743*
Percent of Annual load	*0.25%*	*0.28%*	*0.32%*	*0.40%**
Gas Efficiency – Achievements				
Annual gas savings (therms)	35,238	88,028	106,479	169,198
Percent of Annual load	0.11%	0.28%	0.39%	0.55%[+]

*The FY 2011 efficiency goals were based on the 2010/2011 EE goals update.

[+] Half of these savings came from the (OPOWER) Home Energy Reports.

To meet the legislative requirement, the ten-year Electric EE Goals need to be updated by June 2013. However, the ten-year EE goals update process is planned to be completed by December 2012 so that the results can be incorporated into the plan to develop a carbon-neutral electric supply by 2015, since EE will be a priority resource in this portfolio.

Discussion

Overview of the Energy Efficiency Potential Model

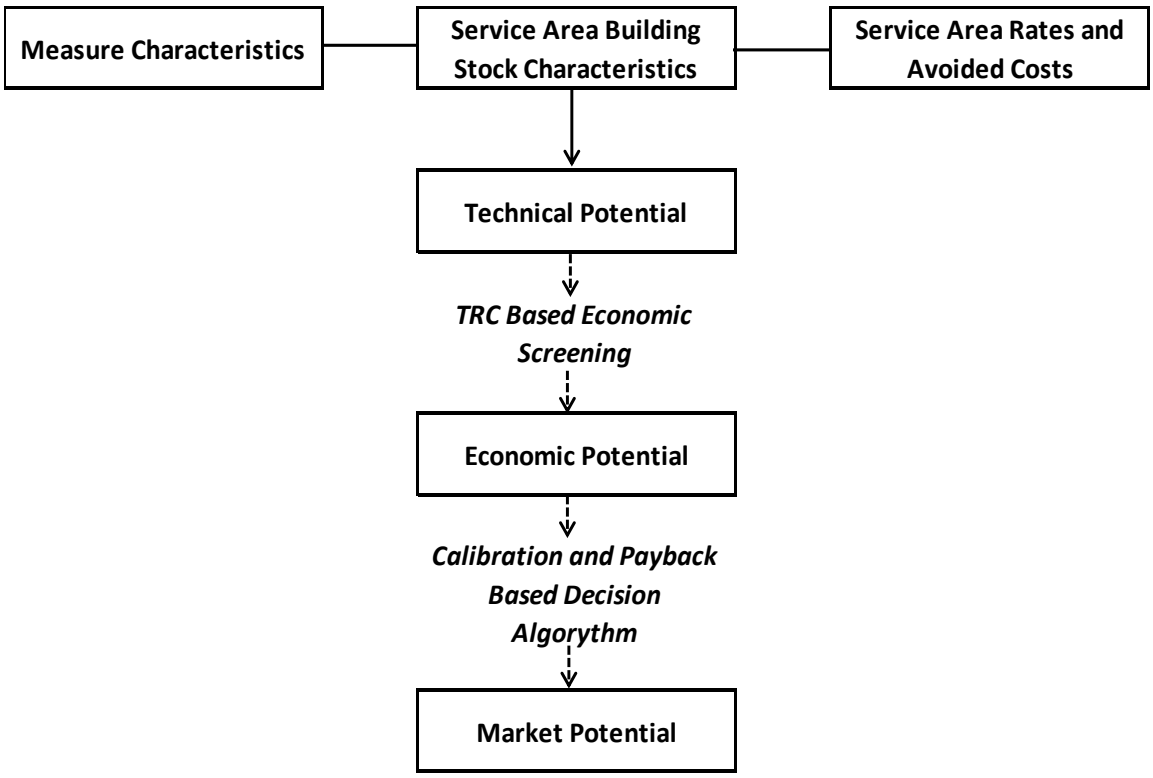
The first step in establishing EE goals is to determine what the potential is for energy savings in the City. This step was completed using an EE potential model developed by Navigant Consulting. The 2012 EE potential model is similar to the one used by publicly owned utilities

statewide in 2010 and was most recently used by the California Public Utilities Commission to determine the EE potential for investor-owned utilities. The model estimates the technical, economic and market potential for energy efficiency measures for residential and non-residential customers, defined as follows:

- **Technical potential** is the energy savings that would result from installation of the most energy efficient measures that are commercially available.
- **Economic potential** includes only savings from the installation of cost-effective EE measures.
- **Market potential** is a subset of the economic potential; it reflects the reality of customers' awareness and willingness to adopt energy efficient equipment.

The model establishes 2006 as the base year and takes into account past EE program achievements as well as user-specified input such as projected avoided energy costs and retail rates of electricity and natural gas, discount rate, building stock and assumptions regarding appliance and equipment among residential customers (e.g. room air-conditioner, electric/gas clothes dryer or others). Efficiency measures included in the analysis cover over 50 residential electric measures (including the Home Energy Report), 200 non-residential electric measures, 20 residential gas measures and 50 non-residential gas measures. For each year starting in 2006, the model steps through the calculation of the technical potential, then filters out the uneconomic measures to determine the economic potential, and, finally, identifies the market potential by applying a diffusion curve function for customer adoption of EE measures. The calculated market potential forms the basis of the proposed EE goals for 2014 to 2023. Figure 1 illustrates the model calculation steps.

Figure 1: EE Potential Model Schematic



Note: TRC stands for Total Resource Costs. See Appendix B for explanation of different costs-effectiveness tests for EE programs.

A key enhancement to the 2012 EE potential model is the explicit accounting of savings attributed to appliance codes and building standards (Codes and Standards) upgrades, beginning in 2014. Upgrades to Codes and Standards prior to 2014 are also accounted for in the technical potential, but are not shown in the model results. Changes to federal standards[1] for room air-conditioners, dishwashers, clothes washers and water heaters take effect between 2013 and 2015. For California, AB 1109 (2007) has a phased-in schedule for lighting through a minimum efficiency improvement of 50% and 25% for indoor residential application and commercial facilities respectively by 2018. Energy savings attributed to Codes and Standards are excluded from the energy efficiency potential for CPAU.

The 2012 EE potential model captures the impacts of residential behavioral programs. Behavior-based energy efficiency programs, such as OPOWER's Home Energy Reports, deliver

[1] The Energy Independence and Security Act of 2007 set mandatory efficiency standards for appliances and lighting.

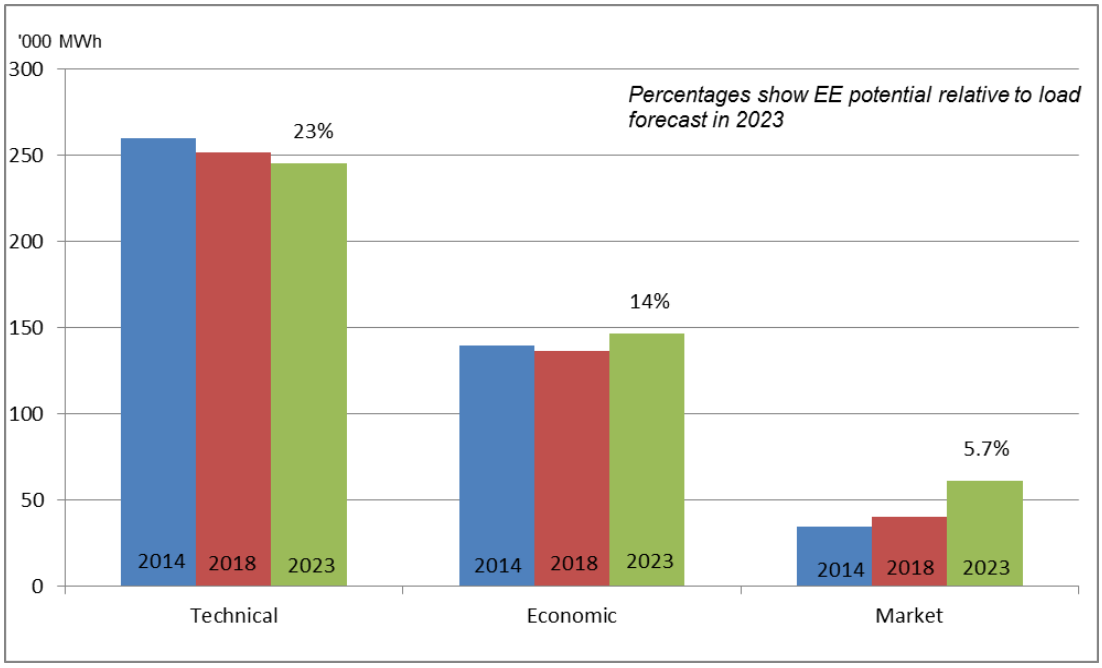
energy savings by motivating customers to operate their energy-using devices more efficiently. Examples include running only full loads of dishes and laundry, reducing pool pump run times and changing programmable thermostat set-points.

Many emerging EE technologies have also been added to the 2012 EE potential model. Examples include LED lighting technologies, ozone laundry systems, key card control for hotel rooms and high performance rooftop cooling units. The model assumes declining costs for emerging technology measures over the ten-year forecast period (e.g. for LED, measure cost declines by 50% over an eight-year timeframe), as well as lowers the cost-effectiveness screening criterion for emerging technology measures.

Summary of Electric Efficiency Potential Results

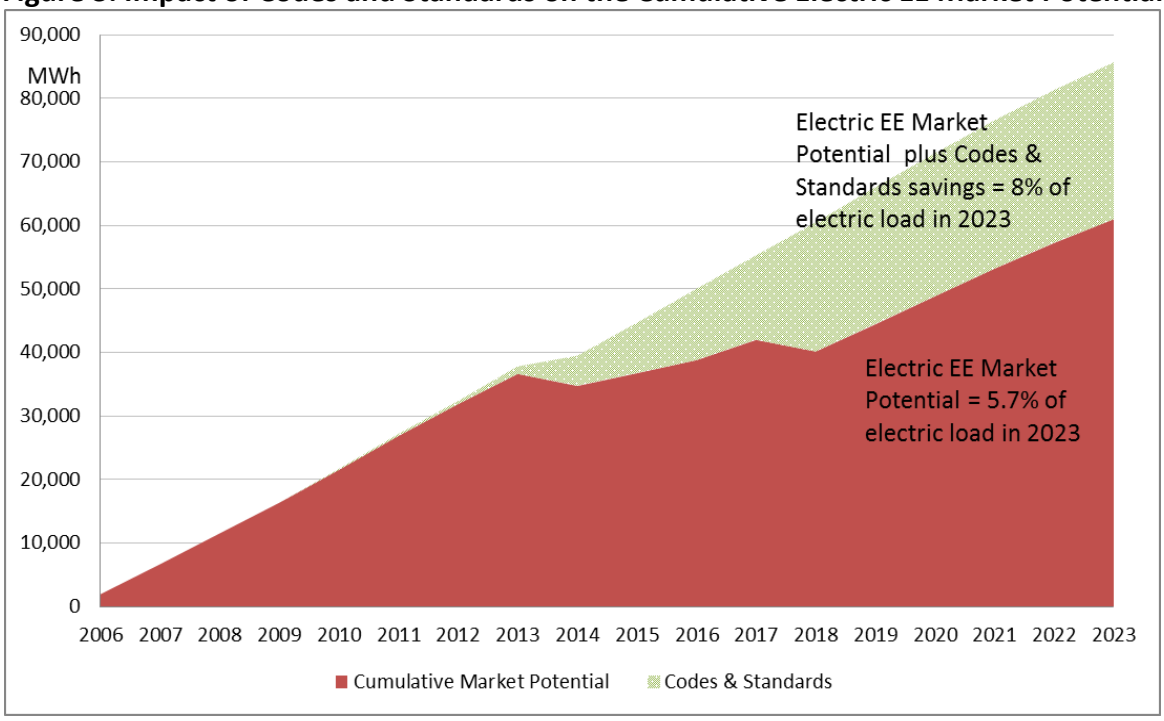
Using projections of renewable electric supply costs as of May 2012 and the assumption that 50% of the incremental cost of EE measures are covered by utility incentives, the technical, economic and market potential in 2014, 2018 and 2023 are shown in Figure 2. The technical potential declines over time due to the increasingly stringent Codes and Standards. The economic potential, on the other hand, rebounds in 2023 as more EE measures become cost-effective. Market potential also increases over time as emerging technology measures become more affordable and customers' attitudes toward these emerging technologies change and become more positive. The base case assumptions for the electric efficiency potential analysis are provided in Appendix D.

Figure 2: Electric Efficiency Potential Savings



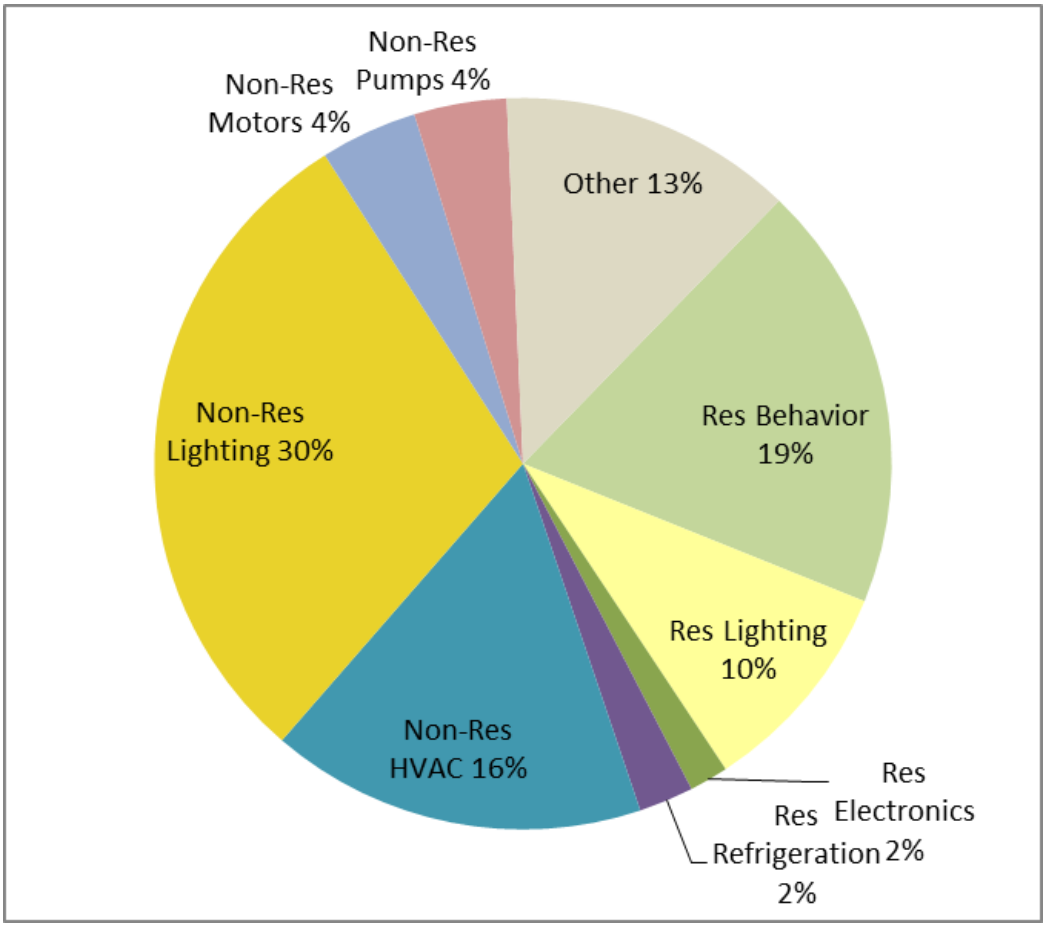
The cumulative market potential represents 5.7% of the electric load in 2023. This is lower than the 7.2% market potential from the 2010 EE potential study. The 2010 study, however, did not account for the impact of Codes and Standards. In the absence of Codes and Standards, the market potential would have been 8% of the electric load, as illustrated in Figure 3 below.

Figure 3: Impact of Codes and Standards on the Cumulative Electric EE Market Potential



As shown in Figure 4, savings from residential customers make up 37% of the incremental electric EE market potential in 2014 while 63% of the savings are from non-residential customers. Of the residential savings, more than half comes from behavioral programs, such as the Home Energy Reports. Savings from lighting make up another 40% of the incremental market potential in 2014. However, with the big shift in lighting efficiency standards beginning in 2018, lighting end-uses make up only 10% of the incremental market potential by 2023. A list of the top twenty electric efficiency measures in 2014 is provided in Appendix E.

Figure 4: Composition of Electric Market Potential in 2014



Proposed Electric Efficiency Goals

Staff proposes new annual electric EE targets at 0.6% of forecast electric load beginning in FY 2014, increasing to 0.65% in FY 2020 and 0.7% in FY 2022. These proposed goals may appear less aggressive than the annual electric EE targets adopted in 2010 (see Figure 5). However, when the energy savings that occur due to Codes and Standards are taken into account, the total EE savings are similar to the 2010 EE targets. Figure 6 below shows the historic EE savings, existing EE goals for FY 2012 and FY 2013 and the proposed 2014 to 2023 EE goals.

Figure 5: Comparison of 2010 Electric EE goals and Proposed Electric EE Goals

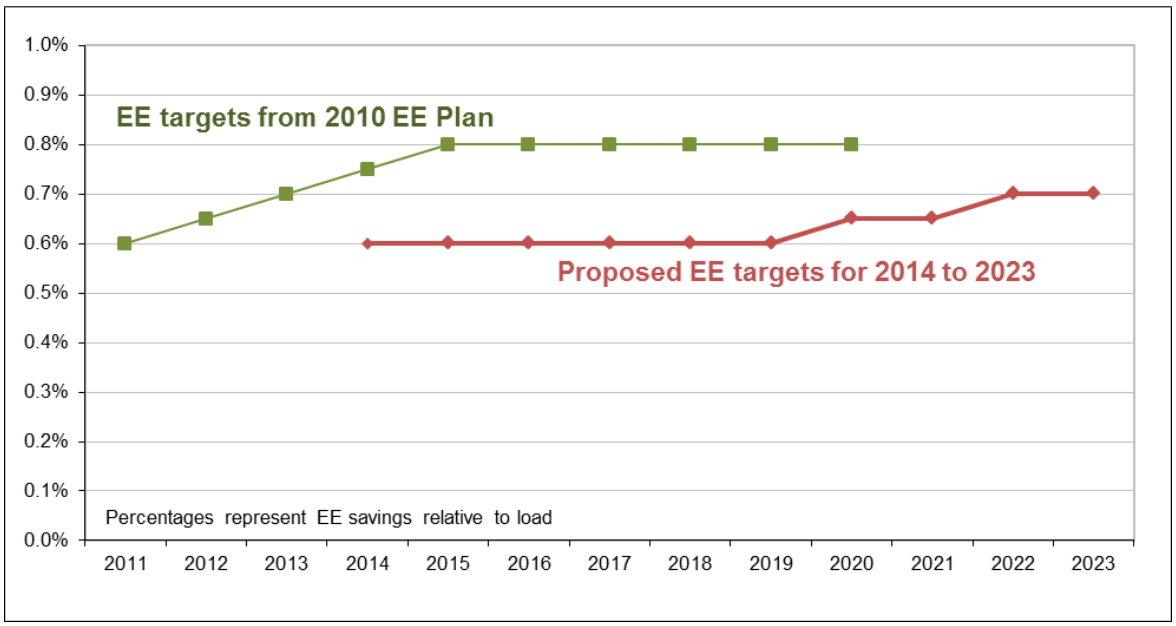
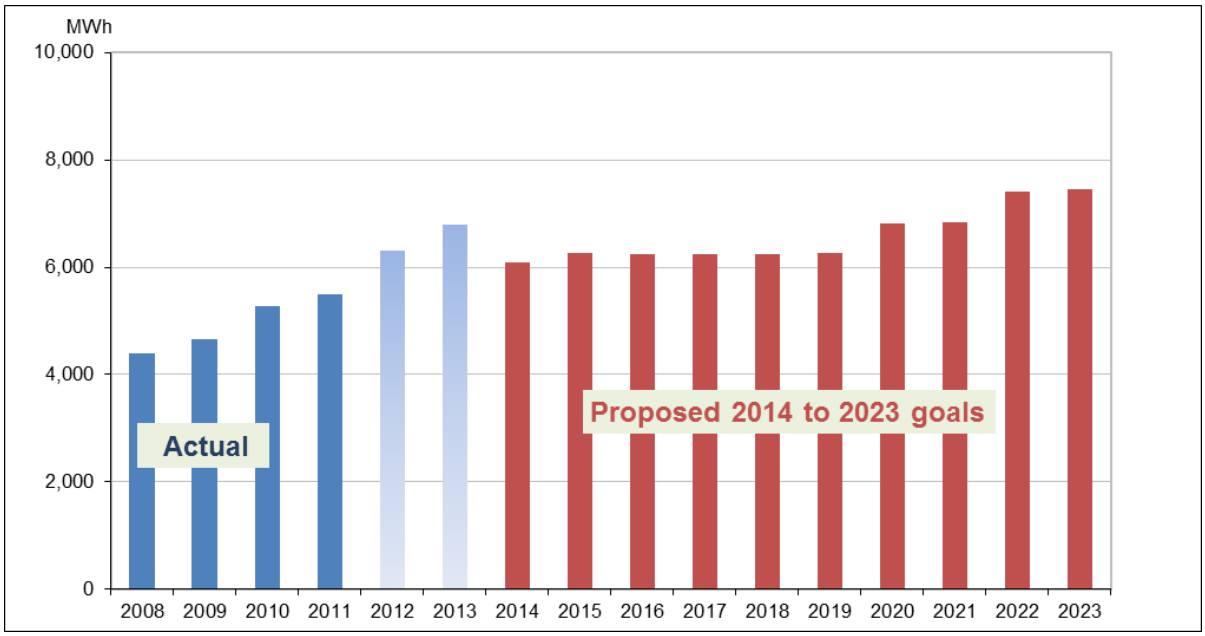


Figure 6: Historic EE Savings and Proposed Annual Electric EE Goals

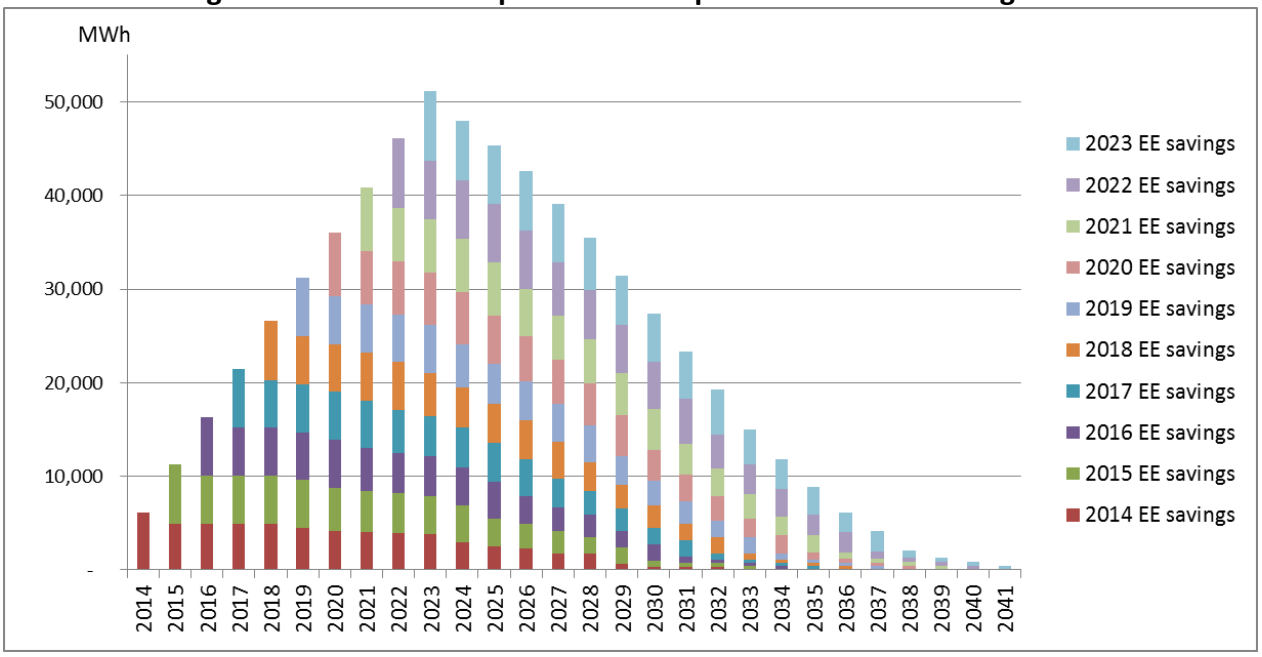


The annual electric EE savings in the forecast period are similar to the make-up of the market potential as illustrated in Figure 4. It is important to note that some EE savings have a longer-lasting effect than others, as different EE measures have different useful lifetimes. For example, EE impacts from residential behavior programs are conservatively estimated to last only one year, as there have been few, if any, evaluation studies focusing on the persistence of

behavioral programs. Measure life for Light Emitting Diode (LED) bulbs can be up to 12 years, whereas for Compact Fluorescent Light (CFL) bulbs, it may only be 5 years. On the other hand, high efficiency chillers for large businesses are expected to last 20 years. Due to the differences in lifetime that savings can be counted, the cumulative EE impact over the ten-year period is not equal to the sum of the annual EE goals for the 10 years.

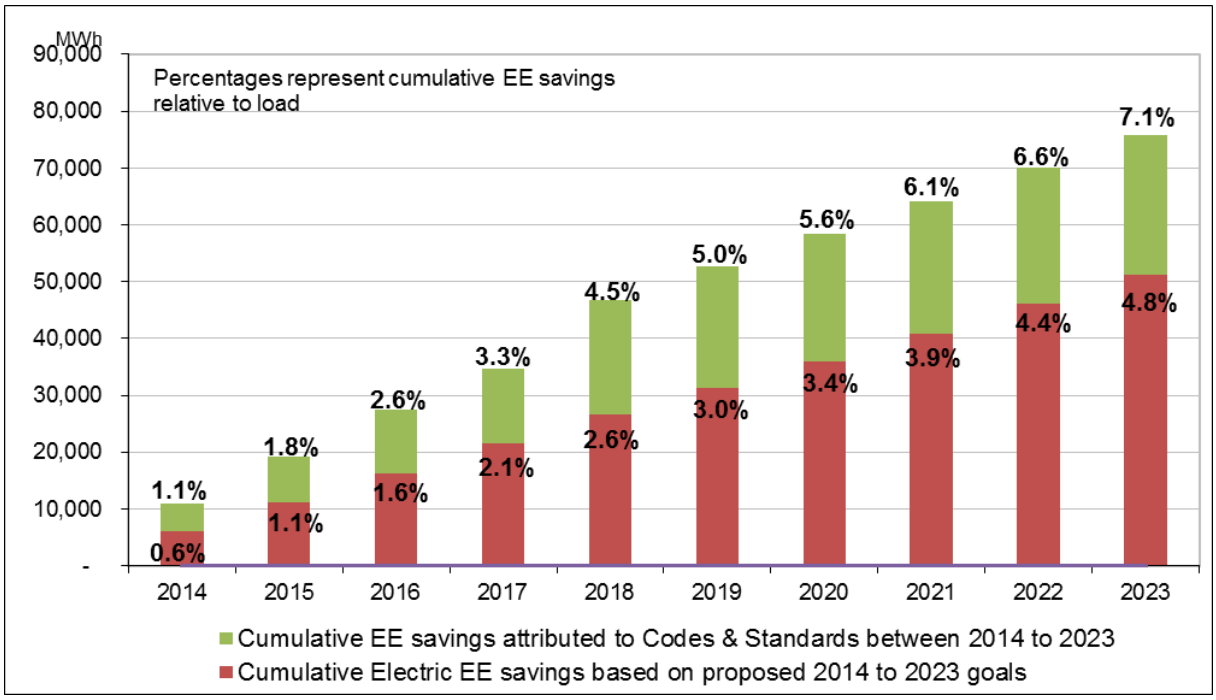
To estimate the cumulative ten-year EE impact, staff took into account the degradation of EE savings over time. This is illustrated in Figure 7 below. Only 67% of the EE impact from programs implemented in 2014 persists in 2015, and by 2033, there are no savings remaining from the 2014 EE programs. The impact from EE programs implemented in 2023 will extend until 2041.

Figure 7: Cumulative impact of the Proposed 2014 to 2023 EE goals



On a cumulative basis, the total EE savings from the proposed 2014 to 2023 targets represent 4.8% of the forecast electric load in 2023. If the EE savings from Codes and Standards are included, the cumulative EE savings in 2023 is 7.1%. The annual and cumulative impact of the annual targets for the ten-year period is shown in Figure 8.

Figure 8: Proposed 2014-2023 Cumulative Electric EE Goals

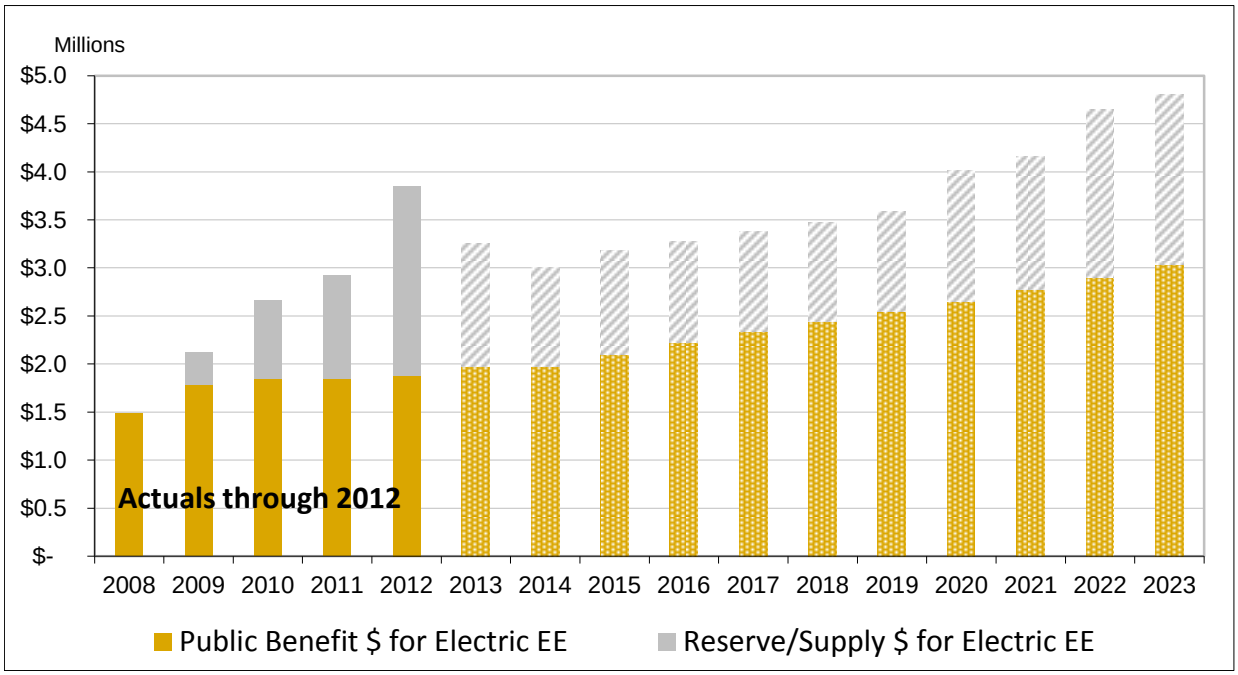


Projected Electric EE Program Costs

Electric EE program expenditures have been steadily increasing in the past few years. Funding for EE programs comes from two sources: a mandated Public Benefit surcharge for all electric customers and supply resource funds. Prior to 2009, annual EE program expenditures were less than the available Public Benefit funds and leftover EE funds have been tracked in a reserve account. Since 2009, annual EE targets have been steadily growing, and program EE expenditures have also been increasing. Funds in the EE reserve have been drawn to supplement Public Benefit funds in the past four years and are almost exhausted.

To meet the proposed electric EE goals, staff estimates that the annual EE budget will grow from around $3 million in FY 2014 to almost $5 million in FY 2023. Public Benefit funds for EE programs, which are based on a fixed percentage of electric revenue, are expected to be around $2 million in FY 2014. Supply funds will be used to supplement Public Benefit funds. The use of Electric Supply Reserve funds to supplement EE programs is in line with the Council-adopted Long-Term Electric Acquisition Plan as well as state law, which designates energy efficiency as the highest priority electric resource. Figure 9 shows the actual electric EE program expenditures for FY 2008 through FY 2012 and the estimated annual program budget needed to achieve the proposed EE targets.

Figure 9: Actual and Projected Electric EE Progam Expenditures



Retail Rate Impact of the Proposed Electric EE Goals and EE Budget

EE programs impact retail rates in two ways. First, the use of supply funds to support EE programs increases the revenue requirements for the electric utility. Second, lower electric load means that fixed costs (capital and operating costs to run the electric utility) must be distributed over a lower electric sales volume, thereby increasing the average electric retail rate.

Based on the proposed 2014 to 2023 electric EE goals and estimated annual budget, the retail electric rate in FY 2023 under the proposed ten-year goals is estimated to be 5% to 6% higher compared to a scenario with no EE programs (including those funded by Public Benefit funds). The retail rate impact from the additional supply funds to supplement the Public Benefit funds is around 2% by 2023. Customers who participate in electric EE programs will have lower electric bills due to reduced energy use; those who do not increase their equipment efficiency will have higher electric bills.

Results of Alternative Electric EE Scenarios

Staff examined several alternative scenarios using different portfolio strategies and electric avoided costs to test the sensitivity of the assumptions. The assumptions used in developing the base case scenario can be found in Appendix D.

1. **Increase incentives**: If customer incentives for electric EE projects are increased by 50%, the ten-year cumulative savings could increase by about 10%, from 4.8% to 5.2%. However, the annual EE program budget would increase by 25%, with an additional 1% rate increase. Given the small gain in EE savings and the disproportionately large increase in budget, staff feels that it is imprudent to increase the customer incentive level.

2. **Only select cost-effective EE measures:** In the base case, a screening criterion for individual EE measures is set at a minimum benefit-cost ratio of 0.75 (i.e. not all EE measures are cost-effective). While some measures such as residential wall and ceiling insulation, commercial kitchen equipment, assistance for low-income customers and emerging technology measures are not cost-effective, other measures, including LED recessed fixtures, are highly cost-effective. The overall EE portfolio remains cost-effective. If the screening criterion for non-low income EE measures is restricted to a minimum benefit-cost ratio of 1.0, the ten-year cumulative savings would decrease by 12%, from 4.8% to 4.2%. Staff recommends a portfolio-based cost effectiveness screening in order to capture additional EE savings.

3. **Suspend residential rebate programs:** As appliance standards and lighting standards continue to increase between 2013 and 2018, some policy makers have questioned the

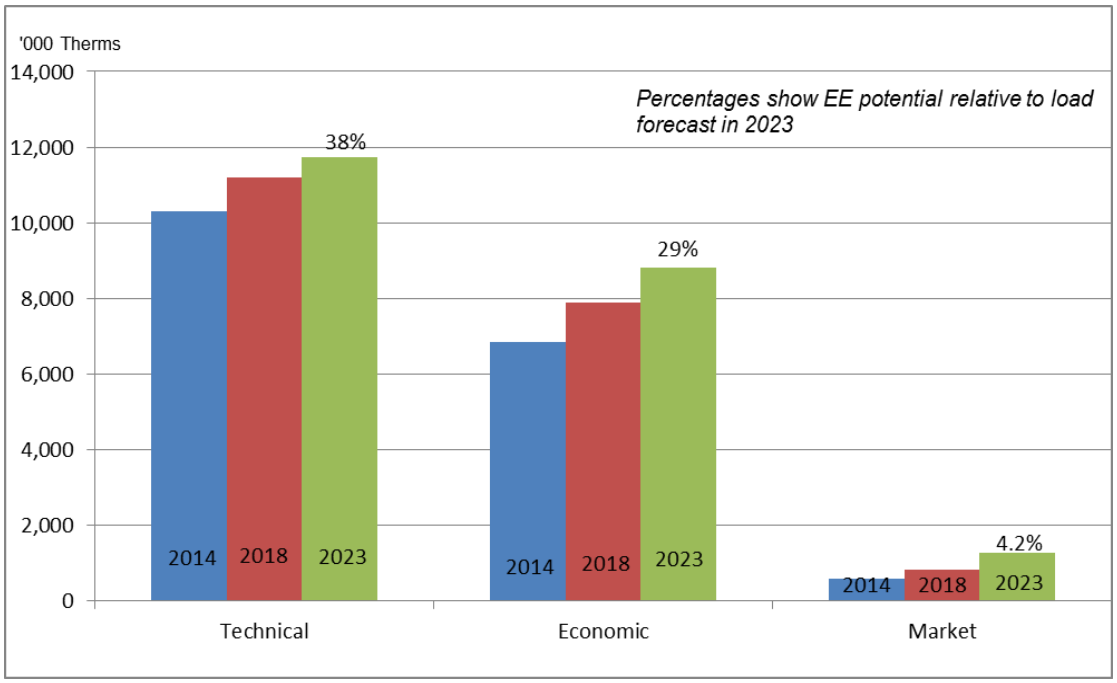
merits of continuing residential rebate programs as more and more program participants may be free-riders (i.e. they would have undertaken the efficiency improvement anyway without the rebate). Under a scenario where residential rebates are suspended beginning 2018, the ten-year cumulative savings would drop from 4.8% to 3.7%.

4. **Higher avoided cost:** Since the 2010 Electric EE potential study, the price of renewable energy for the planning period from 2014 to 2020 has declined by an average of 25%. Under a high energy cost scenario, with the avoided electricity cost assumed to be 30% higher than the base case projections, the ten-year cumulative savings could increase from 4.8% to 8.2%. If the Codes and Standards savings are included in this high-price scenario, the ten-year cumulative savings could reach 10%. Close examination of model results show that there are a number of commercial measures that marginally fail the cost-effectiveness screen in 2014 under the base case avoided costs. Higher avoided costs allow these measures to pass the cost effectiveness screen. Appendix F lists the Top 20 electric efficiency measures in 2014 under the high avoided cost scenario. Note that four out of the top five measures in this list are missing in the base case Top 20 list (Appendix E.)

Summary of Gas Efficiency Potential Results

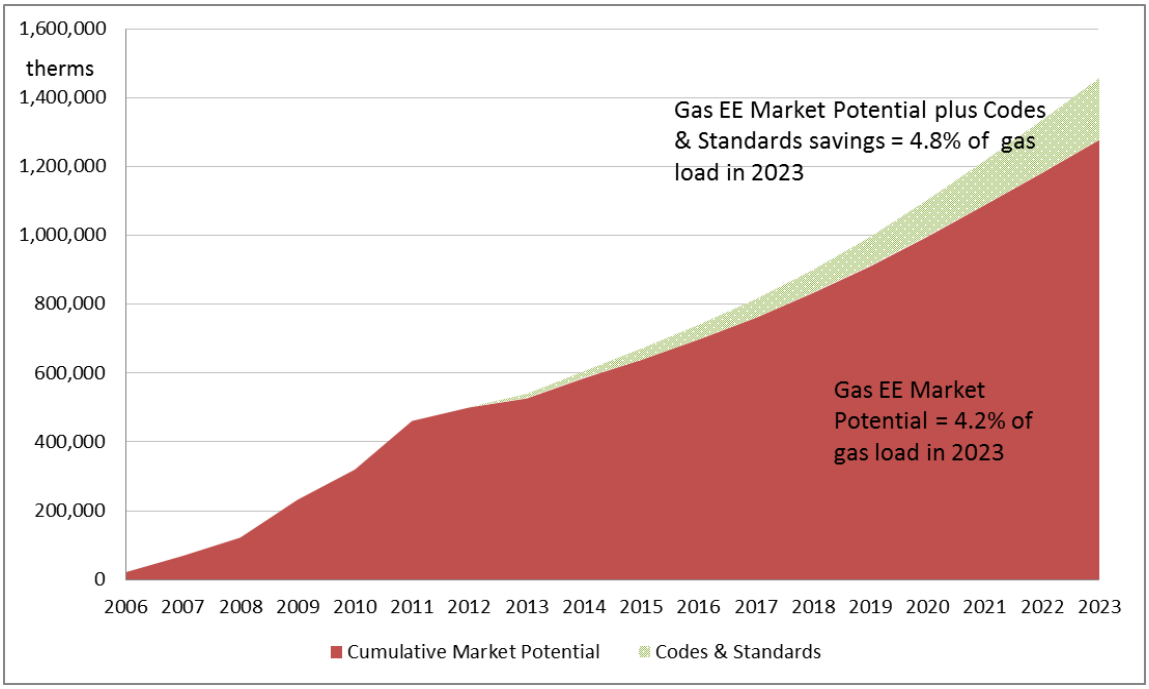
For modeling the gas EE potential, the base case assumes market projections of gas costs as of end of April 2012 and that 50% of the incremental cost of efficiency measures are covered by utility incentives. The technical, economic and market potential in 2014, 2018 and 2023 are shown in Figure 10. Gas market potential represents only 4.2% of the forecast load in 2023. This is due to the fact that gas EE measures such as insulating building envelopes and retrofitting boilers and furnaces are more expensive and have a longer payback than electric EE measures. Customers are more reluctant to make those investments.

Figure 10: Gas Efficiency Potential Savings



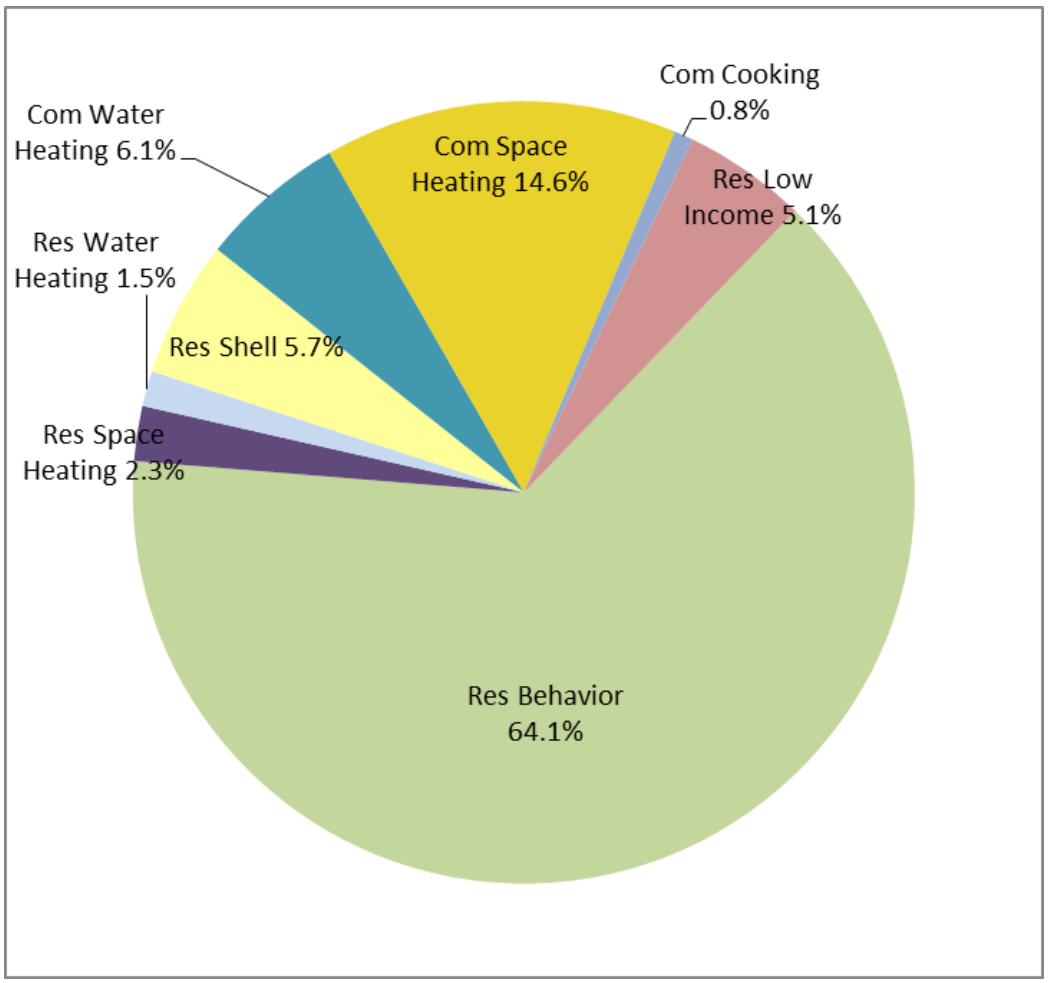
Similar to the electric side, the gas EE potential is also impacted by Codes and Standards. Figure 11 below shows that in the absence of Codes and Standards, the gas market potential in 2023 would have been 4.8% of the load instead of 4.2%.

Figure 11: Impact of Codes and Standards on the Cumulative Gas EE Market Potential



More than half the incremental market potential in 2014 is made up of residential behavioral savings, as shown in Figure 12. These behavioral activities, such as lowering the thermostat for space heating and doing laundry with cold water, are significant steps to achieving gas efficiency. Of the remaining gas market potential, approximately 40% is from residential retrofits such as attic/roof insulation, water heaters, space heating and clothes washers, while the remaining 60% is from commercial retrofits. Note the relatively small percentage of gas market potential attributed to residential water heating (1.5%). CPAU requires customer shows proof of permit and final inspection for water heater rebate. The fact that customers often bypass the permit process when replacing their water heaters limits the market potential of residential water heaters. A list of the top twenty gas efficiency measures in 2014 is provided in Appendix G.

Figure 12: Composition of Gas Market Potential in 2014



Proposed Gas Efficiency Goals

Staff proposes new annual gas EE targets of 0.5% of forecast gas load beginning in FY 2014, increasing to 0.55% in FY 2016, 0.6% in FY 2020 and 0.65% in FY 2022. Again, these proposed goals appear to be less aggressive than the EE targets adopted in 2011 (see Figure 13). However, when the energy savings included in Codes and Standards upgrades are taken into account, the total EE savings exceed the 2010 EE targets. Figure 14 below shows the historic gas EE savings, current gas EE goals for FY 2012 and FY 2013, and the proposed 2014 to 2023 annual gas EE targets.

Figure 13: Comparison of 2010 Gas EE goals and Proposed Gas EE Goals

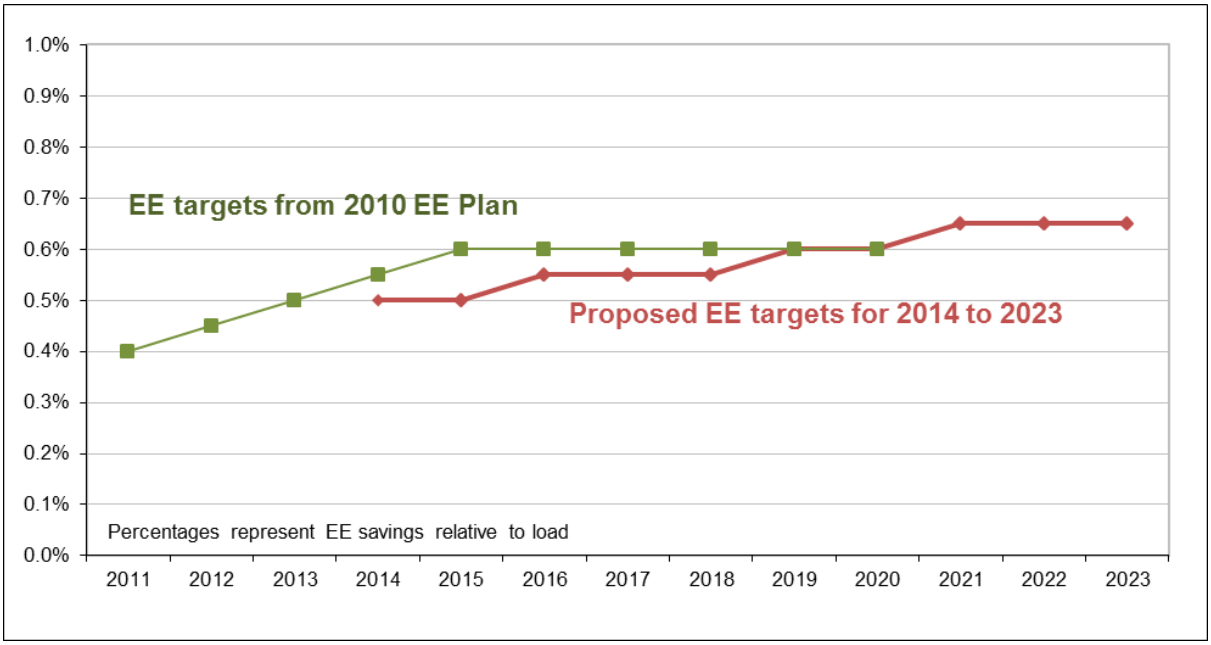
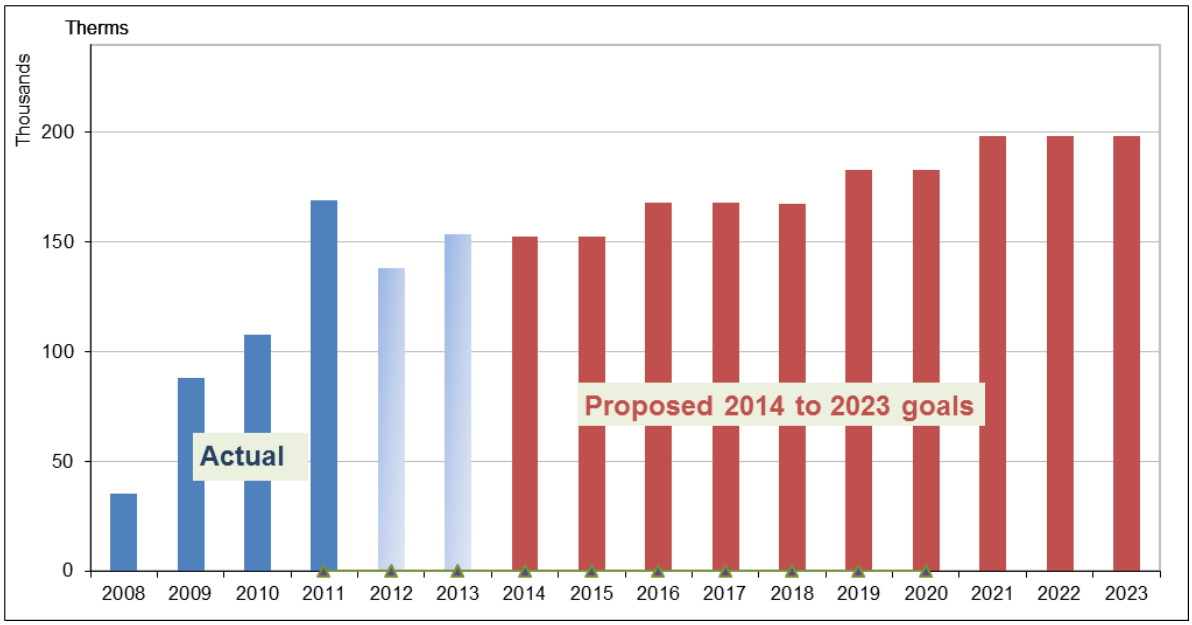


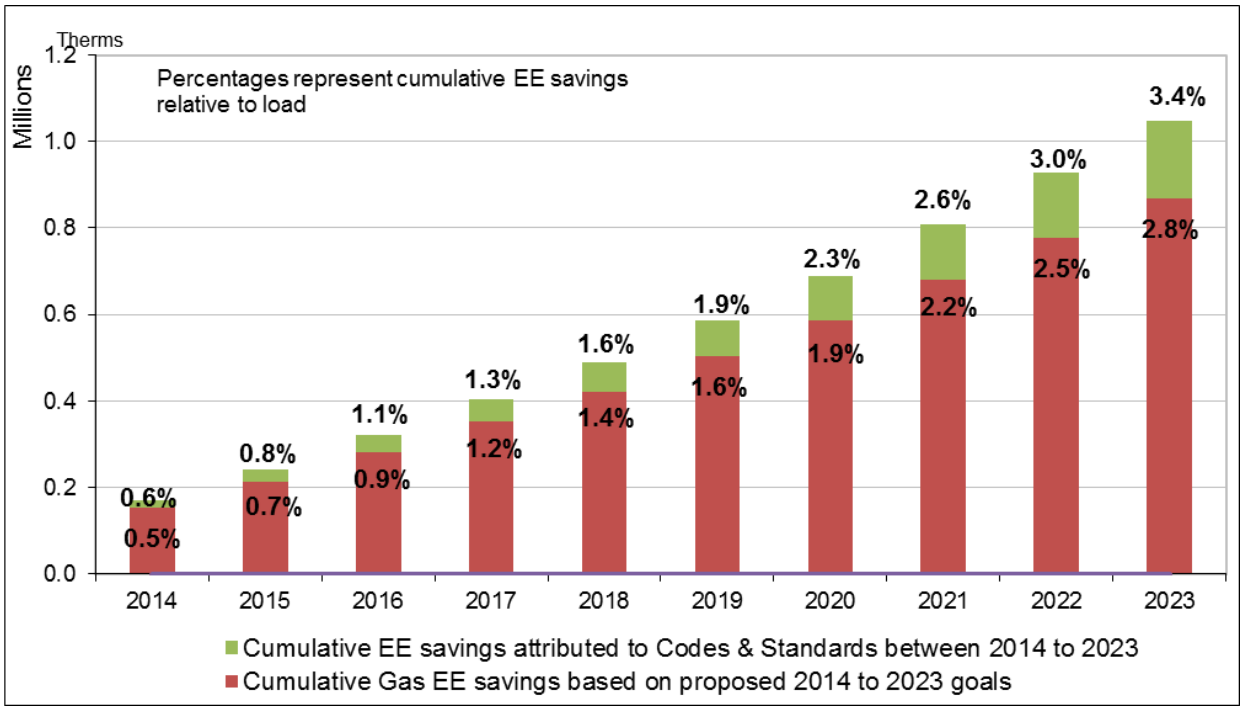
Figure 14: Historic EE Savings and Proposed Annual Gas EE Goals



On a cumulative basis, the total ten-year gas EE savings goal represents 2.8% of the gas load in 2023. If the gas EE savings from Codes and Standards are included, the cumulative EE savings in 2023 would be 3.4%. The annual savings do not add up to the cumulative savings since more than half the annual gas EE savings come from residential behavioral program(s) and these

savings are conservatively estimated to last only one year. The remaining gas savings also degrade over time as equipment burns out, similar to electric EE saving.

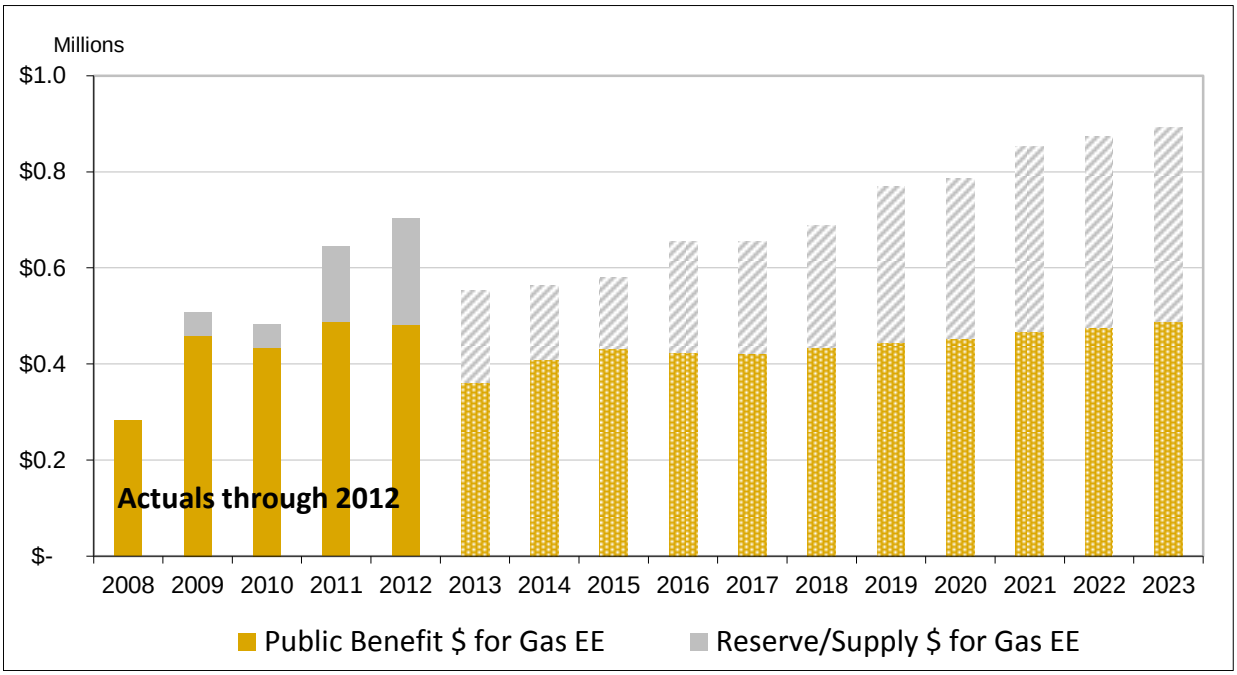
Figure 15: Proposed 2014 to 2023 Cumulative Gas EE Goals



Projected Gas EE program Costs

During the past several years, the City has spent an average of 1% of the natural gas utility's revenues as Public Benefit funding for gas efficiency programs, with additional funding for the solar water heating program coming from the natural gas supply budget. Gas EE funding in FY 2011 and FY 2012 was increased due to the addition of the Home Energy Report program. With the restructuring of the gas retail rate for residential and small to medium-sized commercial customers beginning in FY 2013, the projected gas revenue in FY 2013 is approximately 25% less than in FY 2012. Therefore, the proportion of funding for the gas EE budget from supply funds increased beginning in FY 2013. This phenomenon is shown in Figure 16 below.

Figure 16: Actual and Projected Gas EE Progam Expenditures



To meet the proposed gas EE goals, staff estimates that the annual gas EE budget will grow from under $600,000 in 2014 to over $800,000 in 2023.

Retail Rate Impact of the Proposed Gas EE Goals and EE Budget

Based on the proposed ten-year gas EE goals and estimated annual budget, the retail gas rate in FY 2023 is estimated to be 4% higher compared to a scenario with no EE programs (including those funded by Public Benefit funds.) The retail rate impact from the additional supply funds to supplement the Public Benefit funds is between 1% and 2% by 2023.

Results of Alternative Gas EE Scenarios

Staff examined several scenarios to test how sensitive the gas EE potential is to changes in using different portfolio strategies and assumptions for gas avoided costs. These alternative scenarios are described below.

1. **Increase incentives**: If customer incentives for gas EE projects are increased by 50%, the ten-year cumulative savings could increase 15%, from 2.8% to 3.2% of the City's gas usage in 2023. The corresponding increase in annual EE program budget would also increase by 15% to 20%. As part of ongoing program management, staff will continue to monitor customers' adoption of gas efficiency measures and may increase the incentive level, as necessary.

2. **Only select cost-effective EE measures:** If the screening criterion for non-low income gas EE measures is restricted to a benefit-cost ratio of 1.0 (i.e. all gas EE measures must be cost-effective), the ten-year cumulative savings would decrease by 23%, from 2.8% to 2.2%. Under this scenario, measures that previously pass the minimum benefit-cost ratio of 0.75, such as ceiling/attic insulation and high efficiency gas water heaters, will not qualify for utility rebates. Staff recommends continuing a comprehensive customer rebate program while maintaining a gas EE portfolio that is cost-effective in its entirety, even if some of the individual measures are not cost-effective on their own.

3. **Higher avoided cost:** Similar to renewable energy prices, the price of natural gas for the planning period has declined by an average of 20% since the 2010 Gas EE potential study was completed. Under a high energy cost scenario, with the avoided gas cost assumed to be 25% higher than the base case projections, the ten-year cumulative savings could increase from 2.8% to 3.3%. If the Codes and Standards savings are included in this high-price scenario, the ten-year cumulative savings could reach 3.9%.

Commission Review and Recommendations

Staff presented the proposed ten-year electric and gas EE goals at the October 3, 2012 UAC meeting. Staff clarified that improvements to appliance codes and building standards at both the state and federal levels have reduced the amount of EE that can be counted from the City's programs.

A commissioner asked for an explanation of why the total electric EE savings is shown as 5.7% by 2023, but the proposed cumulative goal is 4.8%. Staff explained that the 5.7% savings is the total cumulative savings as a result of EE programs since 2008, and the 4.8% represents new EE savings to be captured between 2014 and 2023. After discussion, the UAC voted unanimously (6-0) to recommend Council approval of the proposed 2014 to 2023 electric and gas efficiency goals. The draft excerpted notes from the UAC's October 3, 2012 meeting are provided as Appendix I.

Resource Impact

Although this report contains preliminary estimates of the costs of achieving the proposed electric and gas EE goals, the detailed budget plan and staffing needs to meet the annual EE goals will be part of the annual City budgeting process. The Demand Side Management (DSM) budget is developed by Utilities staff and will be a part of the entire Utilities Department and City budget request. The annual budget will present the costs for both internally administered, as well as contractor supported, efficiency programs. At this time, any additional costs to deliver the program are expected to be for third party administration and not for additional internal staff.

Policy Implications

Approval of this recommendation conforms to the Council-approved Long-Term Electric Acquisition Plan and Gas Utility Long-term Plan Guidelines, which call for funding programs that maximize the deployment of cost-effective, reliable and feasible energy efficiency as the highest priority resource. The proposed electric and gas efficiency goals will also help achieve the Council-approved greenhouse gas emissions reduction targets by 2020.

Environmental Review

Approval of this recommendation does not meet the definition of a project, pursuant to section 21065 of the California Environmental Quality Act (CEQA). Thus, no environmental review is required.

Attachments:

- Appendix A: Overview of Current Energy Efficiency Portfolio (PDF)
- Appendix B: Cost-Effectiveness Tests for Energy Efficiency Programs (PDF)
- Appendix C: Electric and Gas Efficiency Potentials from the 2010 EE Potential Studies (PDF)
- Appendix D: Electric Efficiency Potential Base Case Assumptions (PDF)
- Appendix E: Top 20 Electric Efficiency Measures in 2014 under base case avoided costs (PDF)
- Appendix F: Top 20 Electric Efficiency Measures in 2014 under high avoided costs (PDF)
- Appendix G: Top 20 Gas Efficiency Measures in 2014 (PDF)
- Appendix H: Distribution of Residential Electric and Gas Consumption by End Use (PDF)
- Appendix I: Excerpt of Draft Minutes from October 3, 2012 UAC Meeting (PDF)

APPENDIX A: OVERVIEW OF CURRENT ENERGY EFFICIENCY PORTFOLIO

The DSM portfolio is delivered by a mixture of in-house and third party administrators. The third party contracts are mostly three-year contracts obtained through Requests for Proposals (RFPs). In the RFPs, staff typically requests a wide variety of programs, including new and innovative designs and approaches, to assist in meeting the EE goals approved by Council within the authorized budget. Staff reviews the proposals and recommends a variety of cost-effective programs for Council to approve. The overall goal is to deliver a wide-ranging, cost-effective portfolio to all customer groups in Palo Alto. Updating the programs in the portfolio every three years helps to keep programs fresh and focus on cost-effective, but new technologies while allowing customers and contractors the stability of knowing what programs will exist in the near term.

The City currently contracts with 23 third-party vendors for the administration and delivery of efficiency and conservation programs in electric, natural gas and water areas. The majority of these current contracts will end in June 2014, so an RFP will go out in early 2014 to replace, modify and continue to deliver the majority of the programs in the portfolio.

A few third party contracts have separate time schedules, and these programs follow a different schedule. The contract with OPower, for example, for the delivery of Home Energy Reports will end in June 2013. The contract with the California Center for Sustainable Energy for the administration of the Solar Water Heating program ends in December 2013. Staff plans to issue a Request for Proposal in Spring 2013 to continue to pursue the residential customer behavioral savings found in this potential study, as well as to continue to the solar water heating program.

APPENDIX B: COST-EFFECTIVENESS TESTS FOR ENERGY EFFICIENCY PROGRAMS

The primary aim of cost-effective energy efficiency programs is to reduce utility cost and hence customer bills while improving the environment. Cost-effectiveness can be measured in many ways. The four perspectives most commonly used in efficiency program cost-effectiveness testing are:

1. Participant: An energy efficiency measure that provides net savings to a customer is cost-effective for them as a "participant." If a customer's initial investment, after accounting for utility rebates and tax incentives, can be recouped with lower operating cost over the life of the measure, the measure is considered cost-effective from a participant's perspective.

2. Utility: A measure that lowers overall cost for the utility is cost-effective for the utility (also referred to as "Program Administrator"). For CPAU, this could also be considered the "all ratepayers test" or "average utility bill test," as it reflects the change in the utility bill to the average customer. To be cost-effective from the utility perspective, the cost of the program (administrative and rebate costs) must be less than the savings from not purchasing the energy supply.

3. Total Resource: If the combination of the utility and all customers together save money, it is cost-effective from a "Total Resource Cost (TRC)" or societal viewpoint. ***This is the cost-effectiveness criteria that is required by the CEC and is used in CPAU reporting***.

4. Non-Participant: Even if the bill for the average customer shrinks significantly, retail rates could increase slightly, so that customers who do not reduce consumption could see a slight increase in rates and therefore bills. This effect is due to the portion of retail revenue that must be collected to pay for fixed costs. For this reason it is important to design diverse programs to be widely available in order to facilitate efficiency implementation in as broad a manner as possible. The Non-Participant perspective is also called the Rate Impact perspective.

The Total Resource Cost reflects the financial perspective of the Palo Alto community as a whole. The Utility Cost, Participant and Rate Impact perspectives should also be considered to ensure lower average bills and sufficient incentives to achieve participation

The costs and benefits that are used to calculate the benefit-cost ratios for each of these different perspectives are illustrated below:

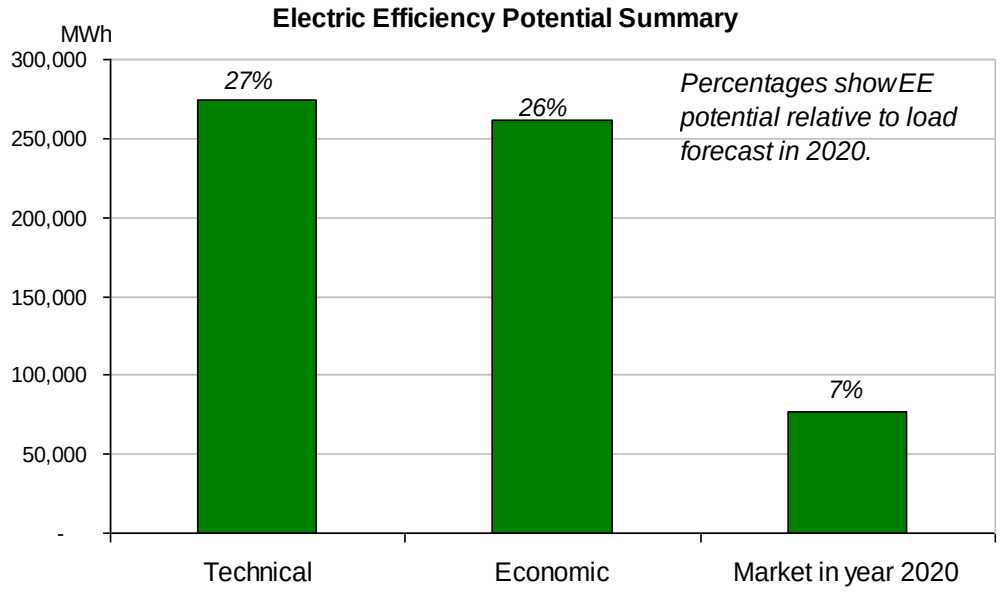
Table B1: Cost-Effectiveness Perspectives and Associated Costs and Benefits

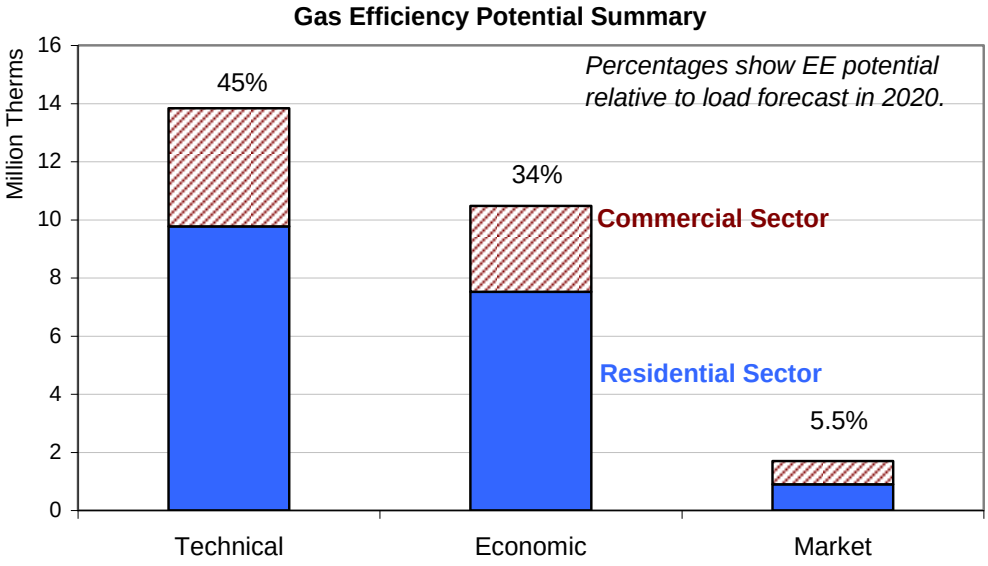
Cost Effectiveness Test	Costs	Benefits
Participant Cost Test (PCT) *Does the participant save money?*	Measure Cost	Incentive to customer Bill Savings Tax Savings
Utility Cost Test (UCT) – Average Bill *Are utility revenue requirements lowered?*	Incentive to customer Program Delivery Cost	Avoided Supply Costs
Total Resource Cost Test (TRC) Sum of Participant + Non-participant *Are total community expenditures lowered?*	Measure Cost Program Delivery Cost	Avoided Supply Costs Tax Savings
Rate Impact Measure (RIM) Also known as non-participant test *Are utility rates lowered?*	Incentives to customer Lost Revenues (=Bill Savings) Program Delivery Cost	Avoided Supply Costs

For the Gas EE potential analysis, the avoided gas supply cost includes a carbon adder based on the City's Climate Protection Plan ($20/tonne in 2007 increasing by 5% per year). The Electric EE potential analysis assumes the cost of renewable energy as the avoided supply cost.

APPENDIX C: ELECTRIC AND GAS EFFICIENCY POTENTIALS FROM THE 2010 EE POTENTIAL STUDIES

The 2010 EE potential study estimated the technical, economic and market potential for electric efficiency to be 27%, 26% and 7%, respectively, of the City's electric load in the year 2020. For gas efficiency potential, this was estimated to be 45%, 34% and 5.5% of the City's gas load in 2020. The EE targets adopted in 2010 (for electricity) and 2011 (for gas) were based on the estimated market potential for each measure. The 2010 EE potential study results are summarized in the figures below.





APPENDIX D: EFFICIENCY POTENTIAL BASE CASE ASSUMPTIONS

The following assumptions are used in the EE potential model for the base case scenario:

Utility Electric Avoided Costs	Avoided renewable supply costs, including avoided T&D losses and local capacity costs
Utility Natural Gas Avoided Costs	Forward gas price as of April 24, 2012, plus avoided local transportation costs and carbon cost in accordance with the City's Climate Protection Plan
Customer Incentives	50% of incremental costs of efficiency measures compared to standard measures
Total Resource Cost (TRC) screen value for individual EE measure	0.75 (a TRC value of 1.0 or higher is considered cost-effective)
TRC screen value for emerging tech measures	0.50
Measure-level savings and cost	Based on values in Database of Energy Efficiency Resources (DEER), which is maintained by the CPUC and is used for EE program planning and reporting by investor-owned utilities as well as publicly-owned utilities
Free-ridership	Free-riders are customers who would have purchased the energy efficient equipment without additional financial incentives and, therefore, the savings from these equipment purchases would have occurred without utility EE programs. Assumptions of free-ridership at the measure level are based on California statewide evaluation studies and are documented in Database of Energy Efficiency Results (DEER). Generally, mature, low-cost technologies tend to have higher free-ridership. The market potential, and, therefore, proposed EE goals, are net of free-ridership.

APPENDIX E: TOP 20 ELECTRIC EFFICIENCY MEASURES IN 2014 (Base Case Avoided Costs)

The following table lists the top twenty electric efficiency measures in 2014 under the base case assumptions. The combined energy savings from these 20 measures represents around 70% of the total market potential. Home Energy Report tops the list, followed by delamping of 4-foot linear fluorescents in commercial buildings. High performance rooftop units are air-conditioning systems for commercial buildings and are projected to deliver savings of up to 50% of the energy use by conventional rooftop AC units. Fault Detection & Diagnostics are software tools that utilize sensors and controller hardware to automatically detect and diagnose deviations between actual and optimal HVAC system performance. Energy Management Systems (EMS) provides monitoring and analytics to building managers to optimize energy performance.

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	Energy % of Total
1	SFE - Home Energy Report	1,118	20.6%
2	Com - Linear fluorescent delamping 4 ft	221	4.1%
3	Com - LED Exit sign	214	3.9%
4	Com - PS Exterior HID - Mercury Vapor Base	203	3.7%
5	Com - CFL Fixture Under 15W	188	3.5%
6	LI - Low Income	182	3.3%
7	Com - High bay fluorescent	180	3.3%
8	Com - High Performance Rooftop Unit	173	3.2%
9	Com - Fault Detection & Diagnostics	169	3.1%
10	Com - LED Lighting T8 - 4ft Equiv	155	2.9%
11	Ind - Occupancy_Sensor_4L4_Fluorescent_Fixtures	143	2.6%
12	Com - EMS	121	2.2%
13	SFE - Recycle refrigerator	102	1.9%
14	om - Comprehensive Commercial HVAC Rooftop Unit Quality Maintenanc	95	1.7%
15	Com - Linear fluorescent delamping 8 ft	94	1.7%
16	Com - Kitchen Vent Hoods	91	1.7%
17	SFE - HVAC Quality Maintenance	87	1.6%
18	Com - CFL Fixture 16 to 24W	80	1.5%
19	Ind - Pumps_Controls	70	1.3%
20	Ind - Pumps_System_Optimization	64	1.2%
	Top 20 Total	**3,748**	**69.1%**

APPENDIX F: TOP 20 ELECTRIC EFFICIENCY MEASURES IN 2014 (High Avoided Costs Scenario)

The following table lists the top twenty electric efficiency measures in 2014 under a 20% higher avoided costs scenario. There are four commercial measures in this list that previously do not pass the TRC screen. The combined energy savings in 2014 from the top 20 measures under the High Avoided Cost scenario is 40% higher than that in the base case.

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (MWh)	Energy % of Total
1	SFE - Home Energy Report	1,118	14.5%
2	Com - Combination Oven	754	9.8%
3	Com - Advanced Generation T8 - 4ft	750	9.7%
4	Ind - Retrofit T12 to Premium T8-4foot-2lamp	308	4.0%
5	Com - Lighting Controls - Timeclock	211	2.7%
6	Com - Linear fluorescent delamping 4 ft	198	2.6%
7	Com - LED Exit sign	194	2.5%
8	Com - PS Exterior HID - Mercury Vapor Base	185	2.4%
9	LI - Low Income	182	2.4%
10	Com - High Performance Rooftop Unit	173	2.2%
11	Com - CFL Fixture Under 15W	169	2.2%
12	Com - Fault Detection & Diagnostics	163	2.1%
13	Com - High bay fluorescent	162	2.1%
14	Com - LED Lighting T8 - 4ft Equiv	155	2.0%
15	Ind - Occupancy_Sensor_4L4_Fluorescent_Fixtures	128	1.7%
16	Com - EMS	117	1.5%
17	SFE - Recycle refrigerator	102	1.3%
18	om - Comprehensive Commercial HVAC Rooftop Unit Quality Maintenan	95	1.2%
19	Com - Kitchen Vent Hoods	91	1.2%
20	SFE - HVAC Quality Maintenance	87	1.1%
	Top 20 Total	**5,343**	**69.3%**

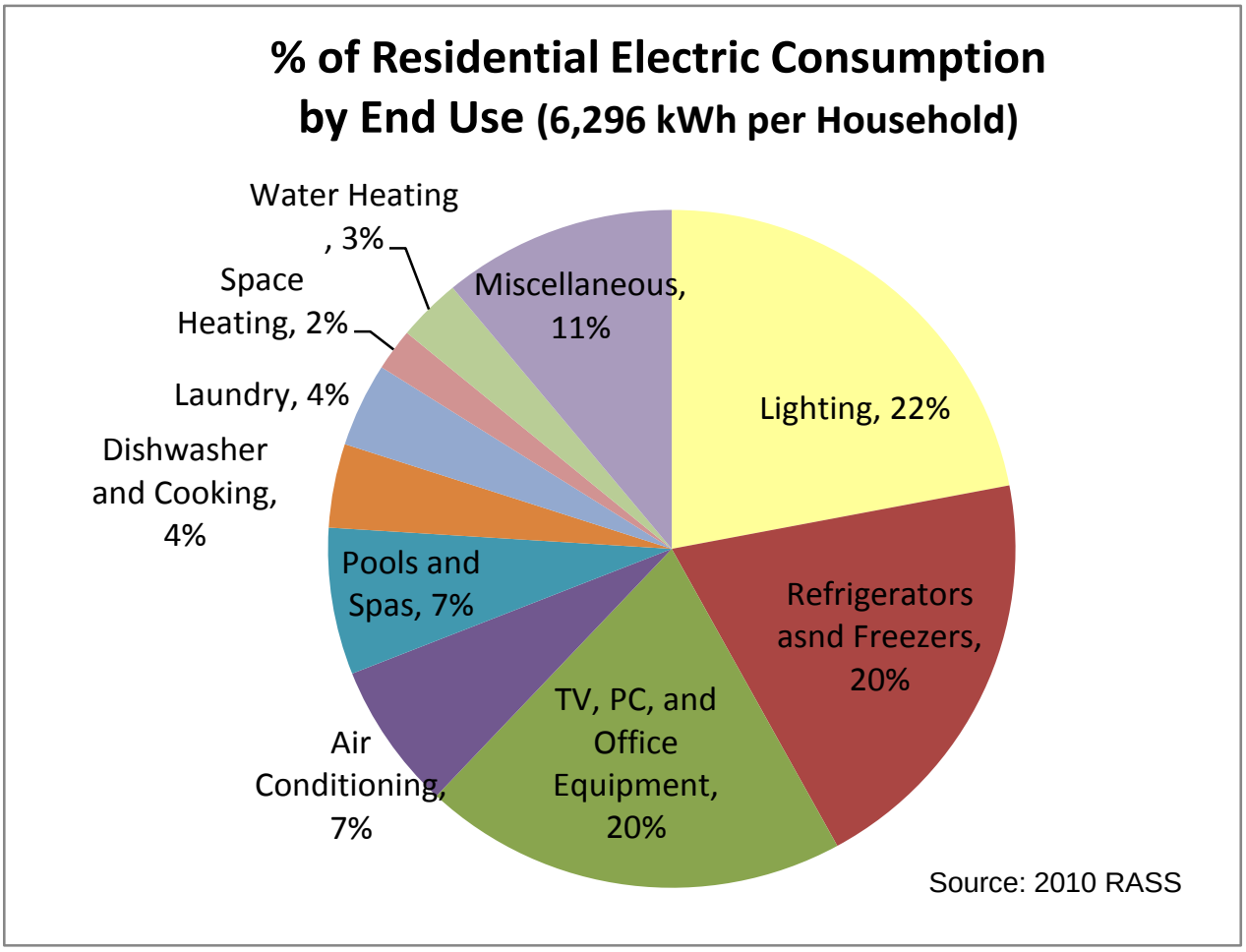
APPENDIX G: TOP 20 GAS EFFICIENCY MEASURES IN 2014 (Base Case Avoided Costs)

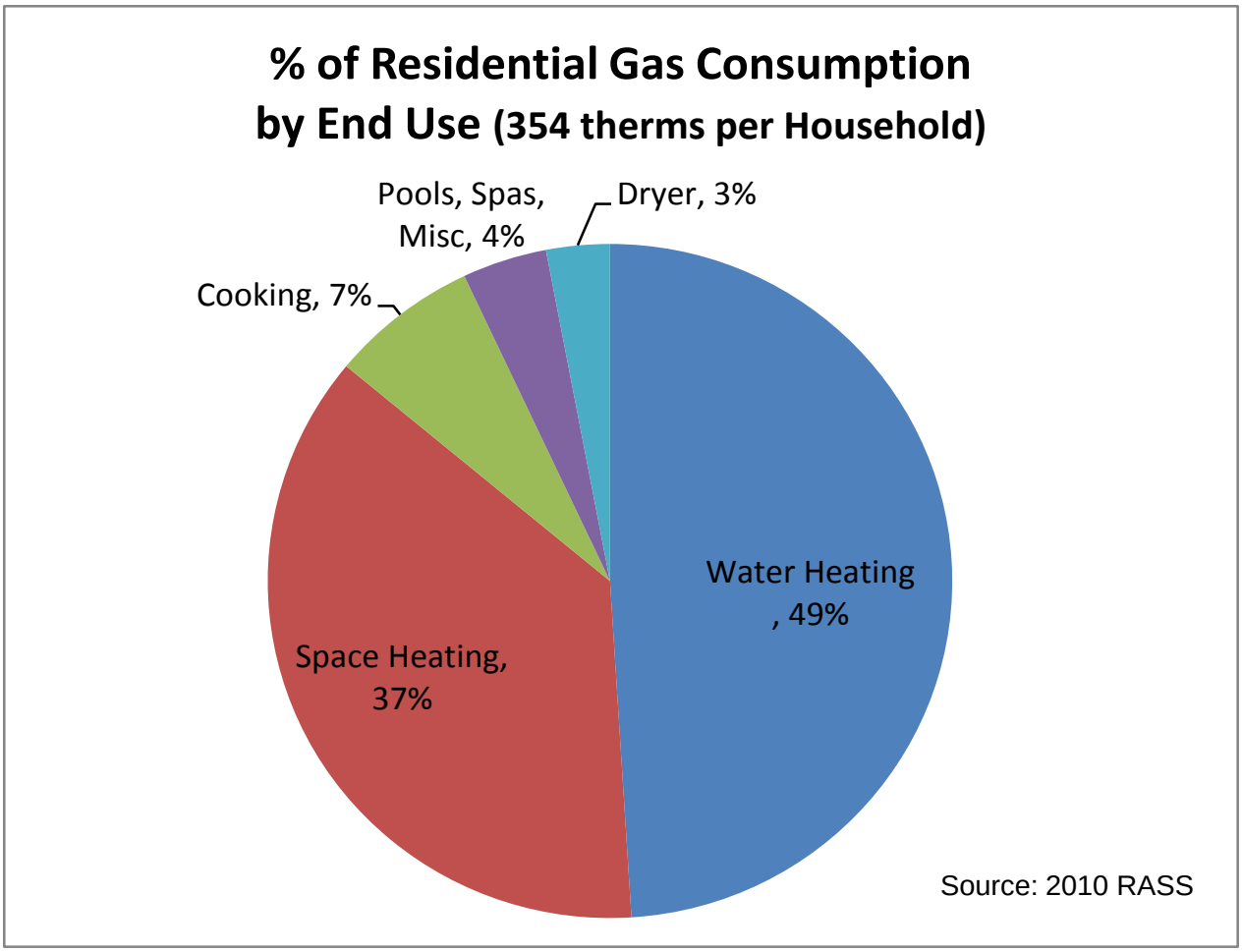
The following table lists the top twenty gas efficiency measures in 2014 under the base case assumptions. The combined energy savings from these 20 measures represents over 95% of the total market potential. The Home Energy Report tops the list, followed by residential low-income measures (this includes a combination of gas measures including shell insulation, weather-stripping, installation of programmable thermostat, etc.), ceiling and wall insulation for single family households, and Energy Management Systems (EMS) for commercial buildings. Home Energy Reports account for more than half of the gas market potential in 2014. The top 20 gas efficiency measures remain unchanged under the high avoided cost scenario.

Rank	Top Twenty Measures - 2014	2014 - Energy Savings (Therms)	Energy % of Total
1	SFE - Home Energy Report	93,328	63.3%
2	LI - Low Income	7,436	5.0%
3	SFE - Insulation - Ceiling R30, Wall R13	6,857	4.6%
4	Com - EMS	6,708	4.5%
5	Com - Automatic Steam Trap Monitoring	5,569	3.8%
6	Com - Space Heating Boiler 95% Efficient	5,097	3.5%
7	MFE - High Efficiency Space heating boiler	3,312	2.2%
8	Ind - Steam_trap_maintenance	2,357	1.6%
9	Com - Pipe and Tank Insulation	1,670	1.1%
10	Ind - EMS_install	1,499	1.0%
11	Com - Advanced Ozone Laundry Systems	1,479	1.0%
12	SFE - ES Clothes Washer - GW&ED	1,448	1.0%
13	Com - Retrocommissioning	1,411	1.0%
14	Com - HE Griddle	1,168	0.8%
15	Ind - Maintain_boilers	926	0.6%
16	Com - Space Heating Boiler 85% Efficient	817	0.6%
17	SFE - Duct sealing and insul	801	0.5%
18	Ind - Automatic_steam_trap_monitoring	644	0.4%
19	MFE - Insulation - Ceiling R30, Wall R13	566	0.4%
20	SFE - Low Flow Showerhead	527	0.4%
	Top 20 Total	**143,622**	97.38%

APPENDIX H: Distribution of Residential Electric and Gas Consumption by End Use

The following charts show the distribution of residential electric and gas consumption by end use based on the findings from the 2010 Residential Appliance Saturation Survey (RASS) administered by the California Energy Commission. Compared to the results of the 2003 RASS, average household electric consumption increased by 6%, whereas average household gas consumption decreased by 18%. The proportion of electric consumption from TV, PC and office equipment went up from 15% to 20%. The proportion of gas consumption from space heating went down from 44% to 37%.




% of Residential Gas Consumption
by End Use (354 therms per Household)
Pools, Spas, Misc, 4%
Dryer, 3%
Cooking, 7%
Water Heating , 49%
Space Heating, 37%
Source: 2010 RASS

ATTACHMENT I

DRAFT

UTILITIES ADVISORY COMMISSION MEETING MINUTES OF OCTOBER 3, 2012

EXCERPT

ITEM 2: ACTION: UAC Recommendation that Council Approve the Update on the City of Palo Alto's Ten-Year Energy Efficiency Goals (2014 to 2023)

Utility Marketing Services Manager Joyce Kinnear and Resource Planner Christine Tam provided a summary of the written report. Kinnear emphasized that the impact of improvements to building codes and appliance standards has reduced the amount of energy efficiency (EE) that can be counted from the City's programs. Tam explained that the model that was used to calculate the EE potential included the impacts of improvement to codes and standards and emerging technologies. EE savings from both the City's programs as well codes & standards upgrades are both taken into account for supply resource planning. Kinnear explained that the measures that comprise the market potential change from 2014 to 2023. For example, commercial lighting improvements account for a significant part of the potential in 2014, but the potential is much smaller in 2023.

Tam explained that the funding for EE programs comes from Public Benefits funds as well as supply funds. Sensitivity analyses were conducted to determine how changing assumptions would change the amount of market potential. For example, if the avoided cost increased by 25%, the EE potential would increase by 70% for electric and 18% for gas as more measures would be cost-effective.

Kinnear explained the impacts of the changes to the codes and standards. In general, the baseline is changing to more efficient devices so that the savings that can be counted is reduced.

Commissioner Hall asked why the total savings for electric is 5.7% by 2023 (as shown in Figure 3 in the report), but the cumulative goal for 2023 is 4.8%. Tam replied that the 5.7% savings include EE savings that have already been captured by 2013 and the 4.8% is for new savings during the 10-year period from 2014 to 2023 only. Commissioner Hall asked why there is such a severe decay each year in the savings. Tam stated that the lifetimes of each measure vary over different periods of time and the replacement units may be standard requirements at the time of replacement. Kinnear added that some of the measures, such as the Home Energy Reports, have a one year expected life frequency. Other items, such as chillers, can have a much longer lifespan.

Commissioner Waldfogel asked what the cost of saved energy is compared to the cost of brown power since what we avoid buying is brown power. Tam said that the cost of saved energy is compared to renewable power, as energy efficiency is considered to be the first resource in the Loading Order. She pointed out that Palo Alto used renewable energy in the avoided cost analysis in the last goal setting process, and that this is a part of Palo Alto's support of energy efficiency.

Commissioner Eglash stated that we should increase the investment in EE. This is an ambitious program, but we should try to do more such as lowering the barriers to EE and offer more innovative programs. He said that we will need to do more innovative programs to meet the goals and will need to increase the budget for EE programs. He would like to see the impact of increasing budgets for EE. Kinnear stated that Palo Alto is a member of many nationwide groups and is recognized across the country as a leader and innovator. However, she stated that many of the new programs may not provide a large amount of savings and there are administrative costs to administer each program.

ACTION:

Commissioner Eglash made a motion to support staff's recommendation. Vice Chair Foster seconded the motion. The motion carried unanimously (6-0).

ATTACHMENT 2

FINANCE COMMITTEE
DRAFT EXCERPT

Special Meeting
November 14, 2012

Utilities Advisory Commission Recommendation to Approve Updated Ten-Year Electric and Gas Energy Efficiency Goals for 2014 to 2023.

Joyce Kinnear, Manager Utilities Marketing Services discussed the major difference in electric energy with regard to codes and standards. She said incandescent and halogen light would be phased out and the baseline would be either compact fluorescent or a linear light. The codes and standards required that Staff be more efficient, so the ability for utility programs to make changes was reduced. The total efficiency for supply from programs and purchases remained the same. The map of utility programs influenced new technologies.

Chair Shepherd said the big change was with regulations, as there was not a chance to buy anything anymore. For example, people were naturally changing their water heaters when they went out.

Vice Mayor Scharff remarked that the Staff report was laid out from low to high efficiency. Secondarily, the State continued to make more regulations on efficiency, making it more difficult to reach later goals.

Ms. Kinnear said State and Federal laws had already passed so that a company could continue to add programs and become more efficient. Additionally, there were a lot of businesses out there to choose from.

Christine Tam, Resource Planner said one thing Staff considered was emerging technology because over time technologies became cheaper as uptake increased. As the program continued Staff projected a lot of the emerging technologies were going to be more widely adopted, making the cost cheaper; Staff has considered this projected cost decrease.

James Keene, City Manager asked if demographics, in relation to energy efficiency, played a role in relation to technology.

Ms. Kinnear said efficiency measures and sustainability were more likely to be adopted by women.

Chair Shepherd said in the event that Palo Alto became engaged in the Cool City Challenge, the thinking in the next 10 years might change because the effort was to reduce the carbon foot print.

Council Member Burt asked if the escalation of improvements in efficiency was driven by layering in mandates, or if it was based on anticipation of technology advancement, or both.

Ms. Kinnear said it included codes and standards, as well as emerging technologies. She said the estimation became less effective when the programs were not technically possible or not cost effective.

Council Member Burt asked if this was the same projection given a year ago.

Ms. Kinnear said the percentage per year went down. The utility goal went down, cumulatively, 7.2 percent over 10 years. The total estimated over 10 years was 4.8 percent, the codes and standards were considered about 2.3 percent in change and efficiency.

Council Member Burt asked if Staff was counting codes and standards.

Ms. Kinnear said Staff cannot count codes and standards.

Council Member Burt suggested showing what the overall energy efficiency improvement was because the Climate Protection Plan did not differentiate between the impact of codes and standards verses Palo Alto's initiatives. He suggested Staff consider the way the information was framed to consider issues like future policy changes. Vice Mayor Scharff asked if Staff counted Palo Alto's standards that were higher than mandated by the State.

Ms. Kinnear said, with the new construction program they counted all installations higher than State standard.

Council Member Price asked what Staff based their assumptions off of because for later years the projections became weaker.

Ms. Kinnear said a few assumptions were saturation of equipment of appliances, when they expected to be replaced. Staff looked at the

continuing reduction in price based off of reduction in price for emerging technologies and their saturation levels.

Council Member Price inquired whether Staff considered the demographic factor and move-out cycles. Ms. Kinnear said yes. As an example, she said young families entering neighborhoods seemed to be part of the natural course of things.

MOTION: Chair Shepherd Moved, seconded by Council Member Burt to recommend the City Council approve the proposed annual and cumulative Electric and Gas Energy Efficiency Goals for the period 2014 to 2023.

MOTION PASSED: 4-0