City of Emeryville

Strategic Energy Plan

Produced by: City of Emeryville Energy Leadership Team

Fall 2015

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

> **VISION STATEMENT**
>
> *The city of Emeryville will be a model and leader in energy planning through the development and implementation of innovative municipal policies and programs that enhance the environment, boost economic vitality, and inspire and empower our community.*

As with many public sector agencies, the City of Emeryville (City) recognizes the environmental, economic, and social benefits of energy-use reduction, clean energy generation, and the reduction of Greenhouse Gas (GHG) emissions. The passage of the California Global Warming Solutions Act (AB 32) in 2006, the Clean Energy and Pollution Act of 2015 (SB 350), and various other legislation has established the State of California as an international leader in efforts to reduce energy use, become a more energy-efficient economy, and move our state toward a more sustainable future. The City of Emeryville understands the unique and vital role that local governments have in helping the State reach the goals set forth in the policies above.

To help meet these challenges, Emeryville agreed to participate as a "Pilot City" in the East Bay Energy Watch (EBEW) Strategic Energy Planning program. EBEW is the Pacific Gas and Electric (PG&E) Local Government Partnership in Alameda and Contra Costa Counties, serving cities in both counties with energy efficiency programs and technical assistance, as well as incentives and rebates for implementing energy savings projects. Several City staff from a variety of departments were engaged throughout a collaborative process, working with EBEW staff, and consultants Newcomb Anderson McCormick (NAM) and QuEST, in the development of this Strategic Energy Plan (SEP). This SEP outlines a comprehensive, organized, and actionable approach for the City to meet its "Energy Vision" and energy-use reduction goals, while reflecting the City's unique culture, values, and constraints.

The outcome of this process is not just a Strategic Energy Plan for the City of Emeryville, but the results, "best practices," and lessons learned from this planning process will be incorporated by EBEW and the program consultants into a Strategic Energy Planning "Template", which will provide a process map and tools to allow other cities in Alameda and Contra Costa Counties to develop their own, customized SEPs. The City of Emeryville's contribution to both their own SEP and to the development of the Template that will benefit other neighboring cities was valuable and commendable.

The following pages describes the policy context for energy planning, the process undertaken by the City to create the SEP, and the resulting Vision, Goals, and specific programs and projects for implementation to achieve the City's Vision for energy efficiency and sustainability.

2. BACKGROUND

2.1 POLICY CONTEXT OF STRATEGIC ENERGY PLANNING

The State of California and local agencies have been on the forefront of establishing aggressive policies and standards for environmental protection and reducing GHG emissions that contribute to global warming. In 1970, the State adopted the California Environmental Quality Act (CEQA) with the goal to inform governments and the public about potential environmental impacts of projects. From 2005 onward, legislation has been passed to directly regulate GHG emissions, encouraging the creation of incentive mechanisms and cap-and-trade programs and the participation in voluntary activities such as purchasing emissions offsets and offering renewable energy certificates (RECs).

In October 2015 the most recent and significant legislation, the **Clean Energy and Pollution Reduction Act of 2015 (SB350),** was signed into law by California Governor Jerry Brown. This bill mandates an increase in California's Renewables Portfolio Standard (RPS) to 50 percent and the doubling of building energy efficiency, both by 2030. Implementation of this bill is likely to result in expanded utility efficiency programs which may benefit local governments. Additionally, AB 802 is another bill that was signed in September and is likely to change how energy efficiency savings is measured and reported. Compliance with state and local policies and regulations regarding these issues is an important factor for consideration by the City of Emeryville. The following list outlines the some of the numerous past policies and regulatory drivers that contributed to the creation of this Plan.

- **Warren Alquist Act of 1974** – Created the California Energy Commission (CEC) mandate to develop and regularly update Building Energy Efficiency and Equipment Standards, now known as Title 24 and Title 20 codes. These standard are largely credited with holding California's per capita energy consumption essentially flat since the mid-1970s.
- **AB 4420, 1988 (Sher)** – Directed the CEC to inventory and study greenhouse gases (GHGs) and the impacts of climate change on the states' economy and environment.
- **SB 1771, 2000 (Sher)** – Established the State's Climate Action Registry and established GHG baselines and ongoing monitoring.
- **AB 1493, 2002 (Pavley)** – Landmark "Clean Car Legislation" after California received authorization from the US EPA to regulate these emissions. These rules were initially heavily fought by the auto industry but have since become the standard for the nation.
- **SB 1078, 2002 (Sher); SB 107, 2006 (Simitian); SB X1-2 (Simitian)** – Establishing the State's Renewable Portfolio Standard (RPS) goals with increasing targets, currently requiring all retail sales of electricity to include 33% renewable power by the end of 2020.
- **AB 32, 2006 (Pavley, Nunez)** – Global Warming Solutions Act of 2006; Established goal to reduce California's GHG emissions below 1990 levels by 2020 and 80% below these levels by 2050.
- **California Long-Term Energy Efficiency Strategic Plan (CEESP) drafted by the CPUC in 2008 and updated 2011** – Outlines "big and bold" goals including 40% of residential building to be zero net energy (ZNE) by 2030 and 50% of commercial building to meet this criteria by 2040
- **AB758, 2009, (Skinner)** – Comprehensive Energy Efficiency Program for Existing Buildings; requires the CEC to create and implement an Existing Building Energy Efficiency Action Plan, in coordination with the California Public Utilities Commission (CPUC) and stakeholders.

2.2 HISTORY OF ENERGY USE REDUCTION EFFORTS TO DATE

The City of Emeryville has taken several actions to improve municipal energy performance over the past several years, and has several currently planned projects as part of the 2015 Five-Year Capital Improvement Program (CIP). The City is very active in regional energy planning organizations and has taken a leadership role in the PG&E-funded East Bay Energy Watch (EBEW) as a member of its Strategic Advisory Committee, and serves on the Technical Advisory Committee of the Stopwaste.org Energy Council. These organizations consist of city representation from Alameda and Contra Costa Counties and collaborate on best practices in energy efficiency and sustainability efforts to assist all East Bay cities in becoming more sustainable. The City took a significant step forward in its efforts to reduce energy use and implement broader sustainability programs and GHG reduction with the adoption of a Climate Action Plan (CAP) in November of 2008. This SEP takes many of the goals from the CAP and will flesh out the details for implementation of the necessary steps for their achievement.

The following list summarizes previously implemented and currently planned energy programs and projects at the City of Emeryville.

Completed Projects (as of SEP publication date):

- Participated in the School and Municipal Advanced Retro-commissioning and Tune-up (S.M.A.R.T) Program building analysis for the Civic Center Building in summer 2015. Energy savings projects identified in those reports, located in Appendices 4 (Phase I) & 5 (Phase II), have been implemented and result in over 100,000 kWh in annual energy savings.
- A Civic Center energy audit was conducted by QuEST in April 2015. Two out of three energy efficiency measures identified in the audit (Appendix 6) have been completed and the third (boiler retrofit) is planned for completion in 2016.
- Adopted a policy for new municipal buildings to be LEED-Silver rating “equivalent” and Stopwaste.org Bay Friendly Landscape Guidelines verified
- Eliminated design review requirements and reduced building permit fees for single family home solar PV installation
- Solar PV roof system installation: Civic Center, Police Station roof, Fire Station 34
- Traffic signal lights converted to more efficient LED lamps
- Peninsula Fire Station Improvements– Lighting & HVAC
- Worked with the California Youth Energy Services organization to provide summer jobs to high school students in the energy efficiency retrofit of local small businesses
- Required new residential and commercial development to rate energy efficiency and other green building elements of their construction using the Stopwate.org “Green Points” system and the LEED rating system developed by the U.S. Green Building council

Planned and Funded Projects – 2015 CIP

Many of the building rehabilitation and improvement projects listed contain energy efficiency or renewable energy elements as part of a broader building rehabilitation effort.

- Child Development Center Rehabilitation – efficient lighting and HVAC improvements

- Civic Center HVAC upgrades (currently underway)
- Corporation Yard Improvements – lighting, HVAC, solar PV
- Senior Center Rehabilitation – lighting, HVAC, solar PV
- Transit Center Parking Lot LED lights
- Hollis Street Fire Station Rehabilitation - lighting, HVAC, Solar PV
- Marina Park Improvements – exterior lighting
- Lumec Street Lighting LED retrofit
- City Hall Lighting Upgrade

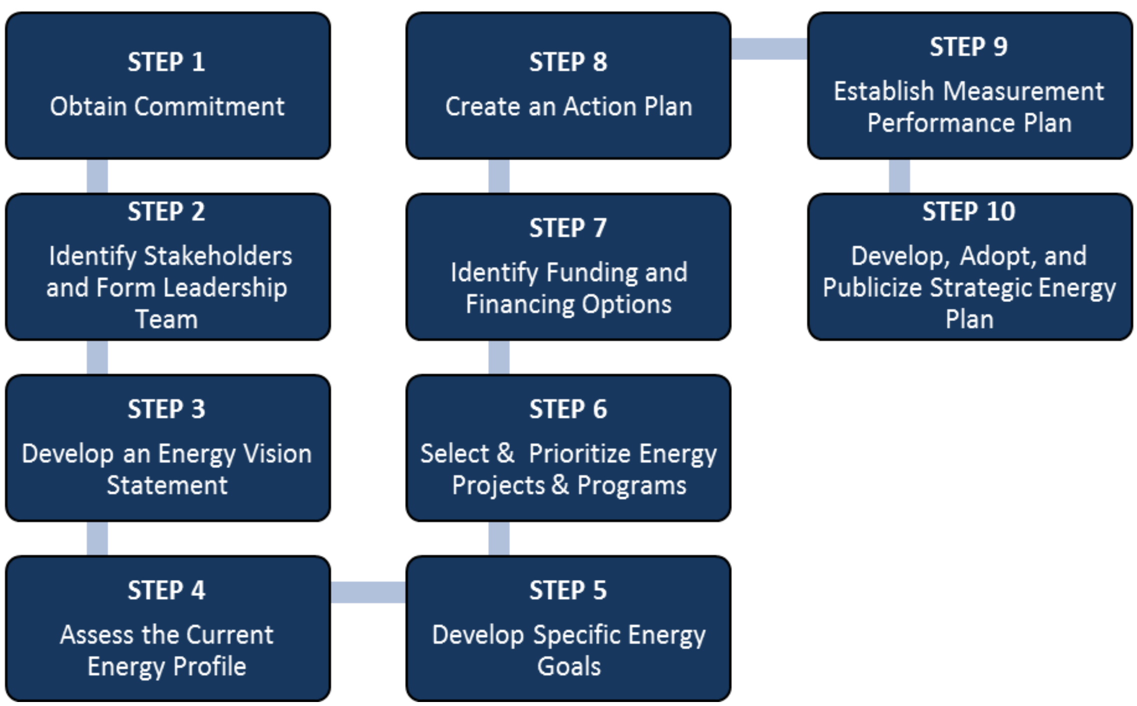
Many of the building rehabilitation projects listed above are candidates for PG&E's Savings by Design energy efficiency design assistance services. The City will pursue this as appropriate.

For a complete listing of past, current, and planned energy programs and projects see the Implementation Programs and Plans Checklist in Appendix 2.

2.3 CREATION OF THE STRATEGIC ENERGY PLAN

To create this Strategic Energy Plan, the City of Emeryville followed the process and utilized the tools developed for the EBEW Local Government Strategic Energy Plan Template. The energy planning process is illustrated in the flow chart below.

Strategic Energy Plan Creation Process



On June 12, 2015, the City made a commitment to create this SEP by means of a commitment letter issued by the City Public Works Director, Maurice Kaufman. An Energy Leadership Team was created that consisted of City staff from a variety of departments, as well as members from EBEW and consultants Newcomb Anderson McCormick and QuEST. The Energy Leadership Team worked to implement this process starting in June of 2015, culminating in the production of a Final Strategic Energy Plan in November 2015.

The implementation of the energy planning process and the resulting Strategic Energy Plan are described in the following chapters.

3. VISION STATEMENT AND GOALS

The City of Emeryville has developed the following Vision Statement as a guide to the creation of a municipal Strategic Energy Plan, a major component of implementing a broader Climate Action Plan.

The City of Emeryville will be a model and leader in energy planning through the development and implementation of innovative municipal policies and programs that enhance the environment, boost economic vitality, and inspire and empower our community.

3.1 ENERGY USE BENCHMARKING STUDY

To assist in the development of goals, EBEW performed an Energy Use Benchmarking Study for the City of Emeryville, included in Appendix 7. The Benchmarking Study compared the energy performance of the City's buildings and facilities against an established baseline. The results of the study indicated that City Hall, the City building with the highest energy cost, operated at a higher energy use intensity (energy use per square feet of space) than the baseline for typical, similar buildings. The Child Development Center, Corp Yard, Police Department, Fire Station 1 and 2, and the Senior Center were also included within the analysis and revealed that these buildings operate efficiently, relative to similar buildings. A thorough energy audit is recommended of all City buildings to assist in identifying measures to reduce overall energy use and cost.

3.2 GOALS

To realize this Vision Statement, the City has defined the following energy planning goals and priorities. The goals and priorities for the Strategic Energy Plan reflect city needs, interests, and available resources. The Goals outlined below are not necessarily listed in order of priority. Priorities for all goals and implementation programs are contained in the Implementation Programs and Plans Checklist contained in Appendix 2.

Energy Plan Goals and Criteria

Goal No.	Topic	Established Goal
1	**Energy Efficiency**	Reduce annual energy usage for existing facilities from a 2010 baseline by 10% by the end of 2020 (as identified in the City CAP) by targeting opportunities from the Civic Center energy audit provided by QuEST in 2015 and additional energy audits to be performed on the remaining City facilities.
2	**Energy Generation & Procurement**	Explore local opportunities for clean energy generation and procurement. Evaluate and begin implementing viable measures that meet established economic and fiscal criteria by 2017.
3	**Community Outreach & Education**	Engage city staff and the larger community in Energy Plan implementation by developing and implementing education and awareness programs to reduce energy use and promote energy efficiency and renewable energy options.

The goals described above were used by the Leadership Team to develop specific programs and projects for implementation to achieve each goal. This process is described in the next section.

The goals and criteria established for the Strategic Energy Plan will be monitored during plan implementation as described in Section 6, "Measure and Report Performance."

4. PROGRAMS AND PROJECTS FOR IMPLEMENTATION

Based on the goals and priorities described above, the City has selected programs and projects to actively improve energy use. The programs and projects were selected from a menu of opportunities provided in the LG-SEP Strategic Energy Planning Template. In addition, projects identified from City of Emeryville staff are also included.

The programs and projects to be implemented with the Strategic Energy Plan fall into the following broad categories:

1. Management and Organization Structure
2. Energy Efficiency
3. Facilities Operations
4. Sustainable Building Practices
5. Onsite Generation and Renewable Energy
6. Outreach and Awareness
7. Economics

Appendix 1 provides a detailed description of the energy programs and projects selected, including those already completed, currently being implemented, and planned for the future. These programs and projects are also reflected in the Implementation Programs and Projects Checklist, provided in Appendix 2, which outlines the priorities, responsibility for implementation, schedule, and estimated cost of each. The Checklist will be used by the City to manage the implementation process.

5. FUNDING AND FINANCING OPPORTUNITIES

In an environment of budget cuts and limited funding, the City of Emeryville understands the importance of leveraging the many funding resources available to local governments to help finance the energy-use reduction and generation projects selected for implementation in this plan. The following are a list of tools and resources that the City will consider as it evaluates energy projects moving forward. The list is broken into two general categories: funds that can be raised by the City and funds that come from external grants and incentives.

Funding Through City Action

- **Energy Performance Contracts (EPCs)*:*** Energy Performance Contracts (EPCs) are structured so that energy efficiency projects can be installed with little or no up-front costs to the customer. A portion of the revenue from energy savings go directly to an Energy Service Company (ESCO), who finances and constructs the project. ESCOs will finance the costs for the projects as part of the EPC. The structure and details of EPCs vary from project to project but the keys steps involved are generally universal. For an overview of these steps, best practices, and case studies, visit the link below.

  New York State Department of Environmental Conservation – Energy Performance Contracts for Local Governments: Industry Standards and Best Practices:
  www.dec.ny.gov/docs/administration_pdf/epcguide.pdf

  New York State Department of Environmental Conservation Homepage: www.dec.ny.gov/

  Additional resource: National Association of Energy Service Companies (NAESCO): www.naesco.org/

- **Power Purchase Agreements (PPA)*:*** A Power Purchase Agreement (PPA) is a contract where an end-use customer purchases clean energy from a power producer for on-site projects. In the case of solar photovoltaic electricity, customers can opt to purchase solar energy from a system installed on-site through a PPA at a negotiated rate instead of purchasing, installing, and maintaining the operations of solar photovoltaic panels themselves. The length of the PPA contract varies (as does the negotiated electricity rate), but typically ranges from 10 to 20 years. For more information on solar power purchase agreements, visit the Environmental Protection Agency (EPA) link below, which outlines PPA benefits and challenges and provides local-government case studies.

  EPA – Solar Power Purchase Agreements: www3.epa.gov/greenpower/buygp/solarpower.htm
  EPA Homepage: www3.epa.gov

  Additional resources:

  Renewable Energy Laboratory (NREL) Homepage: www.nrel.gov/
  NREL – Power Purchase Agreement Checklist for State and Local Governments, which provides a detailed guide to power purchase agreements for state and local governments including financial and contractual considerations:

  https://financere.nrel.gov/finance/content/power-purchase-agreement-checklist-state-and-local-governments

  Department of Energy (DOE) Homepage: www.energy.gov
  DOE – Power Purchase Agreements, which provides a general overview of PPAs and lists additional resources, including case studies: energy.gov/eere/slsc/power-purchase-agreements

- **National Renewable Energy Certificates (RECs)*:*** Renewable Energy Certificates (RECs), also known as Renewable Energy Credits, Green Tags, or Tradable Renewable Certificates (TRCs), represent the environmental benefits of one megawatt-hour (mWh) of electricity generated from renewable sources. A REC is a tradable commodity and can be sold as a source of revenue to the City. RECs can also be retained so that the owner has claim to the renewable attributes of the electricity. For more information about RECs, how they work, and how they are purchased and tracked, visit the Environmental Protection Agency links below.

  EPA - Renewable Energy Certificates: www3.epa.gov/greenpower/gpmarket/rec.htm
  EPA - REC Tracking: www3.epa.gov/greenpower/gpmarket/tracking.htm

- **Carbon Offset Credits:** Projects that offset or reduce greenhouse gas emissions can be certified by the Climate Action Reserve and traded as a Climate Reserve Tonne (CRT) credit, which is the equivalent of one metric ton of carbon dioxide equivalent emissions reduced or approximately 2,350 vehicle-miles traveled (VMT) for the average passenger vehicle. In addition to the cap-and-trade market, there are other marketplaces where CRTs can be purchased and sold, though similar to RECs, cities that sell CRTs lose the GHG "offset" attributes and cannot count the reductions towards their goals.

- **"Green" Revolving Fund (GRF):** A "green" revolving fund is an internal fund that would provide financing to energy and sustainability projects that generate cost savings. These savings are tracked and used to replenish the fund for future rounds of "green" investments, thus establishing a sustainable funding cycle. Capital for GRF's may be obtained from a variety of funding sources and the accounting system used to track the funds may also vary. A detailed, and useful guide on the creation and maintenance of a successful GRF can be found by following the link below. Although tailored for the higher educational space, its resources are relevant for a variety of institutions and agencies, including local governments.

  Billion Dollar Green Challenge - Green Revolving Funds: An Introductory Guide to Implementation & Management: http://greenbillion.org/wp-content/uploads/2013/01/GRF_Implementation_Guide.pdf

External Grants and Incentives

- **Ener**gy **Utility Programs and Incentives:** Local energy utilities offer a variety of programs and financial assistance to their customers for energy efficiency, renewable energy, and Climate Action Planning.
  - **East Bay Energy Watch (EBEW),** the local government partnership between PG&E and cities in Alameda and Contra Costa Counties. EBEW, through PG&E, provides cites with a variety of programs and incentives that assist in the financing of energy projects. For example, the **PG&E On-Bill Financing (OBF) Program** allows cities to finance energy efficiency projects with no-interest loans that are repaid through the city's utility bill. Additional benefits made available through PG&E and EBEW include access to free, comprehensive energy audits, incentive dollars for LED street lighting upgrades and new construction technical assistance (**Savings By Design Program**), and a variety of other programs. Emeryville has and will continue to work closely with EBEW and PG&E to ensure that all incentives and resources are leveraged to their full potential.

- **Government Grants:** The availability of government grants is constantly changing. The City will stay up-to-date on federal and state grants by referring to the following websites, which consolidate the available grants from all government departments:

Federal Grants: http://grants.gov/
California State Grants: http://www.ca.gov/Grants.html

- **State Energy Efficiency Loans:** Cities can also apply for other state and federal loans, such as the loans available through the California Energy Commission. At the time of the LG-SEP's publication, the California Energy Commission was accepting applications for their 1% interest loan for projects with proven energy and/or demand cost savings. The repayment schedule is up to 20 years and will be based on the annual projected energy cost savings from the aggregated projects. More information can be found on their website at:

  http://www.energy.ca.gov/efficiency/financing/index.html

6. MEASURE AND REPORT PERFORMANCE

As with any successful program, the ongoing progress and performance of energy reduction activities should be monitored and compared to goals and criteria. This will require continuous participation of the City Energy Leadership Team, City staff, and other participants in the process. To communicate results and ensure transparency and accountability, the results of the Strategic Energy Plan activities should be communicated within City departments and to the larger community on a regular basis.

The following section describes the planned process for measuring and reporting energy use reduction activities and achievements.

6.1 MEASURING PERFORMANCE

In order to monitor the City's progress towards its energy goals, the City Energy Leadership Team plans to collect information on the following key metrics at the regular intervals described below. In addition, the table below indicates responsibility for the accomplishment of each goal to meet the timelines established.

Goal No.	Topic	Established Goal	Performance Metric and Frequency of Measurement	Responsibility
1	**Energy Efficiency**	Reduce annual energy usage for existing facilities from a 2010 baseline by 10%, as identified in the City CAP, by the end of 2020 by targeting opportunities from a benchmarking analysis provided by EBEW in 2015.	Energy usage to be reviewed annually using EBEW benchmarking analysis.	Environmental Programs Supervisor
2	**Energy Generation & Procurement**	Explore local opportunities for clean energy generation and procurement. Evaluate and begin implementing viable measures that meet established economic and fiscal criteria by 2017.	City-wide solar feasibility assessment to be conducted by the end of 2016.	Environmental Programs Supervisor
3	**Community Outreach and Education**	Engage City staff and the larger community in Energy Plan implementation by developing and implementing education and awareness programs to reduce energy use and promote energy efficiency and renewable energy options.	Beginning in Q4 2016, the City will work to offer outreach and educational programs. Updates to the City sustainability webpage with current resources and information to occur on a quarterly basis.	Environmental Programs Supervisor

6.2 REPORTING PERFORMANCE

The Energy leadership will report progress on established goals in consistency with performance metrics and frequency of measurements identified above.

APPENDICES

CITY OF EMERYVILLE

APPENDIX 1: ENERGY PROGRAMS AND PROJECTS DESCRIPTIONS

1. MANAGEMENT AND ORGANIZATIONAL STRUCTURE
2. ENERGY EFFICIENCY
3. FACILITIES OPERATION
4. SUSTAINABILE BUILDING PRACTICES
5. ON-SITE GENERATION AND RENEWABLE ENERGY
6. OUTREACH & AWARENESS
7. ECONOMICS

PROGRAMS AND PROJECTS APPENDIX

Based on the goals and priorities adopted by the City, the following programs and projects have been chosen to actively reduce energy use. The programs and projects were selected from a menu of opportunities provided in the LG-SEP Template. In addition, projects identified from City of Emeryville staff are also included.

The following provides a detailed description of the selected programs and projects, including those already completed, currently being implemented, and planned for the future. These programs and projects are also reflected in the Implementation Programs and Projects Checklist, located in Appendix 2 which outlines the priorities, responsibility for implementation, schedule, and current status of each. The Checklist will be used by the City to manage the implementation process.

1. MANAGEMENT AND ORGANIZATIONAL STRUCTURE

In order to implement an effective Strategic Energy Plan, it is important for a city to have a policy mandate for energy and/or sustainability, the organizational structure required to manage the process, and the financial and technical resources to accomplish the plan goals.

The following implementation programs are part of the SEP. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

1.1 ESTABLISH A CITY COUNCIL SUSTAINABILITYCOMMITTEE

The City Council will authorize the establishment of a Council-led committee that will provide leadership, provide policy recommendations, and oversee proposed activities for the City of Emeryville to become more energy efficient and sustainable. The committee will consist of two City Councilmembers and selected City staff. The implementation of this SEP will be a high priority, but its charter will be broader than the plan itself and will serve as a liaison to the full City Council and the community at large.

1.2 ADOPT A CITY ENERGY POLICY/VISION STATEMENT

The City will demonstrate its commitment to environmental, fiscal, and social sustainability by adopting a policy that provides a mandate to develop and implement an SEP. This policy will articulate the mission, vision, and goals of the City and authorize City staff to develop the necessary plans, programs, and actions necessary to achieve them. The vison and goals of the Strategic Energy Plan will serve as a model for the City Council to formally adopt this policy.

1.3 APPOINT A CITY ENERGY LEADERSHIP TEAM

A City Energy Leadership Team will be established consisting of staff members from a variety of departments such as public works, planning, budget/finance office, transportation, etc., as well as industry experts, and representatives from energy utilities. The Leadership Team will follow the direction of the Council and provide the day-to-day support and resources necessary to implement Energy Plan activities. Should the City like to expand their SEP beyond municipal buildings to include the broader community, interested community members and groups will also be included within the Leadership Team. In general, the Team will be designed to provide a broad perspective on sustainability programs and activities within the City. The Team may or may not have authority over plan implementation, but at a minimum will provide input and recommendations regarding performance of plan activities and play an advisory or management role in the process.

1.4 APPOINT AN ENERGY PLAN COORDINATOR

Implementation of an SEP will require time, effort, continuity, and leadership. It is important to establish the management and support infrastructure to meet these needs. To fulfill this purpose, the City of Emeryville will take advantage of the EBEW "Civic Spark" Initiative, which will provide an intern to work full time at the City to assist with coordination and management of Energy Plan activities. The Energy Plan Coordinator will work under the direction of the staff Leadership Team and their duties will include the following:

1.4.1 MANAGE THE PROCESS

Implementing a comprehensive SEP will require coordination of activities and action plans, meeting schedules and deliverables, delegating responsibility, and managing internal and external resources to accomplish the goals of the program. Appointing an individual with the responsibility, authority, and accountability to manage this process will be critical for its success.

1.4.2 CHAMPION FOR ENERGY AND SUSTAINABILITY PROJECTS

Large projects, particularly those that span a long period of time, require an enthusiastic individual to follow through with efforts. The Energy Plan Coordinator will be passionate about sustainability and be excited about working towards City goals despite potential financial, political, and logistical difficulties.

1.4.3 POINT OF CONTACT

Sustainability often begins at the grassroots level, and sustainability efforts can often be sporadic and lack coordination without designated leadership. The Energy Plan Coordinator will serve as a main point of contact for sustainability efforts at the City and help grassroots projects gain the critical mass required for long term success.

1.5 FUNDING AND RESOURCES TO SUPPORT ENERGY PLAN ACTIVITIES

The City will define the economic and fiscal criteria used to evaluate, prioritize, and implement the activities identified in the SEP. Sources of funding may come from internal City budgets or grants, endowments, or other fundraising activities or revenue streams. Additional funding and technical or programmatic resources may come from local or state agencies and energy utilities.

The City will also leverage available programs and funding support from PG&E, including energy project incentives and the EBEW local government partnership. The City will continue to participate in other programs providing energy program support such as Stopwaste.org and the East Bay Regional Energy Network (REN) offered through the Association of Bay Area Governments (ABAG).

1.6 ENGAGE ENERGY PROFESSIONALS AS REQUIRED

Many of the projects identified in the plan may require a level of technical or programmatic expertise not available among City personnel. Where appropriate, specialists will be hired to assist in the design and implementation of energy projects to ensure project success.

The City will ensure that the individual or company being hired has past experience that is relevant to the project for which they are being hired. Experience working with other cities is also a plus.

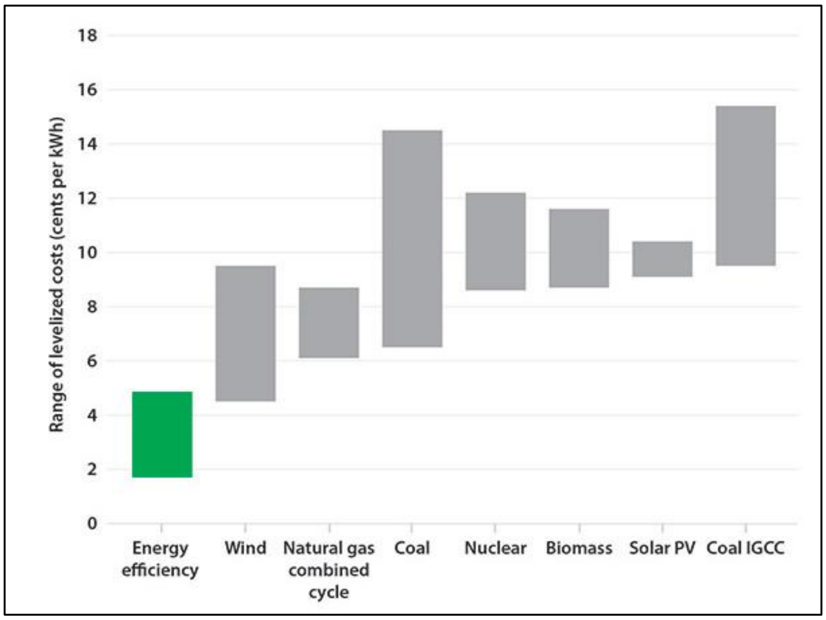
1.7 INTEGRATE ENERGY PLANNING INTO CITY GENERAL PLAN OR CLIMATE ACTION PLAN

City General Plans and energy planning will go hand in hand. The SEP will be designed to be consistent with the policies and programs outlined in the General Plan, however, the SEP may also be used to drive

General Plan changes and the adoption of new energy efficiency or sustainability City policies. In addition, the SEP will be used to implement the broader goals identified in the City of Emeryville CAP.

2. ENERGY EFFICIENCY

Energy efficiency is one of the most cost effective ways to reduce city energy use and its carbon footprint. When implemented properly, efficiency measures can decrease energy use without compromising comfort and can improve indoor air quality and enhance employee and staff performance. Energy efficiency will be a higher priority than renewable energy due to more favorable economics and to avoid over-sizing renewable energy systems. The chart below illustrates a comparison of the cost effectiveness of energy efficiency to power generation. These costs do not account for externalities, such as health costs, pollution costs, and costs incurred from environmental damage and cleanup.



*Costs of electricity resource options, March 2014. **Source:** American Council for an Energy-Efficient Economy*

The following Energy Efficiency Implementation Programs and Projects will be implemented by the City. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

2.1 SET ENERGY EFFICIENCY GOALS

The City has established an annual energy usage reduction goal for existing facilities of 10% below a 2010 baseline by the end of 2020. This reduction will be achieved by targeting opportunities from a benchmarking analysis provided by EBEW in 2015. Performance will be monitored annually to determine if goals are met, and will be re-evaluated every five years to establish new goals.

2.2 EVALUATE MECHANISMS FOR THE IMPLEMENTATION OF ENERGY CONSERVATION AND EFFICIENCY PROJECTS

The City will use various mechanisms for the identification and implementation of energy efficiency projects and programs, including the use of in-house staff, engineering consultants, contractors, and performance contracting vehicles through Energy Service Companies (ESCOs). The following specific tasks will be implemented.

2.3 CONDUCT A FACILITY PRIORITIZATION SURVEY

The City will conduct a prioritization survey of all City facilities. The surveys will be used to establish priorities for conducting comprehensive facility energy audits. Buildings will be prioritized based on energy use intensity (EUI) (i.e. electricity and natural gas use per gross square foot per year), with buildings with the highest energy use intensity given highest priority. The Energy Benchmarking Report developed by EBEW/QuEST as a part of this SEP will be used for this purpose. The surveys will include leased facilities to the extent practicable and to the extent that the recommendations of such surveys and audits can be implemented under the terms of the lease.

2.4 CONDUCT COMPREHENSIVE FACILITY ENERGY AUDITS

The City will establish an Energy Efficiency auditing plan which will consist of the following elements:

1. A long term plan to conduct or obtain comprehensive facility energy audits, which can be based on prioritization surveys.
2. A commitment to conduct energy audits for approximately 20% of their facilities each year, beginning within 6 months of the establishment of the City's Energy Plan. This can be carried out either independently using public agency resources, through Energy Savings Performance Contracts, state programs such as the California Energy Commission Technical Assistance program, utility energy-efficiency technical assistances, or energy engineering consultants hired by the City.
3. Comprehensive audits of facilities performed within the last 3 years may be considered current for the purposes of implementation.
4. "No-cost" audits will be utilized to the extent practicable.
5. The level of details and energy savings calculations will be that of an ASHRAE Level II audit. An ASHRAE Level II audit includes an analysis of energy use at a facility and identifies no-cost, low-cost and capital improvement energy efficiency measures with detailed energy and financial calculations.

2.4.1 IMPLEMENT NEW AND EXISTING AUDIT RECOMMENDATIONS

Within 90 days of the completion of the comprehensive facility audit of each facility, the City will begin implementing cost-effective recommendations for installation of energy efficiency and renewable energy technologies. The City will also do the same for energy audits of facilities performed within the past 3 years. In making decisions about investments in energy efficiency and renewable energy projects, the City will use life-cycle cost analyses, targeting projects with low and no additional life cycle costs first. Savings from low and no-cost measures can be used to support projects requiring more capital investment. Where appropriate, the City will consider the life-cycle costs of combinations of projects, particularly to encourage the bundling of energy efficiency projects with renewable energy projects to improve project economics.

2.5 IMPLEMENT ONGOING ENERGY MONITORING

For City facilities believed to be major energy users, which are likely to be larger buildings or those with technical areas, the City will install permanent meters on all energy inputs (e.g. electricity, natural gas, chilled water, hot water) to allow for continuous energy monitoring and evaluation of the impact of efficiency projects. If a central plant system is installed at a City facility, the City will include metering and monitoring of hot and chilled water circulation from the plant as appropriate. When possible, metering will be connected to energy management systems (EMS) to aid in the monitoring and analysis of energy use.

2.6 PARTICIPATE IN DEMAND RESPONSE (DR) PROGRAMS

The City will participate in the PG&E Peak Pricing Program to reduce energy demand. By using less electricity on Peak Day Pricing Event Days when the power gird is under the most strain, the City will help keep California's energy supply reliable for everyone and reduces the City's energy cost. More information about PG&E's Demand Response programs can be found by following the link below: http://www.pge.com/en/mybusiness/save/energymanagement/index.page

2.7 IDENTIFY AND TAKE ADVANTAGE OF GRANT AND INCENTIVE PROGRAMS

The City will identify and take advantage of all grant and incentive programs available for energy efficiency and conservation projects, including energy utility incentive programs and the CEC low-interest energy project loan programs. See Section 5 of the SEP for more details on funding opportunities.

2.8 ENERGY EFFICIENT EQUIPMENT

The City will purchase and utilize energy efficient equipment whenever possible and will employ the following strategies to accomplish this goal.

2.8.1 ESTABLISH AN ENERGY EFFICIENCY PURCHASING POLICY

The City will establish a city-wide policy for all purchases of energy-using equipment, stipulating where life-cycle cost-effective, energy efficient products will be selected. Products with an ENERGY STAR® label are certified to not only be energy efficient but to also have a reasonable payback period, and ENERGY STAR® labeled equipment will be purchased whenever available. For product groups where ENERGY STAR® labels are not yet available, the City will select products that are in the upper 25% of energy efficiency for their respective product categories. The City will incorporate energy efficient criteria consistent with ENERGY STAR® and other designated energy efficiency levels into all guide specifications and project specifications developed for new construction and renovation, as well as into product specification language developed for Basic Ordering Agreements, Blanket Purchasing Agreements, and all other purchasing procedures.

2.8.2 EFFICIENT LIGHTING AND LIGHTING CONTROLS

The City will install current generation of energy efficient lighting and lighting controls for interior and exterior applications. Energy efficient lighting technologies include low-wattage linear fluorescent lights, compact fluorescent lights, LEDs, and induction lighting. Examples of lighting controls include occupancy sensors, photocell installations for turning off lights when there is enough daylight, and time clocks for scheduling lights on and off automatically.

Install Energy Efficient HVAC Systems

In addition to buying energy efficient air conditioners, chillers, and boilers, the City will further increase the energy efficiency of their HVAC systems by pursuing the following measures.

Install Economizers

Air-side economizers can be added to allow the use of "free cooling", which is to use outside air to ventilate the building when outside air temperatures are favorable. Air-side economizers can be installed on both package units and buildings with central plants. While most cities do not have central plants, those that do can install waterside economizers to further reduce chiller use.

Enhance Control of Equipment

Installing variable frequency drives (VFDs), also known as variable speed drives (VSDs), on HVAC fans and pumps can save a significant amount of energy, as fans and pumps use more energy at higher speeds. VFDs are most effective when incorporated into an EMS for better control but can also be locally controlled if needed.

Appropriately Size Equipment

Oversized equipment can waste energy by using more power than necessary to meet the load. Ensure that all equipment is sized appropriately for its load or has the ability to ramp down through controls instead of cycling on and off repeatedly when loads are low.

Reduce Unnecessary Heat Gain and Loss

Avoid unnecessary cooling and heating by reducing unwanted heat gain or loss. Examples of unwanted heat gains in buildings can be prevented by shading south- and west-facing windows or by "cool roofing" strategies and painting roofs white. Prevent unwanted heat loss in pools by using pool covers to reduce heat loss from pools, thereby reducing boiler usage.

Perform Regular Maintenance on Equipment

Effective preventive and regular maintenance programs keep equipment and systems operating optimally and reduce excess energy use. Set up a routine maintenance schedule to ensure proper maintenance is performed.

Replace equipment with energy efficient models

As old equipment is taken offline, replace it with energy efficient models. See Program 2.8.1 Establish a Purchasing Policy, above, for more guidelines.

2.8.3 MANAGING PLUG LOADS

"Plug Loads" are energy consuming equipment that draws electricity from a wall socket. Examples of plug loads include computers, printers, refrigerators, and space heaters. The City will manage plug loads by activating any energy saving features on your plug load equipment and by using occupancy sensor plug load shut-off devices, such as occupancy sensed power strips.

3. FACILITIES OPERATION

In addition to installing energy efficient equipment, the City will strive to operate high-performing facilities, buildings, and energy infrastructure systems that are optimized for inhabitant comfort, productivity, and energy and resource efficiency.

The following programs will be implemented by the City to meet this goal. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

3.1 ENCOURAGE AND SUPPORT ENERGY EFFICIENCY TRAINING OF STAFF

The City will encourage staff to become trained in energy efficiency and offer support by paying for certification and class fees. Staff can take classes at the IOU energy centers or go through Building Operator certification, a nationally recognized program. For more information, visit: http://www.theboc.info

3.2 INSTALL ENERGY MANAGEMENT SYSTEMS

The City will consider the use of computerized EMS to provide centralized reporting and control of City energy related activities. City staff will strive to achieve optimum efficiency in the use of natural gas, electricity, or other energy resources to meet the heating, cooling, and lighting needs of the buildings and/or facilities. Except for areas requiring special operating conditions, such as electronic data processing facilities, or other scientifically critical areas, where rigid temperature controls are required, building and/or facility temperatures will be controlled to fluctuate between the limits stated below. This will be a future project and will be considered in the annual CIP process.

3.3 ADJUST TEMPERATURE SET POINTS AND SCHEDULE OPERATING TIMES

To avoid overcooling and overheating, the City can raise cooling temperature set points and lower heating temperature set points. If there is a central plant to meet the heating and cooling needs, implementing supply air temperature resets, chilled water and hot water resets, and chilled water and hot water set point changes can help avoid wasting energy during milder weather.

The City will heat buildings at or below 68°F and cool facilities at or above 74°F in order to avoid excess heating and cooling. In order to avoid unnecessary heat loss, domestic hot water temperatures will not be set above 120°F.

3.4 OPTIMIZE HVAC EQUIPMENT SCHEDULING

All air conditioning equipment, including supply and return air fans, will be shut off on weekends, holidays, and for varying periods each night, except where it would adversely affect electronic data processing installations or other critical, or 24-hour operations.

The City will avoid cooling and heating spaces when unnecessary. This can be done by scheduling HVAC systems off during unoccupied times while implementing a pre-cooling strategy to cool the building in the early hours of the morning before outside temperatures heat up. If there is a central plant, scheduling lockouts for chillers and boilers can be used to avoid running this equipment when unneeded.

3.5 ACTIVATE ENERGY-SAVING FEATURES FOR APPLIANCES AND COMPUTERS

The City will activate energy-saving features on all appliances and computer equipment within City facilities, for example, power-saving modes on PCs, copiers, printers, and other office equipment. Install server and desktop virtualization and PC power management systems to reduce computer energy use.

4. SUSTAINABLE BUILDING PRACTICES

Construction and renovation of new and existing facilities provides a significant opportunity to reduce the environmental impacts of the built environment through sustainable building practices. The City will incorporate energy and resource efficient “Green Building” practices in the design and construction of all new and renovated facilities.

The following implementation programs will be implemented by the City to meet this goal. The current status of each (either “planned,” “in-process,” “complete” or “ongoing”) can be found in Appendix 2.

4.1 ESTABLISH A GREEN BUILDING STANDARD

Green Building Standards for new construction and renovation projects will be adopted based on Best Practices, industry standards, professional organizations, institutions of higher learning (UC, CSU, or CCC) or other local governments. All new construction and major remodeling projects will be designed to achieve at least a U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Silver rating or equivalent performance. For more information about LEED ratings, visit: www.usgbc.org/DisplayPage.aspx?CMSPageID=222

4.2 IMPLEMENT SUSTAINABLE DESIGN PRACTICES

All City new construction, renovation, maintenance, and repair projects will be designed with consideration of optimum energy utilization, low lifecycle operating costs, and compliance with the City's goals and all applicable energy codes and regulations. Energy efficient and sustainable design will be addressed early in the project planning and design phases to maximize cost effectiveness and will be implemented in balance with the academic program needs of the project. The following elements will be implemented in the design of all buildings for the City:

- Siting and design considerations that optimize local geographic features to improve sustainability of the project, such as proximity to public transportation, consideration of microclimates, and passive or active solar energy opportunities
- Durable systems and finishes with long life cycles that minimize maintenance and replacement
- Optimization of layout and design of spaces to accommodate reconfiguration, with the expectation that the facility will be renovated and re-used (versus demolished)
- Systems designed for optimization of energy, water, and other natural resources
- Designed to maximize natural daylighting and ventilation
- Optimization of indoor environmental quality for occupants
- Utilization of environmentally preferable products and processes, such as recycled content materials and recyclable materials
- Procedures that monitor, trend, and report operational performance
- Space will be provided in each building to support an active program for recycling and reuse of materials
- Design outdoor spaces to minimize parking lots, use permeable pavement, and avoid blacktopping pavement and plant trees to shade parking lots to prevent the heat island effect. Utilize sustainable landscaping practices
- Any energy-using equipment acquired for the furnishing of new and renovated buildings will be ENERGY STAR® rated or equivalent in accordance with the purchasing policy adopted by the City

4.3 USE AN INTEGRATED SYSTEMS APPROACH IN BUILDING DESIGN

Sustainable building goals will be evaluated in a cost effective manner by identifying economic and environmental performance criteria, evaluating life cycle savings, and adopting an integrated systems approach. Such an approach treats the entire building as one system and recognizes that individual building features, such as lighting, windows, heating and cooling systems, will be evaluated and designed as interactive systems.

4.4 HIRE SUSTAINABLE BUILDING DESIGN PROFESSIONALS

The City will utilize architectural firms, consultants, and energy engineers experienced in all phases of the sustainable building design process to assist in constructing energy and resource efficient buildings. The City will take advantage of the utility provided energy efficiency new construction design programs, such as Savings by Design.

4.5 COMMISSION NEW BUILDINGS

All new buildings will be commissioned after construction to ensure that systems were installed and operating as designed. Individual systems will also be commissioned to ensure that they run as efficiently as possible.

5. ON-SITE GENERATION AND RENEWABLE ENERGY

Renewable generation implementation will occur only after significant efficiency and conservation plans have been implemented to ensure that any self-generation or demand response programs or projects are sized appropriately.

The following implementation programs will be implemented by the City to meet this goal. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

5.1 EVALUATE CLEAN COGENERATION AND RENEWABLE ENERGY GENERATION

The City will evaluate and implement cogeneration projects, such as cogeneration powered by renewable resources like biomass and landfill gas, and renewable energy generation technologies in order to reduce greenhouse gas emissions and to improve campus energy efficiency, utility reliability, and service diversity. The feasibility of solar photovoltaic (PV) systems, wind power, solar thermal water heating for pools and domestic use, biomass and biogas generation, fuel cells, wind energy, and geothermal heat pumping applications will also be evaluated

5.2 MINIMIZE GREENHOUSE GAS INTENSITY OF PURCHASED ELECTRICITY

Where direct access to energy providers is permitted by law, such as with community choice aggregation, the City will consider the source of the electricity and strive to minimize the greenhouse gas intensity of purchased electricity. The City will include provisions for the purchase of electricity from renewable energy sources as a component of their requests for bids whenever procuring electricity and evaluate any climate change mitigation programs offered by providers. The City will strive to exceed the State of California Renewable Portfolio Standard (RPS) in procuring energy. The City will set more aggressive renewable energy purchasing goals than the statewide RPS and set a long term goal to only use and purchase renewable energy.

5.3 PARTICIPATION IN COMMUNITY CHOICE AGGREGATION

The City will participate in Community Choice Aggregation (CCA) efforts as developed by Alameda County or other local agencies, as appropriate. CCA permits public agencies to aggregate the electric loads of residents, businesses, and City and purchase electricity on their behalf. CCA Programs usually have higher RPS than the investor owned utilities. For example, CleanPowerSF, the San Francisco CCA Program, aims to be 51% renewable energy by 2017, which is almost double the statewide RPS of 33% renewable energy generation.

For the CCA Programs currently available, visit:
http://www.cpuc.ca.gov/PUC/energy/Retail+Electric+Markets+and+Finance/070430_ccaggregation.htm

Many other cities and counties are currently evaluating the feasibility of a CCA program.

5.4 IDENTIFY AND TAKE ADVANTAGE OF GRANT AND INCENTIVE PROGRAMS

The City will identify and take advantage of all grant and incentive programs available for self-generation or renewable energy through the local utilities. See SEP Section 5: Funding and Financing Opportunities for more details.

6. OUTREACH & AWARENESS

The effectiveness of a Local Government Strategic Energy Plan is highly dependent on the actions of individual City staff and employees. While energy efficient equipment and the installation of solar panels will make a city more energy responsible, cultural and behavioral changes can have a large impact on the effectiveness of these projects. These factors also strongly influence the likelihood of the continued prioritization of sustainability within City operations and buildings and within the community itself. Additionally, it is important to maintain transparency and keep employees and the community informed of the City's progress with energy planning and action. Ideally, the Emeryville SEP will act as a springboard toward more robust activities with the larger community.

The City will implement the following activities to achieve this goal. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

6.1 WEBPAGE DEDICATED TO CITY SUSTAINABILITY

The City will create a page on the City website dedicated to sharing information about sustainable energy practices. The website will host the latest version of the City's completed SEP and provide a summary of the vision, goals, and past, current, and planned projects. The website can be a great platform to celebrate successes by detailing the energy savings realized by implemented energy projects and can serve as a publicity tool for sustainability events. In addition, the website can serve as a valuable resource for the community, providing information on available incentive programs offered through the local utility and hosting links to energy and sustainability related educational webpages. The Energy Plan Coordinator or a member of the Leadership Team will manage the webpage and ensure that it is kept up to date with the latest City developments and project results.

6.2 WORKSHOPS AND PRESENTATIONS

The City will sponsor workshops or presentations to enable City employees to stay informed about sustainability activities, ask questions, and participate in decisions. Workshops and presentations will be well publicized and open to all, and they will be led by individuals who can knowledgably field questions from the audience and efficiently facilitate the workshop process. The City will also establish a "suggestion program" to allow staff to provide input into future energy program and project ideas.

6.3 SUSTAINABILITY EVENTS

The City will participate in fairs or celebrations for local, national, or global sustainability events to spread awareness of worldwide sustainability. These events are also a good avenue for publicity for achievements. Notable national or global events surrounding sustainability include Earth Day on April 22, 350.org in the fall, and Earth Hour in the spring.

6.4 SUSTAINABILITY CHALLENGES AND COMPETITIONS

The City will challenge City employees to think actively and creatively about solutions for making City buildings and operations more sustainable. Constructive competition will be used to encourage water conservation, energy conservation, reduction in single passenger vehicles driven, or any other sustainability goal. Offering small cash prizes to assist in implementing small sustainability changes can spread awareness and get people thinking about possible changes. If appropriate, the challenge or competition can be extended to the local community.

6.5 CITY ORGANIZATIONAL OUTREACH AND AWARENESS

The City recognizes the importance of internal outreach and awareness efforts for City employees in the overall success of the SEP. The following projects and programs have been selected to assist with this effort.

6.5.1 POST BEHAVIORAL REMINDERS

Reminders will be posted where appropriate to encourage City employees to conserve energy and water, reduce and sort solid waste, turn off car engines to prevent idling, and encourage other sustainable habits by posting reminders where appropriate.

6.5.2 NEW EMPLOYEE ORIENTATION

When hiring a new employee, they will be introduced to the City's strategic energy plan and other sustainability plans and goals so that they are aware of the City's culture of conservation and environmental commitment. Employees will be encouraged to participate on the Leadership Team or get involved in other areas of sustainability within the City.

6.5.3 CITY EMPLOYEE E- NEWSPAPER OR NEWSLETTER

Updates on the SEP and energy projects will be included within regular City e-newsletters or updates. The City Energy/Sustainability Coordinator or a member of the Leadership Team will coordinate with the employee responsible for creating the newsletter to ensure City employees stay informed on successes, new developments, and progress towards defined goals.

6.6 COMMUNITY-WIDE OUTREACH AND AWARENESS

When the City expands the SEP to be inclusive of the entire community by developing a community-wide strategic energy plan, the following engagement strategies will be employed. The current status of each (either "planned," "in-process," "complete" or "ongoing") can be found in Appendix 2.

6.6.1 ENGAGE LOCAL BUSINESSES

The City will engage local businesses, ranging from a variety of industries and sizes, by informing them of the City's energy use reduction goals and inviting representatives to participate in the creation of the larger, community-wide SEP. The City webpage will host information on sustainability and energy resources available for local businesses, including funding and financing opportunities and rebate programs, and will actively involve interested businesses in City sustainability events and programs, where applicable.

6.6.2 REV "SUSTAINABILITY CIRCLE" PROGRAM

REV is an organization based in San Francisco that specializes in accelerating sustainability within businesses. Several local governments have used REV's Sustainability Circle program to engage local businesses in the strategic energy and sustainability planning process. A REV Sustainability Circle is a 6-month comprehensive peer-learning program that improves the way business is conducted through embedding sustainably practices across the organization. The outcome is a customized Sustainability Action Plan for local businesses. The City will consider participating in the REV program or encouraging local businesses to participate.

6.6.3 ENGAGE RESIDENTIAL SECTOR

The City recognizes that effective engagement of the residential sector will be crucial to the success of the community-wide energy plan. Community members wishing to be involved in the SEP creation process will be encouraged to participate throughout Plan creation and implementation. The City will develop and implement a Community Outreach Plan consisting of a variety of engagement strategies and opportunities for community involvement. Resources available for multi-and single family residences will be hosted on the City webpage and advertised at appropriate City events.

6.6.4 ENGAGE EDUCATIONAL INSTITUTIONS

Colleges, K-12 schools and other educational institutions are large energy users and hold a lot of potential for energy efficiency improvements and renewable energy installations. A variety of incentive programs, grants, and financing programs exist for educational institutions that greatly aid in the feasibility of these projects. The City will engage its schools and colleges in the overall effort to reduce City energy use and invite them to participate in the planned creation of a more expansive, community-wide energy plan. The City will also encourage its educational institutions to complete an energy or sustainability plan of their own, which will result in specific, actionable energy reduction programs and projects that will help meet the larger energy goals of the City.

The California Community Colleges Sustainability Template has been effectively used and implemented at many community colleges throughout the State and is a valuable resource for all educational institutions who wish to become more sustainable. A link the Template and its resource documents is provided below:

California Community College Sustainability Template:
http://extranet.cccco.edu/Divisions/FinanceFacilities/Sustainability/CCCSustainabilityPlanTemplateFiles.aspx

APPENDIX 2: ENERGY PROGRAMS AND PROJECTS CHECKLIST

Strategic Energy Plan Summary
Implementation Programs and Checklist

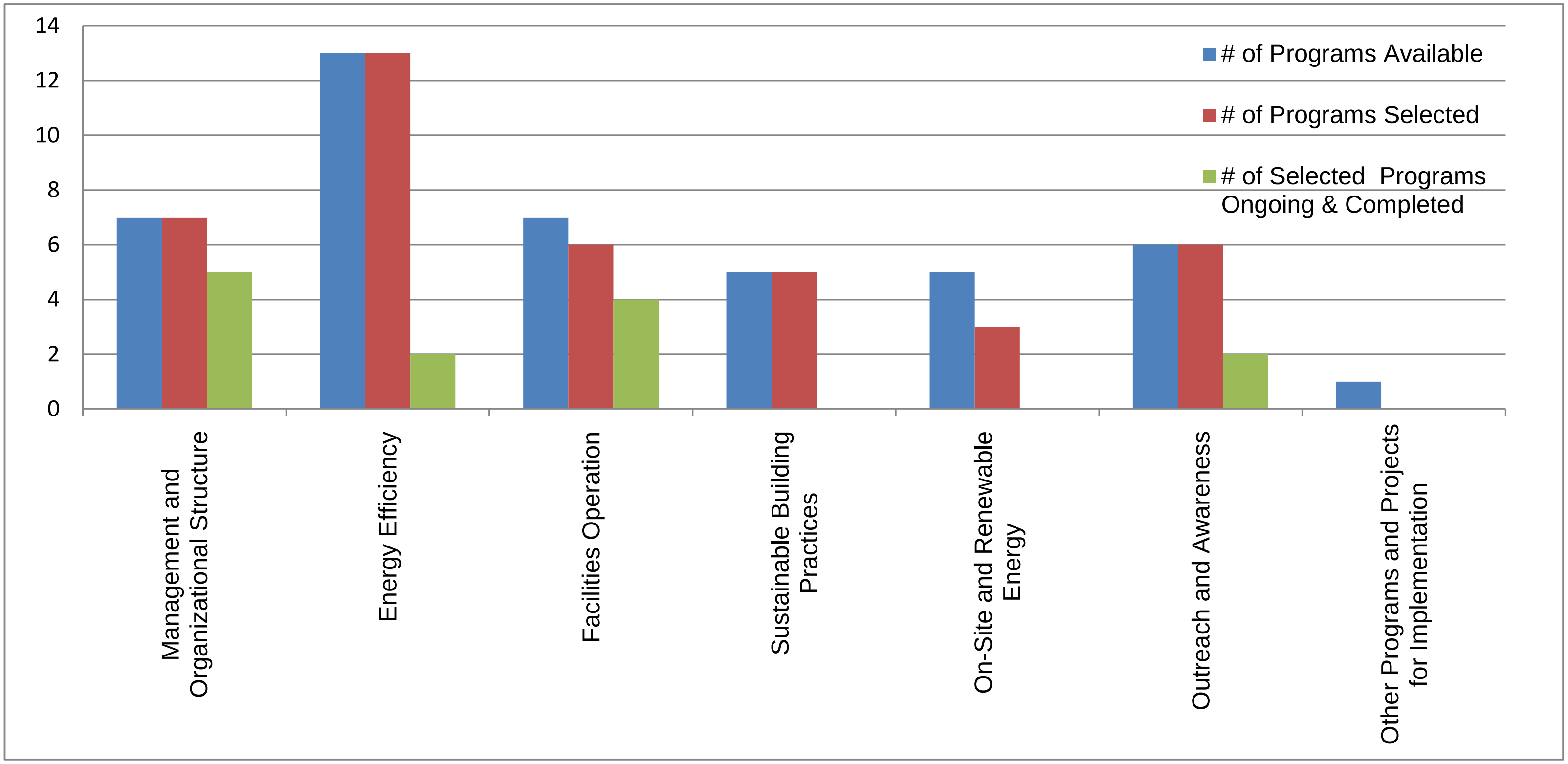
City: Emeryville
Project: Strategic Energy Plan
Date: 10/29/2015

Plan Section	Template Plan Section Description	# of Programs Available	# of Programs Selected	# of Selected Programs Ongoing & Completed
1	Management and Organizational Structure	7	7	5
2	Energy Efficiency	13	13	2
3	Facilities Operation	7	6	4
4	Sustainable Building Practices	5	5	0
5	On-Site and Renewable Energy	5	3	0
6	Outreach and Awareness	6	6	2
7	Other Programs and Projects for Implementation	1	0	0
	Totals	**43**	**40**	**13**

For questions, comments, or feedback, please contact Matt Sullivan, Newcomb | Anderson | McCormick, 415-896-0300, matt_sullivan@newcomb.cc

Strategic Energy Plan Programs and Projects Chart

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015



Sustainability Template Plan
Implementation Programs and Plans Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 1	**MANAGEMENT AND ORGANIZATIONAL STRUCTURE**		**Comments**
☑	1.1	Establish a City Council Sustainability Committee	
☑	1.2	Adopt a City Energy Policy/ Vision Statement	
☑	1.3	Appoint a City Energy Leadership Team	
☑	1.4	Appoint an Energy Plan Coordinator	
☑	1.5	Funding and Resources to Support Energy Plan Activities	
☑	1.6	Engage Energy Professionals as Required	
☑	1.7	Integrate Energy Planning into City General Plan or Climate Action Plan	
☐	*1.8*	*Enter Other Program and Project 1, text will change color*	
☐	*1.9*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 2	**ENERGY EFFICIENCY**		**Comments**
☑	2.1	Set Energy Efficiency Goals	
☑	2.2	Evaluate Mechanisms for the Implementation of Energy Conservation and Efficiency Projects	
☑	2.3	Conduct Facility Prioritization Survey	
☑	2.4	Conduct Comprehensive Facility Energy Audits	
☑	2.4.1	Implement New and Existing Audit Recommendations	
☑	2.5	Implement Ongoing Energy Monitoring	
☑	2.6	Participate in Demand Response (DR) Programs	
☑	2.7	Identify and Take Advantage of Grant and Incentive Programs	
☑	2.8	Energy Efficiency Equipment	
☑	2.8.1	Establish an Energy Efficiency Purchasing Policy	
☑	2.8.2	Efficient Lighting and Lighting Controls	
☑	2.8.3	Install Energy Efficient HVAC Systems	
☑	2.8.4	Managing Plug Loads	
☐	*2.x*	*Enter Other Program and Project 1, text will change color*	
☐	*2.x*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 3	**FACILITIES OPERATION**		**Comments**
☑	3.1	Encourage and Support Energy Efficiency Training of Staff	
☑	3.2	Install Energy Management Systems	
☑	3.3	Adjust Temperature Set Points and Schedule Operating Times	
☑	3.4	Optimize Building Occupancy Scheduling	
☑	3.5	Optimize HVAC Equipment Scheduling	
☑	3.6	Activate Energy-Saving Features for Appliances and Computers	
☐	3.x	Pursue Monitoring-Based(MBCx)/Retro-Commissioning (RCx)	
☐	*3.x*	*Enter Other Program and Project 1, text will change color*	
☐	*3.x*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 4	**SUSTAINABLE BUILDING PRACTICES**		**Comments**
☑	4.1	Establish a Green Building Standard	
☑	4.2	Implement Sustainable Design Practices	
☑	4.3	Use an Integrated Systems Approach in Building Design	
☑	4.4	Hire Sustainable Design Professionals	
☑	4.5	Commission New Buildings	
☐	*4.x*	*Enter Other Program and Project 1, text will change color*	
☐	*4.x*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City: Emeryville
Project: Strategic Energy Plan
Date: 10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 5	**ON-SITE AND RENEWABLE ENERGY**		**Comments**
☑	5.1	Evaluate Clean Cogeneration and Renewable Energy Generation	
☐	5.x	Evaluate Load Shifting Technologies	
☑	5.2	Minimize Greenhouse Gas Intensity of Purchased Electricity	
☑	5.3	Participation in Community Choice Aggregation	
☐	5.x	Identify and Take Advantage of Grant and Incentive Programs	
☐	*5.x*	*Enter Other Program and Project 1, text will change color*	
☐	*5.x*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 6	**OUTREACH AND AWARENESS**		**Comments**
☑	6.1	Webpage Dedicated to City Sustainability	
☑	6.2	Workshops and Presentations	
☑	6.3	Sustainability Events	
☑	6.4	Sustainability Challeneges and Competitions	
☑	6.5	City Organizational Outreach and Awareness	
☑	6.6	Community-wide Outreach & Awareness	
☐	*6.x*	*Enter Other Program and Project 1, text will change color*	
☐	*6.x*	*Enter Other Program and Project 2, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Checklist

City:	Emeryville
Project:	Strategic Energy Plan
Date:	10/29/2015

Priority Implementation Plans Indicated Below

Selected Programs and Plans for Implementation are Summarized Below			
Section 7	**OTHER PROGRAMS AND PROJECTS FOR IMPLEMENTATION**		**Comments**
☐	*7.x*	*Enter Other Program and Project 2, text will change color*	
☐	*7.x*	*Enter Other Program and Project 2, text will change color*	
☐	*7.x*	*Enter Other Program and Project 3, text will change color*	
☐	*7.x*	*Enter Other Program and Project 4, text will change color*	

See SEP Appendix 1 for detials on the above implementation projects and programs.

Strategic Energy Plan
Implementation Programs and Plans Checklist

City: Emeryville
Project: Strategic Energy Plan
Date: 10/29/2015

Priority Implementation Plans Indicated Below

Section 1 MANAGEMENT AND ORGANIZATIONAL STRUCTURE									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
1.1	Establish a City Council Sustainability Committee		Low	Complete		3		Environmental Programs Supervisor	
1.2	Adopt a City Energy Policy/ Vision Statement		High	Complete		1,2,3	Fall 2015	Environmental Programs Supervisor	
1.3	Appoint a City Energy Leadership Team		High	Complete		3	Fall 2015	Environmental Programs Supervisor	
1.4	Appoint an Energy Plan Coordinator		High	Planned		3	Spring 2016	Environmental Programs Supervisor	
1.5	Funding and Resources to Support Energy Plan Activities		High	In-process		1,2,3	June 2016	Finance, Public Works, Environmental Programs Supervisor	
1.6	Engage Energy Professionals as Required		Low	Ongoing		1,2,3	n/a	Environmental Programs Supervisor	
1.7	Integrate Energy Planning into City General Plan or Climate Action Plan		High	Complete		1,2,3	n/a	Environmental Programs Supervisor	

Section 2 ENERGY EFFICIENCY									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
2.1	Set Energy Efficiency Goals		High	In-process		1	June 2016	Environmental Programs Supervisor	
2.2	Evaluate Mechanisms for the Implementation of Energy Conservation and Efficiency Projects		Med	Planned		1	June 2016	Environmental Programs Supervisor	
2.3	Conduct Facility Prioritization Survey		Med	Complete		1	n/a	Environmental Programs Supervisor	
2.4	Conduct Comprehensive Facility Energy Audits		Med	Planned		1	2016	Environmental Programs Supervisor	
2.4.1	Implement New and Existing Audit Recommendations		Low	Planned		1	2016	Environmental Programs Supervisor	
2.5	Implement Ongoing Energy Monitoring		Low	In-process		1	2016	Environmental Programs Supervisor	
2.6	Participate in Demand Response (DR) Programs		Med	In-process		1	2017	Environmental Programs Supervisor	
2.7	Identify and Take Advantage of Grant and Incentive Programs		Med	Ongoing		1	n/a	Environmental Programs Supervisor	
2.8	Energy Efficiency Equipment		High	In-process		1	2016	Environmental Programs Supervisor	
2.8.1	Establish an Energy Efficiency Purchasing Policy		Med	Planned		1	Q2 2016	Energy Leadership Team	
2.8.2	Efficient Lighting and Lighting Controls		High	In-process		1	Q2 2016	Environmental Programs Supervisor	
2.8.3	Install Energy Efficient HVAC Systems		Med	In-process		1	2016	Environmental Programs Supervisor	
2.8.4	Managing Plug Loads		Med	In-process		1	2016	Environmental Programs Supervisor	

Strategic Energy Plan
Implementation Programs and Plans Checklist

City: Emeryville
Project: Strategic Energy Plan
Date: 10/29/2015

Priority Implementation Plans Indicated Below

Section 3 FACILITIES OPERATION									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
3.1	Encourage and Support Energy Efficiency Training of Staff	Annual "Lunch and Learn" sessions	Low	Planned		3	April 2016	Facilities Manager, Environmental Programs Supervisor	
3.2	Install Energy Management Systems		Med	Planned		1	TBD	Facilities Manager, Environmental Programs Supervisor	
3.3	Adjust Temperature Set Points and Schedule Operating Times		Med	Ongoing		1	n/a	Facilities Manager, Environmental Programs Supervisor	
3.4	Optimize Building Occupancy Scheduling		High	Ongoing		1	n/a	Facilities Manager, Environmental Programs Supervisor	
3.5	Optimize HVAC Equipment Scheduling		Med	Ongoing		1	n/a	Facilities Manager, Environmental Programs Supervisor	
3.6	Activate Energy-Saving Features for Appliances and Computers		Med	Complete		1	n/a	Facilities Manager, Environmental Programs Supervisor	

Section 4 SUSTAINABLE BUILDING PRACTICES									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
4.1	Establish a Green Building Standard		Med	Planned		1	TBD	Energy Leadership Team	
4.2	Implement Sustainable Design Practices		Med	Planned		1	TBD	Public Works	
4.3	Use an Integrated Systems Approach in Building Design		Med	Planned		1	TBD	Public Works	
4.4	Hire Sustainable Design Professionals		Med	Planned		1	TBD	Public Works	
4.5	Commission New Buildings		Med	Planned		1	TBD	Public Works	

Section 5 ON-SITE AND RENEWABLE ENERGY									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
5.1	Evaluate Clean Cogeneration and Renewable Energy Generation		Low	Planned		2		Energy Leadership Team	
5.2	Minimize Greenhouse Gas Intensity of Purchased Electricity		High	Planned		2		Energy Leadership Team	
5.3	Participation in Community Choice Aggregation		High	Planned		2		Energy Leadership Team	

Strategic Energy Plan
Implementation Programs and Plans Checklist

City: Emeryville
Project: Strategic Energy Plan
Date: 10/29/2015

Priority Implementation Plans Indicated Below

Section 6 OUTREACH AND AWARENESS									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address
6.1	Webpage Dedicated to City Sustainability		Med	Planned		3	June 2016	Environmental Programs Supervisor	
6.2	Workshops and Presentations		Low	Planned		3	Spring 2016	Energy Leadership Team	
6.3	Sustainability Events		Low	Ongoing		3	Spring 2016	Energy Leadership Team	
6.4	Sustainability Challeneges and Competitions		Low	Ongoing		3	Summer 2016	Energy Leadership Team	
6.5	City Organizational Outreach and Awareness		Low	Planned		3	Spring 2016	Energy Leadership Team	
6.6	Community-wide Outreach & Awareness		Low	Planned		3	Spring 2016	Energy Leadership Team	

Section 7 OTHER PROGRAMS AND PROJECTS FOR IMPLEMENTATION									
Section	**Selected Program or Project**	Action Items/Notes	Priority (select)	Status (select)	Cost ($)	Associated GOAL(s)	Target Completion Date	Assigned To	Email address

APPENDIX 3: GLOSSARY OF TERMS AND ACRONYMS

Air-side Economizer: a device that, on proper variable sensing, initiates control signals or actions to conserve energy.

ASHRAE Level II Audit: audit includes an analysis of energy use at a facility and identifies no-cost, low-cost and capital improvement energy efficiency measures with detailed energy and financial calculations.

Biomass: Organic non-fossil material of biological origin constituting a renewable energy source.

Clean Energy: energy produced from renewable sources in a process that has minimal impact to the environment

CleanPowerSF: The City and County of San Francisco's Community Choice Aggregation (CCA) program, administered by the San Francisco Public Utilities Commission (SFPUC) and monitored by the San Francisco Local Agency Formation Commission (LAFCo).

Community Choice Aggregation (CCA): efforts as developed by Alameda County or other local agencies, as appropriate. CCA permits public agencies to aggregate the electric loads of residents, businesses, and facilities to facilitate the purchase and sale of electrical energy.

Energy Benchmarking: process of collecting, analyzing and relating energy performance data of a building with the purpose of evaluating and comparing its performance to itself, other buildings within a portfolio, and/or its peers.

Energy Management System (EMS): a computer-aided tool used to monitor, measure, and control electrical building loads. Energy management systems can be used to central control devices like HVAC units and lighting systems across multiple locations. They can also provide metering, sub-metering, and monitory functions that allow facility and building managers to gather data and insight that allows them to make more informed decisions about energy activities across their sites.

ENERGY STAR ®: a government-backed labeling program that helps people and organizations save money and reduce greenhouse gas emissions by identifying factories, office equipment, home appliances and electronics that have superior energy efficiency.

Energy Use Intensity (EUI): metric that expresses a building's energy use as a function of its size or other characteristics.

Fuel Cell: A device capable of generating an electrical current by converting the chemical energy of a fuel (e.g., hydrogen) directly into electrical energy. Fuel cells differ from conventional electrical cells in that the active materials such as fuel and oxygen are not contained within the cell but are supplied from outside. It does not contain an intermediate heat cycle, as do most other electrical generation techniques.

Geothermal Energy: Hot water or steam extracted from geothermal reservoirs in the earth's crust that can be used for geothermal heat pumps, water heating, or electricity generation.

Green Building: an environmentally sustainable building, designed, constructed and operated to minimize the total environmental impacts.

Greenhouse Gas Emissions: a gas contributes to the greenhouse effect by absorbing infrared radiation, e.g., carbon dioxide and chlorofluorocarbons

Leadership in Energy and Environmental Design (LEED): a set of rating systems developed by the U.S. Green Building Council for the design, construction, operation, and maintenance of green buildings, homes and neighborhoods.

LED Lighting: a more environmentally-friendly alternative to incandescent lighting.

Plug Load: energy used by products that are powered by means of an ordinary AC plug. It typically includes office and general miscellaneous equipment, computers, elevators and escalators,

Renewable Energy: energy from a source that is not depleted when used, such as wind or solar power.

Solar Feasibility Assessment: a study that assesses energy available, risks, costs, and size of equipment most appropriate for a building or specified location

Variable Frequency Drives (VFDs): a type of motor controller that drives an electric motor by varying the frequency and voltage supplied to the electric motor.

Variable Speed Drives (VSDs): a piece of equipment that regulates the speed and rotational force, or torque output, of an electric motor.

Acronyms

ABAG: Association of Bay Area Governments
ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
CAP: Climate Action Plan
EBEW: East Bay Energy Watch
HVAC: Heating, Ventilation, and Air-Conditioning
REN: Regional Energy Network
SEP: Strategic Energy Plan

APPENDIX 4: SCHOOL AND MUNICIPAL ADVANCED RETRO-COMMISSIONING AND TUNE-UP (S.M.A.R.T) PROJECT COMPLETION REPORT (PHASE I)

School and Municipal Advanced Retro-commissioning and Tune-up (S.M.A.R.T.)

EMERYVILLE CIVIC CENTER

PHASE 1 PROJECT COMPLETION REPORT

CUSTOMER NUMBER 0613.018.053

Prepared For:

Emeryville Civic Center
1333 Park Ave.
Emeryville Ca, 94608

Prepared By:

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June 22, 2015

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Project Completion Report describes the energy efficiency measures (EEM's) installed for Emeryville Civic Center at ***Emeryville Civic Center*** in Emeryville Ca through participation in the Schools and Municipal Advanced Retro-commissioning and Tune-up (SMART) Program. ***Emeryville Civic Center*** is a single building with two sections; the older portion which is a small historic building, and the newer section, which is an addition to the historic building, and is comprised of mostly open office space. The addition envelope is mostly single pane windows, and the site has significant issues with its HVAC systems. The addition is approximately 12,000 square feet. Measures in this report pertain solely to the addition, and to exterior lights on and around the addition.

1.2 MEASURE SUMMARY

Table 1.1 provides a summary of the energy efficiency measures (EEMs) installed as a part of Phase 1. The EEMs were directly installed by the Program at no cost to the customer and therefore are not eligible for customer incentive. The calculated energy savings figures are based on equipment attributes and operating parameters.

Table 1.1: Direct-Install Energy Efficiency Measure Results

EEM	Measure Code	Description	Associated Bldg Area	Electricity Savings	Peak Demand Reduction	Natural Gas Savings
			ft²	*kWh/yr*	*kW*	*therms/yr*
1	CCB11	Optimize Economizer	12,000	91,763	0	0
2	CCA21	Reschedule Lighting	12,000	583	0	0
				92,346		

2.0 OVERVIEW

2.1 PROGRAM OVERVIEW

The School and Municipal Advanced Retro-commissioning and Tune-up (SMART) Program offers no-cost professional services and financial incentives to help Pacific Gas & Electric (PG&E) customers reduce energy use at their facilities through building controls and equipment retro-commissioning (RCx) measures. The SMART Program operates in Alameda County and San Mateo County to serve school and municipal facilities. Targeted facilities should be equipped with electrical interval meters and 100,000 Gross Square Feet (GSF) on average. The program is funded by PG&E ratepayers through the Public Goods Charge and the Public Purpose Surcharge under the auspices of the California Public Utilities Commission.

The SMART Program employs a "low touch" methodology to cost effectively serve smaller facilities by using whole building electrical interval data to remotely identify potential EEMs. An analytics based software tool customized by Gridium for Enovity is used to analyze building performance across various performance metrics. The SMART Program offers direct implementation of no-cost/low-cost measures and financial incentives for capital measures. Access to six-months of Drift Reporting is provided to alert the customer to any post-implementation efficiency losses.

2.2 CUSTOMER INTERACTION

Historically, utility funded energy efficiency programs have focused on larger commercial and industrial sites with significant opportunity for energy conservation. SMART is different type of program specifically designed to benefit smaller utility customers serving public school and municipal needs through operational tune-up and retrocommissioning measures. The SMART program is dependent on utility customer involvement in order to realize program wide energy goals. Without customer cooperation, schedule revisions and control sequence modifications are not feasible. Fine tuning control systems, equipment schedules and operating set points is a crucial part of reducing energy consumption state wide, and requires critical review of existing facility operations.

Emeryville Civic Center has been integral in ensuring the success of the SMART program at Phase 1. Without Emeryville Civic Center's desire to reduce energy consumption at their facilities numerous energy savings opportunities at these sites would not have been realized. Throughout the implementation process the Emeryville Civic Center has been aligned with the goals of the SMART program by attending planning meetings, providing knowledgeable site staff to assist in identifying energy savings opportunities, and supporting Enovity personnel on site.

Through an ongoing relationship with customers and site personnel it is a goal of the SMART program to see the energy savings measures persist at each site. To facilitate this, operational Drift Reports will be provided to Emeryville Civic Center for 6 months for Phase 1, as a part of on-going persistence monitoring and operational interpretation.

2.3 PROJECT OVERVIEW

Emeryville Civic Center submitted the program Enrollment Agreement on April 3, 2015. During the initial site assessment it was observed from logged 15 minute whole building demand data that ***Emeryville Civic Center*** has unexpected peak demand for a site with significant solar generation capability. Figure 2.1 shows the daily average demand for ***Emeryville Civic Center***. Figure 2.2 shows the site from satellite view. It can be seen in the figures that while the site has an approximately 38 nominal kW solar electric array (based on an assumed 250 watt panel size), the demand curve does not reflect the expected peak hours solar offset. Estimated annual solar generation from PV watts is 58,525 kWh. Based on facility type (office space) and typical hours of operation, the demand curve indicates significant peak hours energy use. Table 2.1 shows the baseline equipment data. In addition this site was singled out as a particularly troubled site by the City of Emeryville. The civic center is not equipped with a Smart meter, Enovity logged demand data at the meter to develop figure 2.1 and to gain insight into building operations.

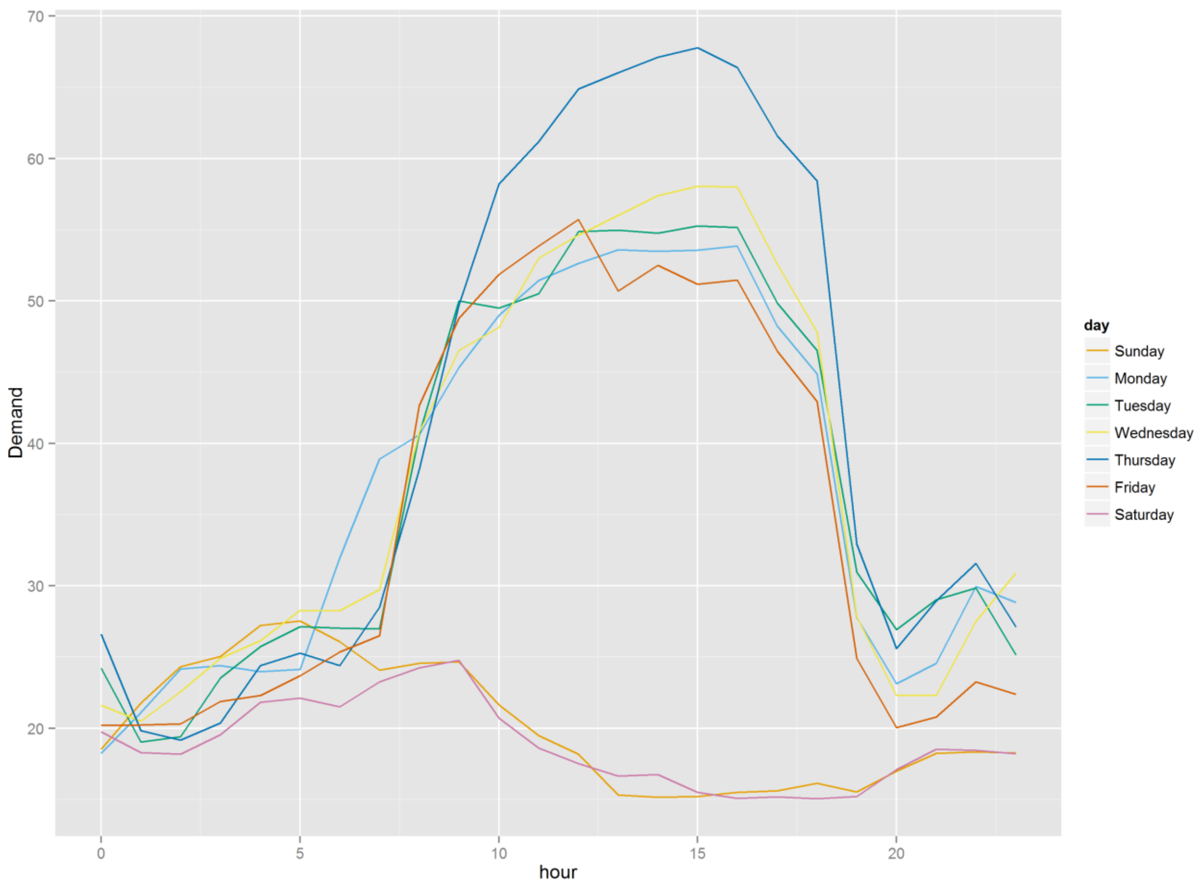


Figure 2.1: Daily average demand plot for *Emeryville Civic Center*

Figure 2.2: Satellite view of Emeryville Civic Center

Table 2.1: Baseline equipment label, service location, and schedule

Site	Equip Description	Manufacturers	Models	HP	MBH	Airflow
Emeryville Civic Center	AC-1	Trane	SXHFC75 (high capacity coil)	56	-	27,000
Emeryville Civic Center	Wattstopper Control Panel	Wattstopper	SC-100	-	-	-

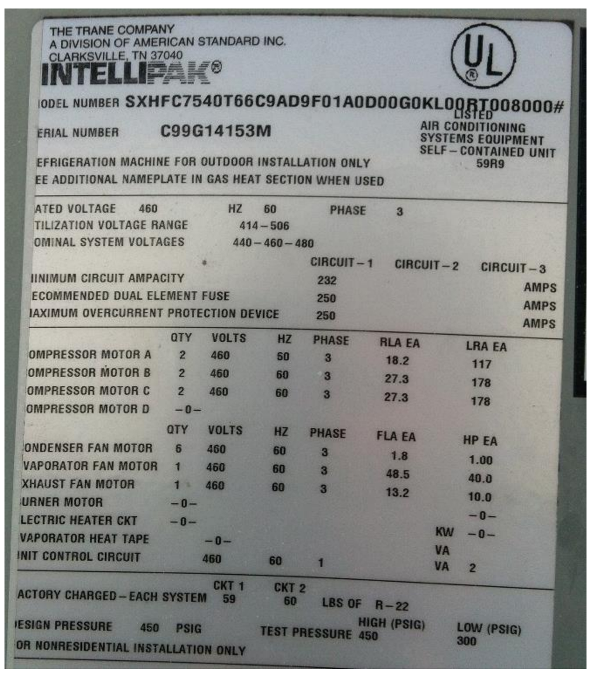


Figure 2.2: AC-1 Nameplate (Model # Indicates High Cap. And Comparative Enthalpy)

Based on the demand data the site schedule is assumed to be 6 am to 7 pm Monday through Friday for HVAC operation. Figure 2.3 shows a 3 day demand plot supporting this assumption. The days shown are typical of building operation, data has been logged for 2 months, and weekend demand is significantly reduced, showing no occupancy. The hours the building is open to the public are from 9 am to 5 pm Monday through Friday.

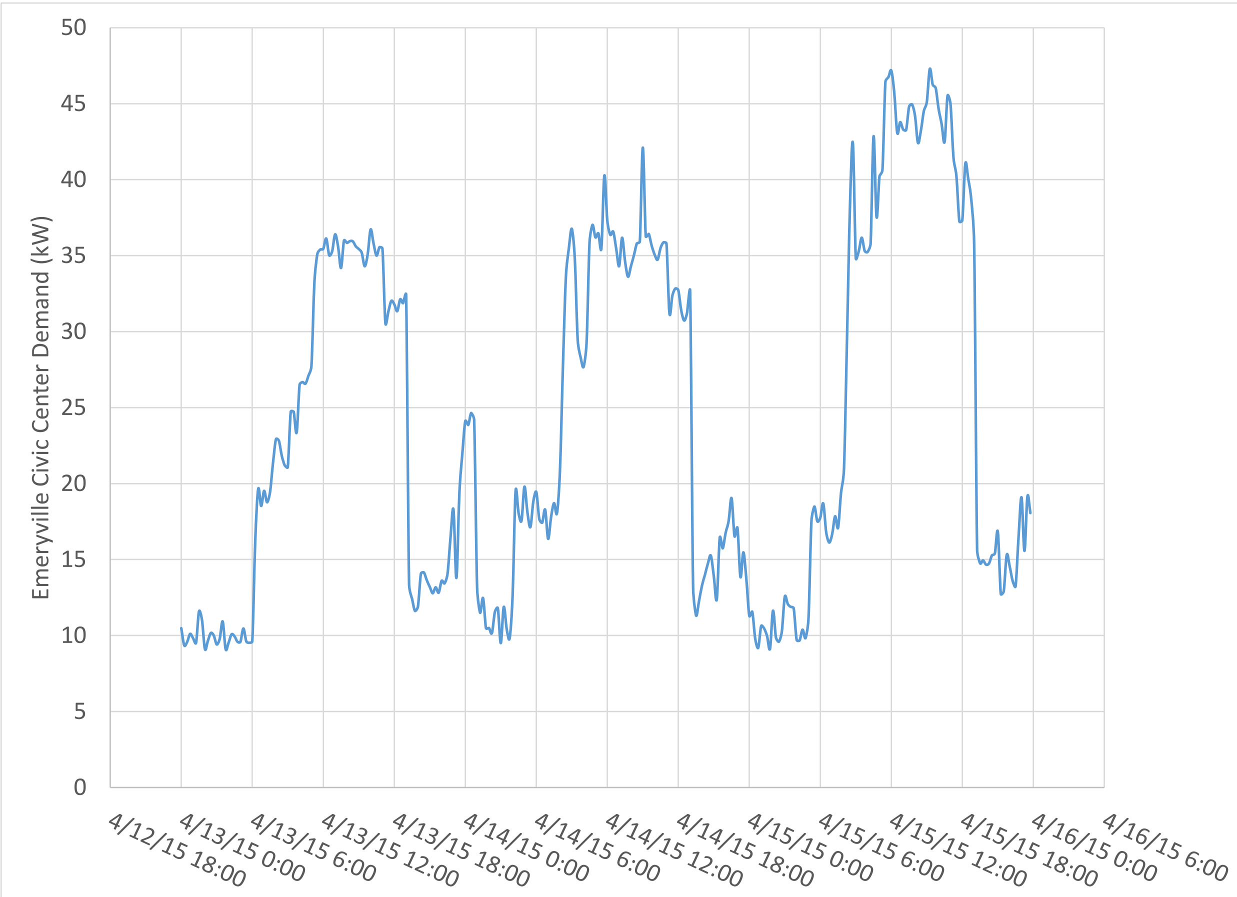


Figure 2.3: Typical Weekday Operation, (Unit has un-occupied set back operation)

3.0 ENERGY EFFICIENCY MEASURES

3.1 EEM 1 – OPTIMIZE ECONOMIZER CONTROL

3.1.1 Existing Condition

One AC unit serves the entire new wing of the Emeryville Civic Center. The unit AC-1 is a 75 ton Trane Cooling only unit. Heating is comprised of a hot water boiler and zone level re-heat coils. The building HVAC controls are on an older Delta BAS system, and includes zone level DDC control. The Trane AC unit is equipped with both a stand-alone controller and is tied into the BAS. A demand based SAT reset algorithm is in place controlling SAT based on cooling demand.

It was observed during the site inspection that the Outside Air (OA) damper set was rusted stuck, and the OA / Return Air (RA) damper actuator was no longer operational as a result of working for too long against the frozen OA damper set. The actuator was tested by disengaging the linkage and driving the OA damper 100% open. The damper blades were stuck in the minimum outside air position (20% based on local control screen set point).

By replacing the broken actuator, and ensuring a functional OA damper set, significant cooling demand can be eliminated. The site was observed to have a 72-74 degree space set point. Due to the large percentage of re-circulated air during cooling conditions, enabling the economizer should reduce excess energy consumption due to re-cooling and re-heating.

In addition, the unit is equipped with a comparative enthalpy sensor, which compares return air to outside air and disables the economizer if the outside air has a higher enthalpy than the return. Due to the zone re-heat, and the nature of the coastal climate, this control scheme is not optimal and results in significant loss of economizer operation. By disabling the comparative enthalpy control, the unit will look solely at the OA enthalpy, and lockout based on a set point, which allows for increased economizer operation depending on the set point selection. Due to the warm space temperature set point, an OA enthalpy control strategy is preferred over comparative enthalpy. The unit does not have dry bulb economizer control.

OA Damper set, Showing baseline linkage condition

Figure 3.2: Broken Actuator Serving AC-1 OA and RA Damper set

3.1.2 Measure Implemented

By removing the stuck linkage, and replacing the linkage hardware, as well as liberal application of lubricant and thorough working of blades, the damper set was made fully operational again. The actuator was replaced and tested. It proved to be fully operational. The comparative enthalpy control was disabled, and an Outside Air Enthalpy set point of 27 btu/lb was used as the economizer lockout. Figure 3.3 and 3.4 show the repaired linkage and new actuator respectively. Figure 3.5 shows the new enthalpy lockout. The unit was tested to ensure that the economizer control sequence will open the damper at enthalpies lower than the set point and successful operation was confirmed by Enovity and site personnel.

Figure 3.3: AC-1 OA Damper Linkage with new hardware

Figure 3.4: New Actuator Installed

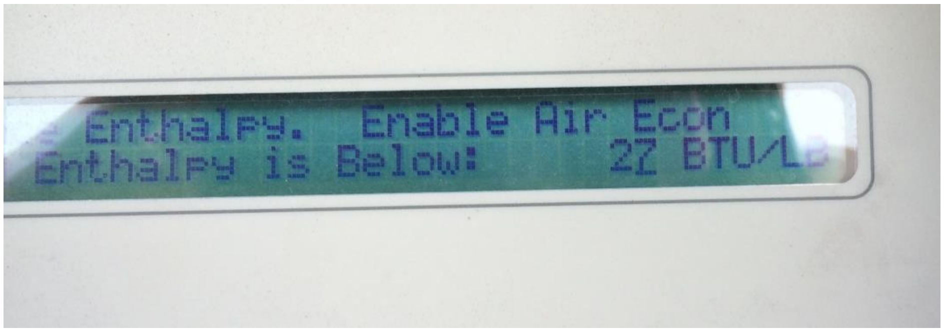


Figure 3.5: New Enthalpy Set point at 27 Btu / lb

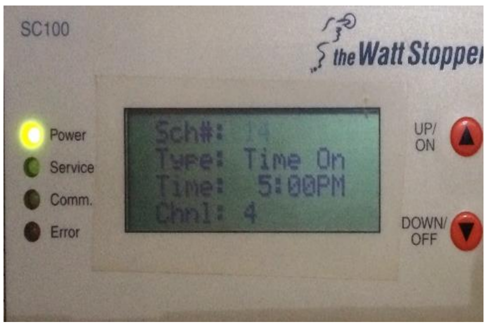
3.2 EEM 2 – REPROGRAM WATTSTOPPER CONTROLLER TO UTILIZE ASTRONOMIC CONTROL ON OUTSIDE LIGHTS

3.2.1 Existing Condition

It was observed during the site visit that the building time clock, which controls both interior and exterior lighting, uses a schedule for exterior zones, which does not reflect daylight conditions. It was requested by the site that the exterior lights be put on astronomical control, to reduce energy usage during daylight hours and summer months. Two circuits are controlled by the Wattstopper controller, one circuit serves the parking lot lighting and front entry lighting, which is comprised of 18 150 watt MH fixtures (a total of 2.7 kW). The other circuit controls main entrance, fountain, and ground lighting, which is comprised of 2 150 watt MH fixtures and 14 ground lights at 35 watts each (a total of 0.790 kW). The baseline schedule for the parking lot lights is 7 pm to 7 am. The baseline schedule for the front entry / fountain lights is 5 pm to 10 pm. Fountain / Landscape lighting operate Monday through Friday, parking lot and entry lighting operate 7 days a week and on holidays. Figure 3.6 shows the baseline control for the exterior lighting circuits. Daily operation is indicated by asterisk beneath the day letter.

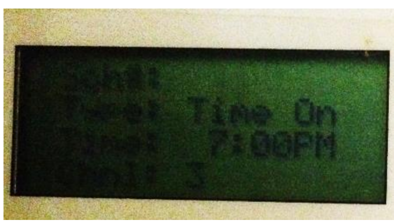
Figure 3.6: Baseline Schedules

Baseline Start for Fountain / Landscape Lights



Baseline days for Fountain / Landscape Lights

Baseline Start for Parking / Front Entry



Baseline Stop for Parking Front Entry

Figure 3.7: Parking Days of Operation

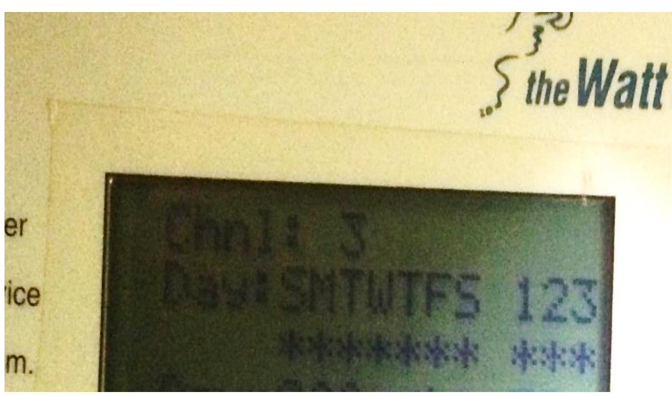
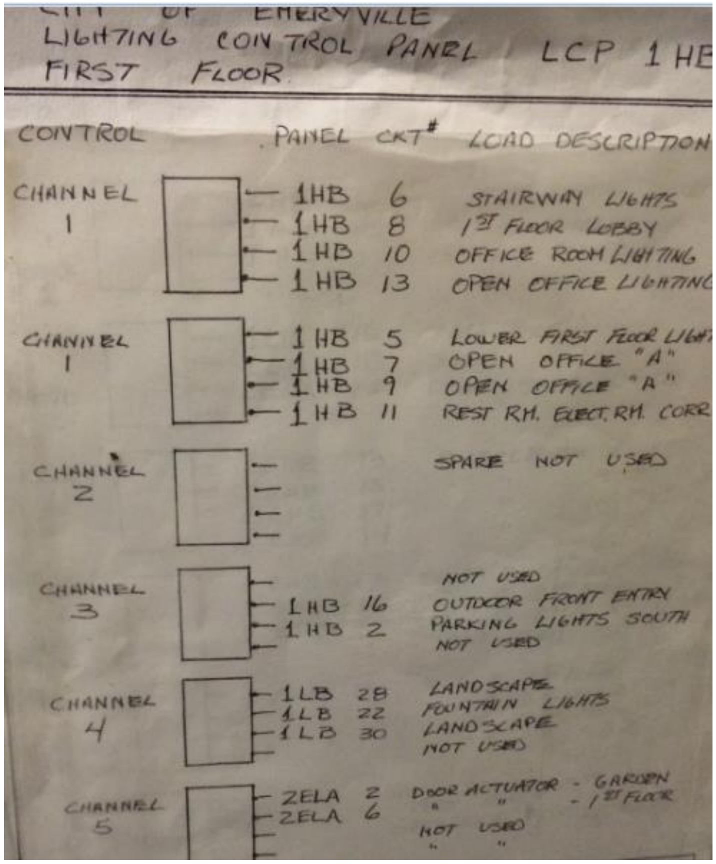


Figure 3.8: AH-1 Watt stopper Channels (Channels 3 and 4 are affected by this measure)

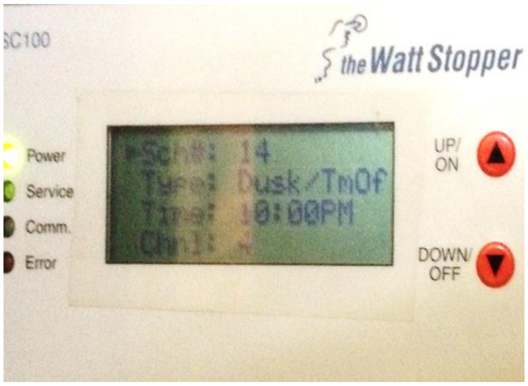


3.2.2 Measure Implemented

Both lighting circuits were re-programmed to take advantage of astronomic control strategies. The fountain and landscape lighting (Circuit 4) was re-programmed to turn on at sunset, and off at the scheduled time of 10 pm, while the parking lot lighting was programmed to turn on at Dusk, and off at Dawn. There is little energy savings from this measure, however the resulting lighting operation will better fit the intended use.

Figure2.5: Return Air Damper after Repair

Revised Start Stop for Landscape Lights



Revised Start Stop for Parking Lights

4.0 ATTACHMENTS AND KEY PARAMETERS

Measure savings were calculated using the BOA[1] tool, and a Custom Calculation Bin Analysis. This tool is endorsed by PG&E for calculating the energy and cost savings from common energy measures. Crucial inputs and performance parameters are described below.

4.1 ATTACHMENTS

1. BOA Calculation File, see Economizer tab for AC unit
2. Custom Calculation Spreadsheet for Astronomic Lighting Control
3. Initial Site Visit Findings
4. Invoice

4.2 KEY PARAMETERS

Equipment specifications can be found in Table 2.1.

EEM 1: Measure savings for AC equipment were calculated using the BOA tool. The BOA tool is an industry standard calculation tool. Inputs to the BOA tool include:

1. System inputs
   a. VAV, DX cooling, Hot Water Re-heat, Building Vintage
2. TMY zone
   a. CZ 3
3. Baseline % outside air
   a. 20%
4. AC-1 Cooling Capacity
   a. 75 tons

EEM 2: Measure savings for lighting equipment were made using a custom bin analysis. Inputs to Custom Calculation include:

1. Baseline schedules for both circuits
   a. Parking and Entry: 7 pm to 7 am 7 days a week
   b. Landscape and fountain: 5 pm to 10 pm 5 days a week
2. Sunrise and sunset times for 2015 (from Federal website)
3. DST start and stop for 2015
   a. March 8 start, Nov. 1 finish

[1] http://www.cacx.org/resources/rcxtools/spreadsheet_tools.html

4.3 ACTUATOR INVOICE

Your Order #111630 (placed on May 5, 2015 10:41:25 AM PDT)

Shipping Information:

robert rodriguez
enovity
100 montgomery st suite 600
san francisco, California, 94104
United States
T: [redacted]
Cell Number: [redacted]
F: 112

Shipping Method:

Select Shipping Method - UPS Ground

Item	Sku	Qty	Subtotal
24V S/R 2/10VDC DamperActuator	OPR0143	1	$533.52
		Subtotal	$533.52
		Shipping & Handling	$24.95
		Grand Total	**$558.47**

APPENDIX 5: SCHOOL AND MUNICIPAL ADVANCED RETRO-COMMISSIONING AND TUNE-UP (S.M.A.R.T) PROJECT COMPLETION REPORT (PHASE II)

School and Municipal Advanced Retro-commissioning and Tune-up (S.M.A.R.T.)

EMERYVILLE CIVIC CENTER

PHASE 2 PROJECT COMPLETION REPORT

CUSTOMER NUMBER 0613.018.053

Prepared For:

Emeryville Civic Center
1333 Park Ave.
Emeryville Ca, 94608

Prepared By:

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August 10, 2015

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Project Completion Report describes the energy efficiency measures (EEM's) installed for Emeryville Civic Center at ***Emeryville Civic Center*** in Emeryville Ca through participation in the Schools and Municipal Advanced Retro-commissioning and Tune-up (SMART) Program. ***Emeryville Civic Center*** is a single building with two sections; the older portion which is a small historic building, and the newer section, which is an addition to the historic building, and is comprised of mostly open office space. The addition envelope is mostly single pane windows, and the site has significant issues with its HVAC systems. The addition is approximately 12,000 square feet. Measures in this report pertain solely to the addition, and to exterior lights on and around the addition.

1.2 MEASURE SUMMARY

Table 1.1 provides a summary of the energy efficiency measures (EEMs) installed as a part of Phase 2. The EEMs were directly installed by the Program at no cost to the customer and therefore are not eligible for customer incentive. The calculated energy savings figures are based on equipment attributes and operating parameters.

Table 1.1: Direct-Install Energy Efficiency Measure Results

EEM	Measure Code	Description	Associated Bldg Area	Electricity Savings	Peak Demand Reduction	Natural Gas Savings
			ft^2	*kWh/yr*	*kW*	*therms/yr*
1	CCB11	Reduce Zone Airflow Set Points	12,000	11,432	4.72	4,574
				11,432	**4.72**	**4,574**

2.0 OVERVIEW

2.1 PROGRAM OVERVIEW

The School and Municipal Advanced Retro-commissioning and Tune-up (SMART) Program offers no-cost professional services and financial incentives to help Pacific Gas & Electric (PG&E) customers reduce energy use at their facilities through building controls and equipment retro-commissioning (RCx) measures. The SMART Program operates in Alameda County and San Mateo County to serve school and municipal facilities. Targeted facilities should be equipped with electrical interval meters and 100,000 Gross Square Feet (GSF) on average. The program is funded by PG&E ratepayers through the Public Goods Charge and the Public Purpose Surcharge under the auspices of the California Public Utilities Commission.

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2.2 CUSTOMER INTERACTION

Historically, utility funded energy efficiency programs have focused on larger commercial and industrial sites with significant opportunity for energy conservation. SMART is different type of program specifically designed to benefit smaller utility customers serving public school and municipal needs through operational tune-up and retrocommissioning measures. The SMART program is dependent on utility customer involvement in order to realize program wide energy goals. Without customer cooperation, schedule revisions and control sequence modifications are not feasible. Fine tuning control systems, equipment schedules and operating set points is a crucial part of reducing energy consumption state wide, and requires critical review of existing facility operations.

Emeryville Civic Center has been integral in ensuring the success of the SMART program for Phase 2. Without Emeryville Civic Center's desire to reduce energy consumption at their facilities numerous energy savings opportunities at these sites would not have been realized. Throughout the implementation process the Emeryville Civic Center has been aligned with the goals of the SMART program by attending planning meetings, providing knowledgeable site staff to assist in identifying energy savings opportunities, and supporting Enovity personnel on site.

Through an ongoing relationship with customers and site personnel it is a goal of the SMART program to see the energy savings measures persist at each site. To facilitate this, operational Drift Reports will be provided to Emeryville Civic Center for 6 months for Phase 2, as a part of on-going persistence monitoring and operational interpretation.

2.3 PROJECT OVERVIEW

Emeryville Civic Center submitted the program Enrollment Agreement on April 3, 2015. During the initial site assessment it was observed from logged 15 minute whole building demand data that ***Emeryville Civic Center*** has unexpected peak demand for a site with significant solar generation capability. Figure 2.1 shows the daily average demand for ***Emeryville Civic Center***. Figure 2.2 shows the site from satellite view. It can be seen in the figures that while the site has an approximately 38 nominal kW solar electric array (based on an assumed 250 watt panel size), the demand curve does not reflect the expected peak hours solar offset. Estimated annual solar generation from PV watts is 58,525 kWh. Based on facility type (office space) and typical hours of operation, the demand curve indicates significant peak hours energy use. Table 2.1 shows the baseline equipment data. In addition this site was singled out as a particularly troubled site by the City of Emeryville. The civic center is not equipped with a Smart meter, Enovity logged demand data at the meter to develop figure 2.1 and to gain insight into building operations.

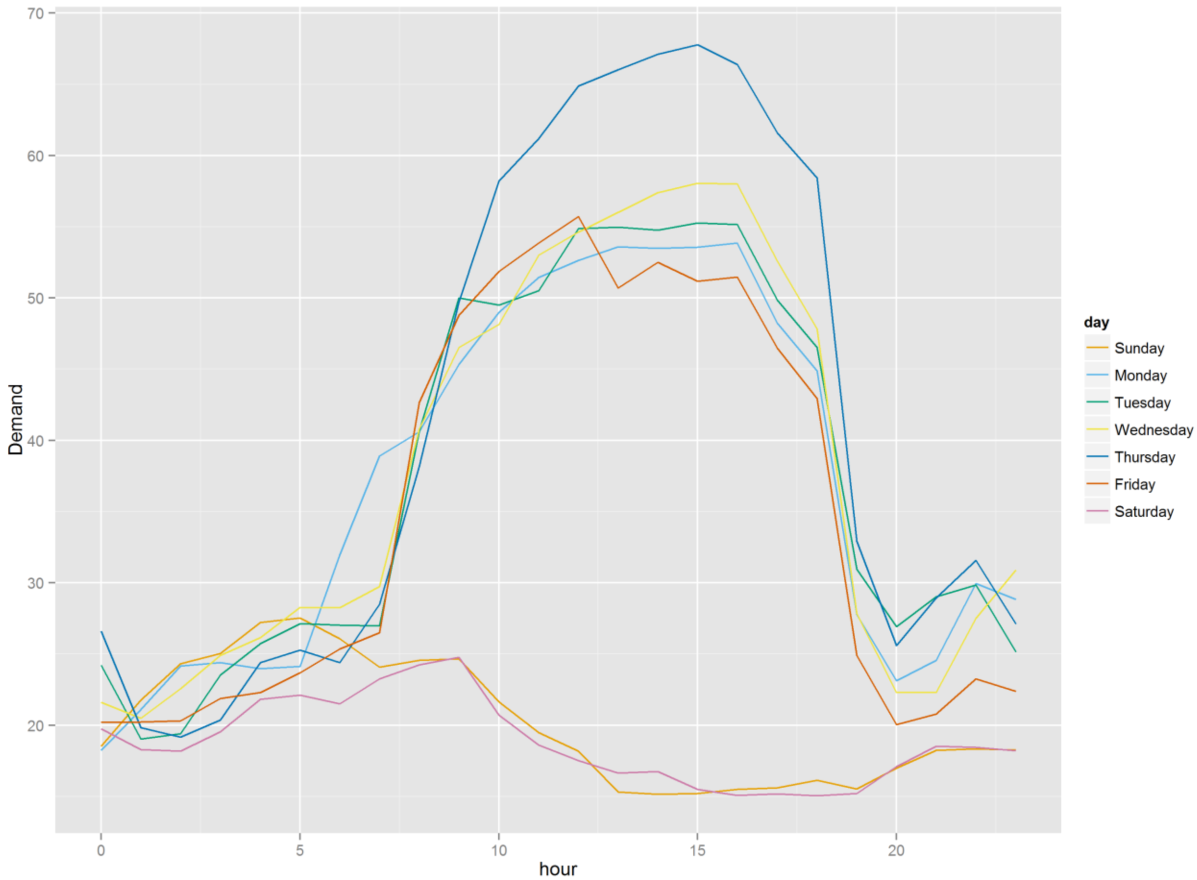


Figure 2.1: Daily average demand plot for *Emeryville Civic Center*

Figure 2.2 shows the site from satellite view. AC-1, the two building wings, and the solar array can be seen in the figure.

Figure 2.2: Satellite view of Emeryville Civic Center

Table 2.1 shows relevant equipment and specifications. Figure 2.2 shows the AC-1 nameplate, while Figure 2.3 shows the heating hot water system.

Table 2.1: Baseline equipment label, service location, and schedule

Site	Equip Description	Manufacturers	Models	HP	MBH	Airflow
Emeryville Civic Center	AC-1	Trane	SXHFC75 (high capacity coil)	56	-	27,000
Emeryville Civic Center	Boiler B-1	Teledyne Laars	PH1010	-	1010	-

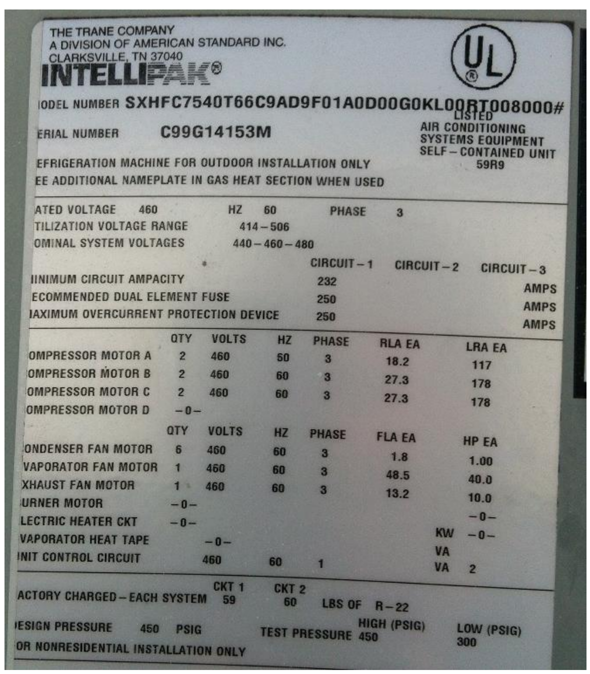


Figure 2.2: AC-1 Nameplate (Model # Indicates High Cap. And Comparative Enthalpy)

Figure 2.3: Boiler B-1, Providing HHW for the Civic Center

The Boiler schedule, seen at the BAS is from 5 am to 6 pm Monday, and 6 am to 6 pm Tuesday through Friday. Figure 2.4 shows a 3 day demand plot from logged electrical data. The days shown are typical of building operation, data has been logged for 2 months, and weekend demand is significantly reduced, showing no occupancy. The hours the building is open to the public are from 9 am to 5 pm Monday through Friday.

Figure 2.5 shows monthly gas usage for the civic center, with the annual total at about 17,500 Therms. This is about 1.5 Therms per square foot, which is significantly higher than benchmarked average gas usage for office buildings.

The BAS is 15 years old, and the site would benefit from a retrofit or upgrade, with additional control of AC-1, and advanced demand based sequences.

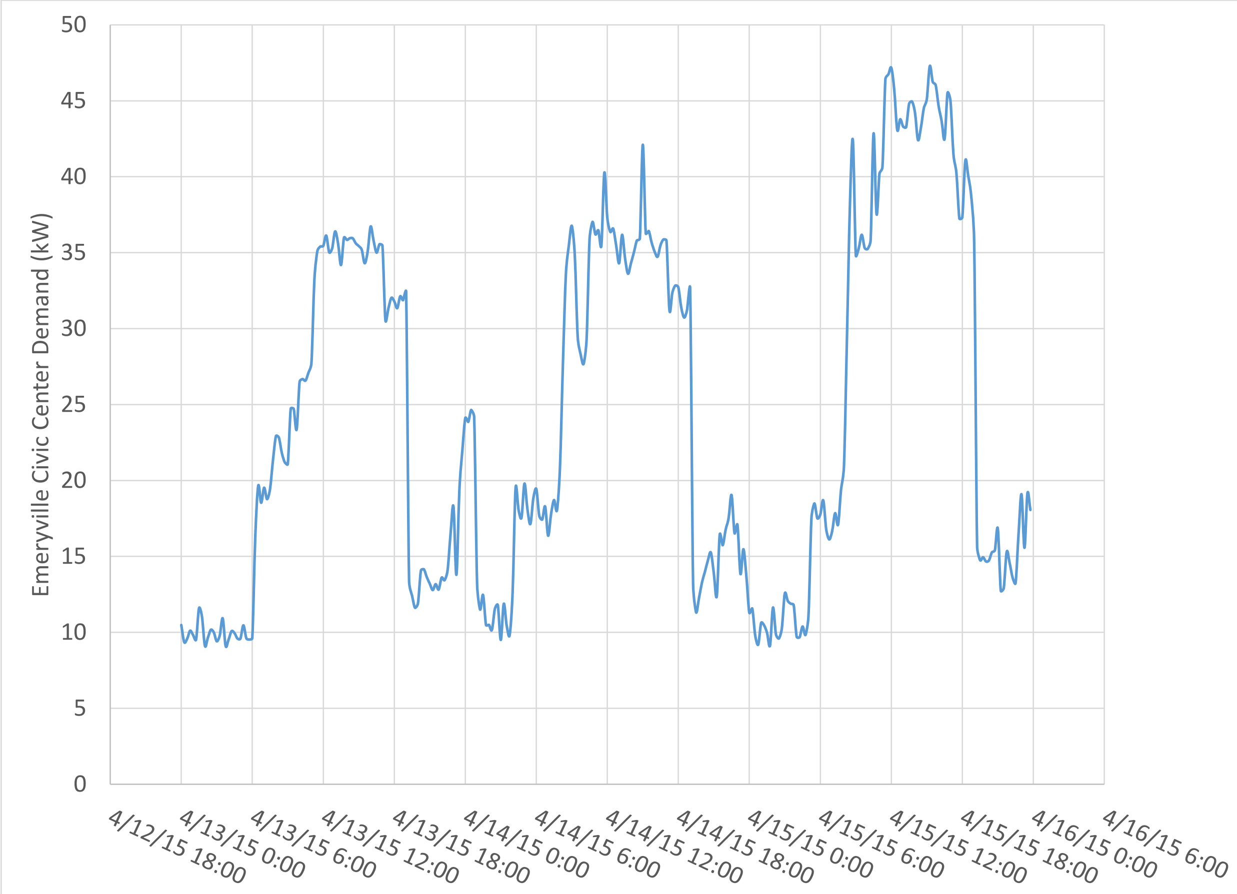


Figure 2.4: Typical Weekday Operation, (Unit has un-occupied set back operation)

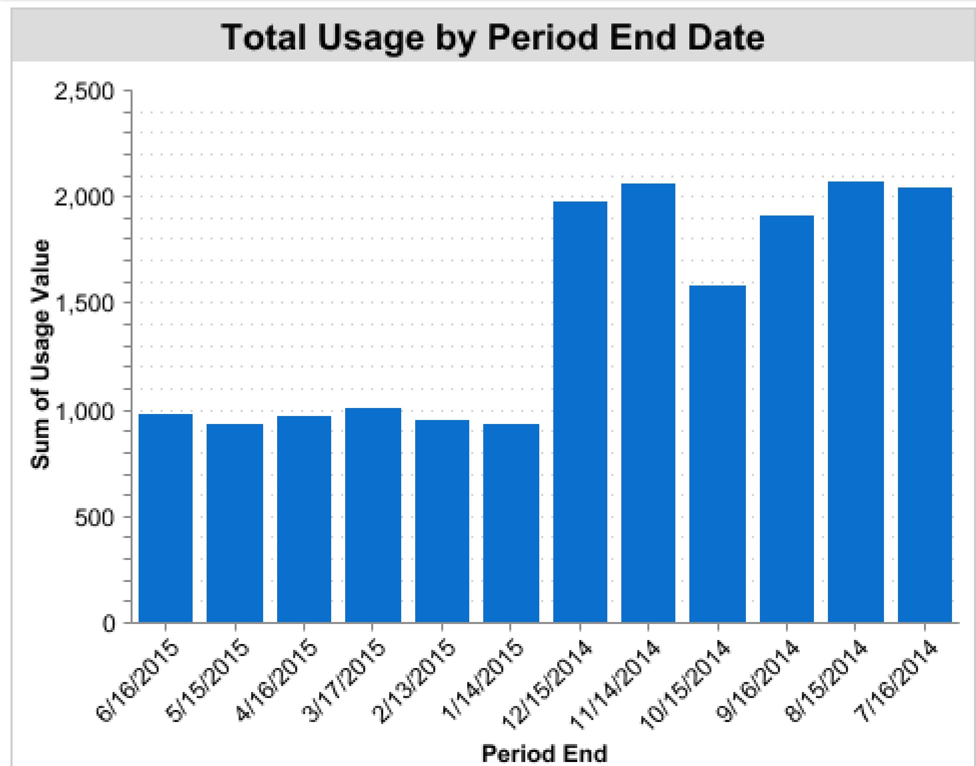


Figure 2.5: Annual Gas Usage at Emeryville Civic Center

3.0 ENERGY EFFICIENCY MEASURES

3.1 EEM 1 – REDUCE ZONE LEVEL AIRFLOWS

3.1.1 Existing Condition

It was observed during site visits that zone airflows, specifically maximum heating airflow set points are much higher than either design airflow set points, or maximum cooling airflow set points. Typically cooling airflows are higher than heating airflows. Additionally, facility gas usage is very high for the site, as seen in figure 2.5. Site facilities personnel expressed a desire to reduce gas consumption, and if possible improve comfort for occupants. An occupant survey indicated that high airflows are the driving factor in discomfort, due to noise, and noticeable air movement.

The zone valves and dampers are equipped with digital control, and a dual maximum airflow control strategy. Zones are equipped with airflow sensors, however many of them (especially on the first floor) appear to be broken, or disabled.

It is recommended that in the short term zone airflow set points are standardized, and heating airflows reduced. In the long term, retrofitting the BAS system, and optimizing the zone control is recommended, which may require some mechanical upgrades (zone valves, and diffusers), as well as for the zones to be re-balanced.

Figure 3.1 shows an example screen shot showing the airflow set points during the baseline condition. All but two zones were found to have higher heating flows than cooling flows.

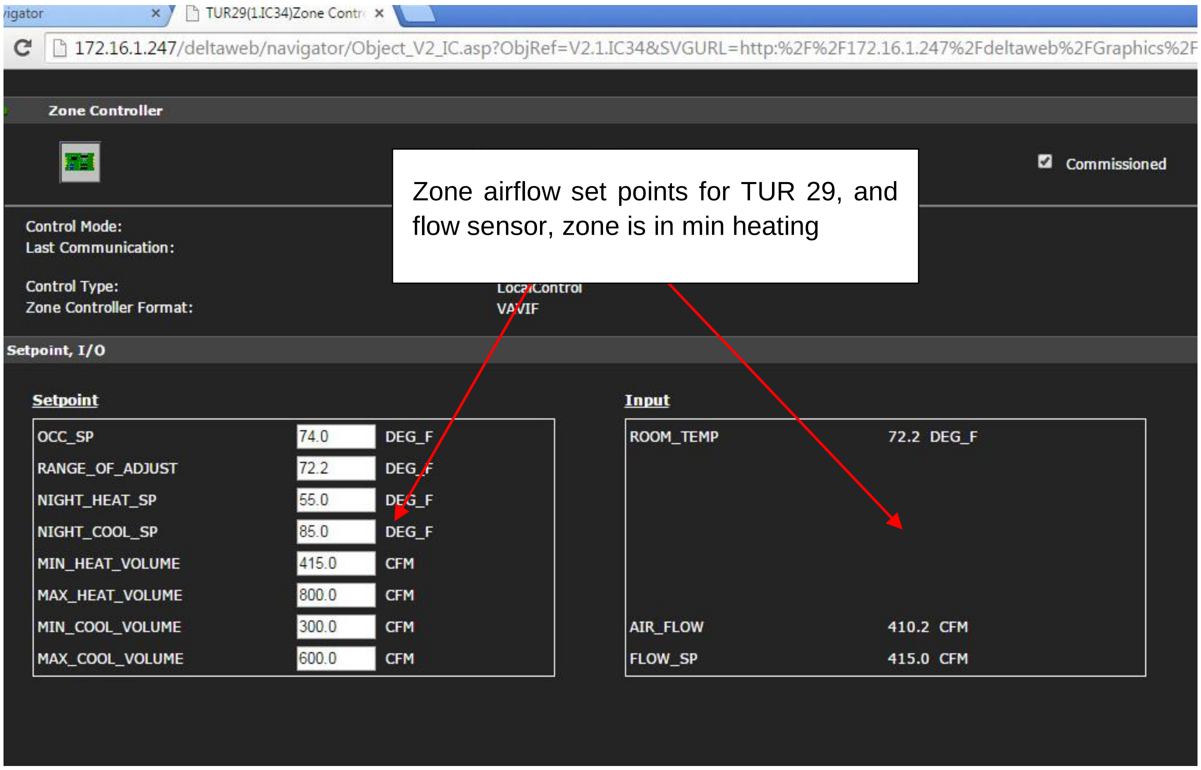


Figure 3.1: TUR 29 zone flow set points and flow sensor output

3.1.2 Measure Implemented

Maximum heating airflows were reduced for most zones. For zones where cooling flows matched design flows, and heating flows exceeded design flows, design airflows were used as the new set points. Due to the design of the HVAC system, some of the high ceiling open area zones, such as the stair case, and the lobby, had high design airflows, however both heating and cooling flows have been subsequently reduced. For zones with reduced flows already, max heating airflows were reduced to match max cooling airflows, and the same for min heating airflows. The baseline and post airflow totals can be seen in table 3.1. A more detailed account of changes zone by zone can be found in Appendix A.

set point	heating (CFM)		Cooling (CFM)	
	baseline	post	baseline	post
max	28,065	16,570	19,516	18,641
min	14,950	9,325	9,960	9,680

Figure 3.3: Baseline and Post Airflow Set points

Figure 3.4 shows the post installation airflow set points. For this zone, the maximum heating airflow was revised to match design heating airflow, reducing the max heating flow by 285 CFM. All other airflows were left as found. For TUR 29. For most zones cooling airflows were left alone. A few zones were found to have cooling airflows in significant excess of design airflows, these zones were reduced to match design.

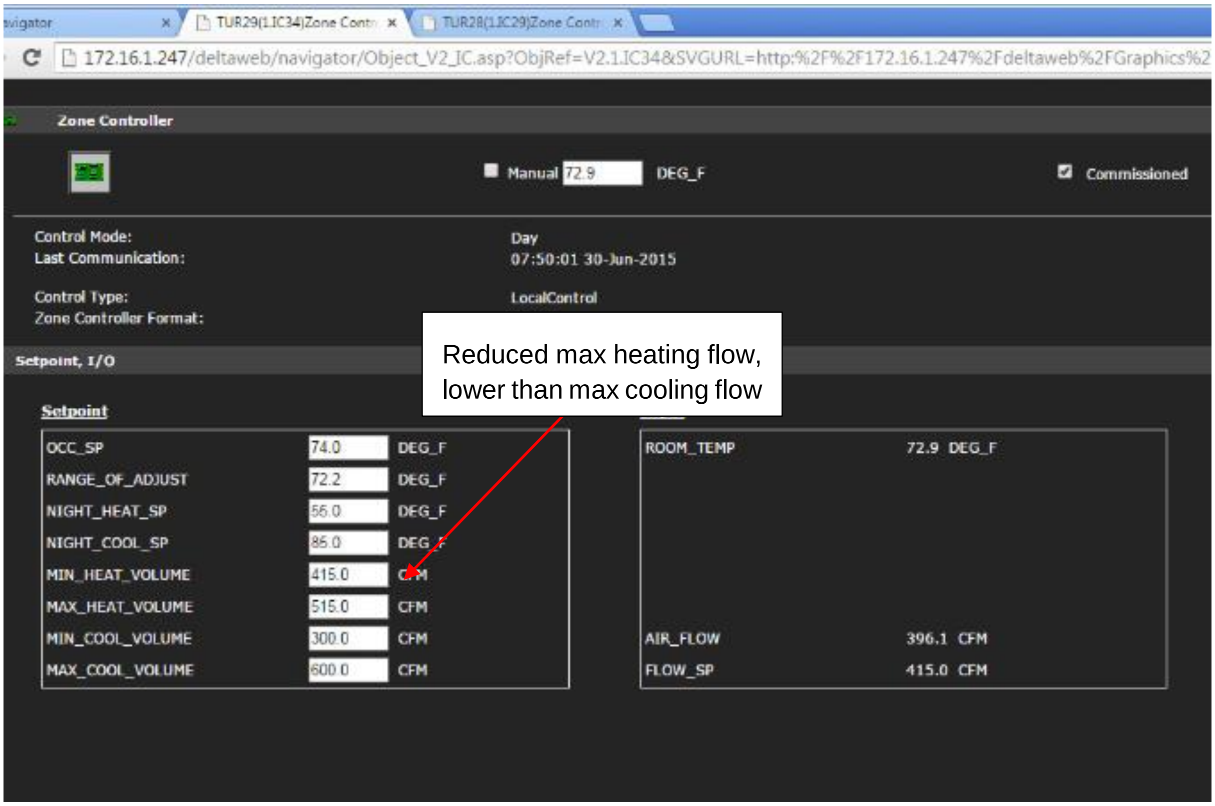


Figure 3.4: Post install flow set points for TUR 29

4.0 ATTACHMENTS AND KEY PARAMETERS

Measure savings were calculated using the CBOA[1] tool. This tool is endorsed by PG&E for calculating the energy and cost savings from common energy measures. Crucial inputs and performance parameters are described below.

4.1 ATTACHMENTS

1. CBOA Calculation File
2. Baseline and post installation zone airflow set point spreadsheet
3. Initial Site Visit Findings

4.2 KEY PARAMETERS

Equipment specifications can be found in Table 2.1.

EEM 1: Measure savings were calculated using the CBOA tool. The CBOA tool is an industry standard calculation tool. Boiler plant efficiency, and re-heat temperature were used to calibrate the model to match billed gas consumption. Inputs to the CBOA tool include:

1. AC unit specifications (See table 2.1)
2. Boiler Specifications (See table 2.1)
3. Minimum and maximum flows for heating and cooling
    a. Taken from baseline and post install screen shots
4. Economizer operation
    a. 20% to 100% based on outside air enthalpy
5. Re-heat temperature (measured on site, adjusted to calibrate modeled gas consumption to match bills.)
6. Return air temperature (estimated 2 degree rise from average zone set point of 74 degrees.)

[1] http://www.cacx.org/resources/rcxtools/spreadsheet_tools.html

4.3 APPENDIX A: DESIGN AIRFLOWS

TERMINAL UNITS

SYMBOL	MANUFACTURER	SERIES	INLET SIZE	COOLING (CFM)	HEATING (CFM)	TOTAL P UNIT & COIL (IN. W.C.)	EAT / EWT	HEATING COIL CAPACITY (MBH/HR.)	GPM	BRANCH PIPING SIZE	COIL
TUR 1	TITUS	DESV	14"	3,135	1,570	0.5 MAX	55°F / 180°F	77.7	5.2	1"	2 ROW
TUR 2	TITUS	DESV	10"	790	395	0.5 MAX	55°F / 180°F	18.5	1.2	3/4"	2 ROW
TUR 3	TITUS	DESV	10"	840	420	0.5 MAX	55°F / 180°F	24.8	1.7	3/4"	2 ROW
TUR 4	TITUS	DESV	10"	775	390	0.5 MAX	55°F / 180°F	19.2	1.3	3/4"	2 ROW
TUR 5	TITUS	DESV	12"	1,590	795	0.5 MAX	55°F / 180°F	39.7	2.7	3/4"	2 ROW
TUR 6	TITUS	DESV	8"	620	310	0.5 MAX	55°F / 180°F	12.1	0.8	3/4"	2 ROW
TUR 7	TITUS	DESV	8"	665	335	0.5 MAX	55°F / 180°F	12.7	0.9	3/4"	2 ROW
TUR 8	TITUS	DESV	10"	1,095	550	0.5 MAX	55°F / 180°F	27.4	1.8	3/4"	2 ROW
TUR 9	TITUS	DESV	10"	930	465	0.5 MAX	55°F / 180°F	15.9	1.1	3/4"	2 ROW
TUR 10	TITUS	DESV	10"	1,030	515	0.5 MAX	55°F / 180°F	21.7	1.5	3/4"	2 ROW
TUR 11	TITUS	DESV	10"	935	470	0.5 MAX	55°F / 180°F	18.9	1.3	3/4"	2 ROW
TUR 12	TITUS	DESV	10"	935	470	0.5 MAX	55°F / 180°F	18.9	1.3	3/4"	2 ROW
TUR 13	TITUS	DESV	8"	415	210	0.5 MAX	55°F / 180°F	13.3	0.9	3/4"	2 ROW
TUR 14	TITUS	DESV	8"	640	395	0.5 MAX	55°F / 180°F	16.7	1.2	3/4"	2 ROW
TUR 15	TITUS	DESV	10"	1,020	650	0.5 MAX	55°F / 180°F	28.2	1.8	3/4"	2 ROW
TUR 16	TITUS	DESV	14"	1,815	940	0.5 MAX	55°F / 180°F	63.7	4.2	3/4"	2 ROW
TUR 17	TITUS	DESV	10"	1,045	525	0.5 MAX	55°F / 180°F	31.1	2.1	3/4"	2 ROW
TUR 18	TITUS	DESV	10"	965	485	0.5 MAX	55°F / 180°F	30.0	2.0	3/4"	2 ROW
TUR 19	TITUS	DESV	10"	960	480	0.5 MAX	55°F / 180°F	29.9	2	3/4"	2 ROW
TUR 20	TITUS	DESV	12"	1,330	665	0.5 MAX	55°F / 180°F	41.8	2.8	3/4"	2 ROW
TUR 21	TITUS	DESV	10"	770	385	0.5 MAX	55°F / 180°F	17.5	1.2	3/4"	2 ROW
TUR 22	TITUS	DESV	10"	770	385	0.5 MAX	55°F / 180°F	17.5	1.2	3/4"	2 ROW
TUR 23	TITUS	DESV	12"	1,270	635	0.5 MAX	55°F / 180°F	32.9	2.2	3/4"	2 ROW
TUR 24	TITUS	DESV	8"	690	345	0.5 MAX	55°F / 180°F	16.0	1.1	3/4"	2 ROW
TUR 25	TITUS	DESV	10"	1,015	510	0.5 MAX	55°F / 180°F	25.0	1.7	3/4"	2 ROW
TUR 26	TITUS	DESV	10"	3,190	1,595	0.5 MAX	55°F / 180°F	76.2	5.1	1"	2 ROW
TUR 27	TITUS	DESV	10"	775	390	0.5 MAX	55°F / 180°F	16.8	1.1	3/4"	2 ROW
TUR 28	TITUS	DESV	6"	325	300	0.5 MAX	55°F / 180°F	10.7	0.7	3/4"	2 ROW
TUR 29	TITUS	DESV	10"	1,025	515	0.5 MAX	55°F / 180°F	23.3	1.6	3/4"	2 ROW
TUR 30	TITUS	DESV	8"	700	350	0.5 MAX	55°F / 180°F	16.5	1.1	3/4"	2 ROW

APPENDIX 6: EMERYVILLE CIVIC CENTER INVESTIGATION REPORT

QuEST

MUNICIPAL IMPLEMENTATION TEAM

Emeryville Civic Center
Investigation Report
QuEST, Inc.

1. Overview

Description of Building

The Emeryville Civic Center is comprised of an 8,000 square foot historic town hall built in 1903, which was renovated in 2000; and a newer 18,000 square foot building which was constructed in 2000. Both buildings are two stories tall and house City offices.

The new building is conditioned by a Trane self-contained air-cooled packaged air handler with 30 VAV terminal boxes. Terminal heating is provided by a 1 Million BTUH Reypak boiler at the terminal reheat boxes. The boiler used to have a 2 HP constant speed pump for hot water circulation but was recently replaced by a 0.5 HP constant speed pump. There are two rooftop split units that serve the elevator machine room and the IT and server closet.

The old town hall building is conditioned by six (6) Trane split heat pumps with indoor and outdoor units. There are two (2) ~5000 CFM and six (6) ~1000 CFM exhaust fans for smoke control. The building has a Delta Controls EMCS System which was installed in 2000. Even though all the units are integrated into the EMCS, the controls system has very limited control capability over the HVAC system in the building.

Taylor Engineering, Inc. conducted a broad assessment of the HVAC system of the Civic Center building in 2012, and made various recommendations that address different occupancy and energy consumption issues in the building. However the potential energy efficiency measures that address energy saving and occupant comfort recommended by Taylor Engineering had not yet been addressed or implemented.

By taking the Taylor Engineering report as a basis, QuEST conducted a site visit to assess the HVAC system at the Emeryville Civic Center on April 6, 2015. The assessment revealed a number of potential energy efficiency measures which are outlined in this report. During the site visit at the Emeryville Civic Center, staff explained that the Old Town Hall building does not have serious occupant comfort issues. On the other hand, the new civic center building has a number of issues that need immediate attention. This report discusses energy-saving strategies at the new building.

Utility Information

There is one shared electric meter for both buildings and separate gas meters for each building. Since there are no major issues at the Old Town Hall building, only the gas consumption of the new building is displayed below (Figure 1.1c). Figures 1.1a, 1.1b, and 1.1c show the Civic Center's monthly electric consumption, monthly electric demand, and monthly gas consumption (new building), respectively.

Figure 1.1a
Monthly Electric Consumption of the Civic Center Building

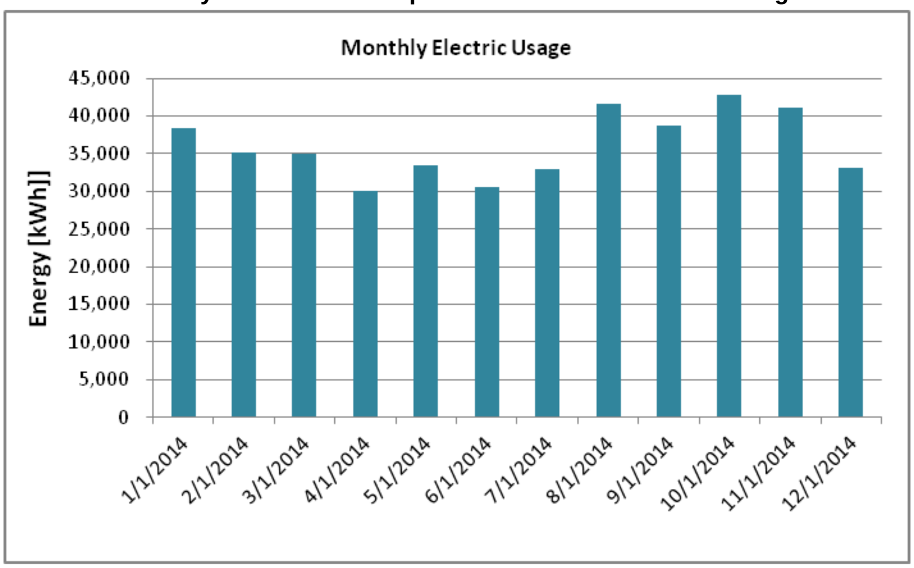


Figure 1.1b
Monthly Electric Demand of the Civic Center Building

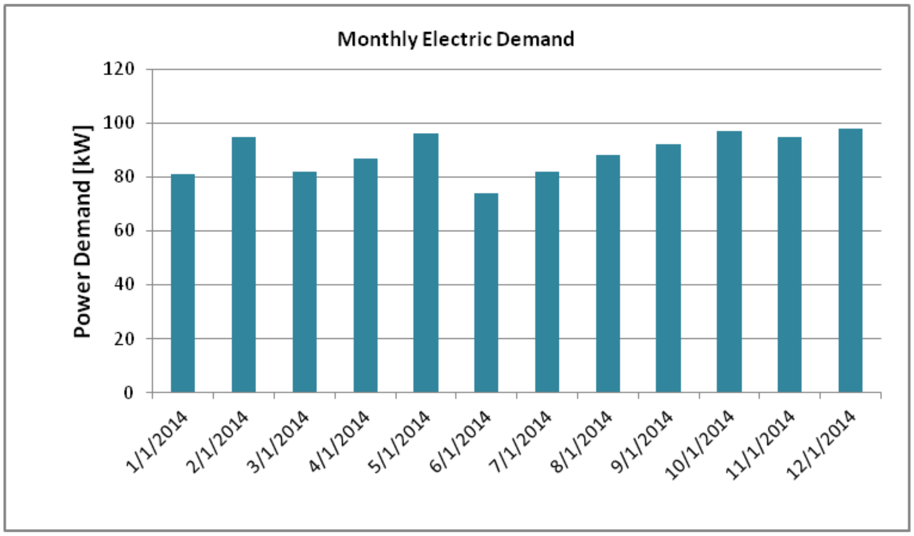
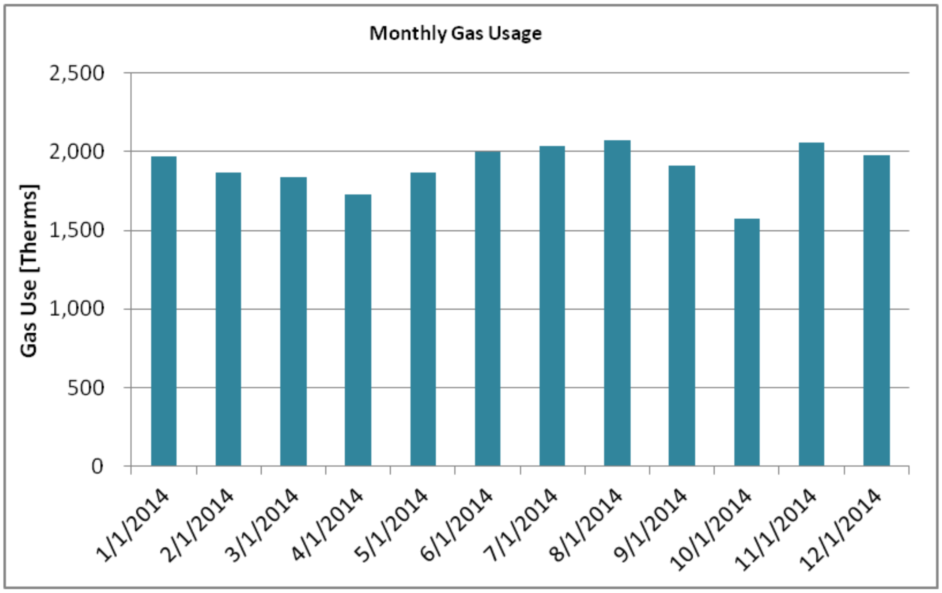


Figure 1.1c
Monthly Gas Consumption of the New Civic Center Building



The new building has an unusual gas consumption pattern where the highest gas consumption occurs in summer. QuEST has been working in partnership with PG&E and Enovity's SMART RCx (retrocommissioning) Program to identify the causes of atypical energy use patterns and high energy use. Enovity has already implemented a number of energy saving strategies to address energy performance of HVAC equipment and systems. Strategies presented in this report are exclusive of those implemented by Enovity.

Equipment

- Single 75 Ton TRANE self-contained packaged unit that serves 30 VAV terminal boxes.
- Single heating hot water system comprised of 1 Million BTUH Raypak Boiler and one 0.5-HP single-phase constant speed pump that serve the new building.
- Two Roof top split units that serve the elevator machine room and the server closet.
- Six (6) TRANE split heat pumps with air handler units with cooling capacity ranging from 2.5 to 5 Tons and heating capacity ranging from 31.2 to 40 kBTUH that serve the Old Town hall building.
- Two (2) 5000 CFM and six (6) 1000 CFM exhaust fans for smoke control.
- Approximately 35 Delta Room Thermostats between both buildings.

2. Potential Energy Efficiency Measures

There are a number of energy performance issues at the new Emeryville Civic Center building. The energy efficiency strategies, or measures, that are described below can correct targeted issues and are eligible for rebate funds through the MIT program. Since the Old Town Hall building has no reported efficiency or comfort issues, all efficiency opportunities described in this report address the issues in the new building.

M1 – Boiler Retrofit
The existing Raypak boiler is a 14-year-old 1 Million BTUH atmospheric combustion boiler with 84% thermal efficiency. The boiler is situated in an exposed area with no weather protection and has worn-out parts. It is integrated to the Delta EMCS but, other than a simple enable set-point control, it has no demand based control. This measure recommends replacing this boiler with a more efficient (~95%) condensing boiler with similar capacity and integrating it to the EMCS. The estimated natural gas savings associated with replacing the existing boiler with a more efficient boiler is presented in Table 2.2.

M2 – Heating Hot Water System Schedule Optimization
Currently the heating hot water system in the building runs 24/7 and has no schedule. Given that the building is entirely for office purpose and is not occupied during weekends, schedule optimization is an appropriate and high-impact saving strategy for the Civic Center. This measure proposes to optimize the operating schedule of the building to match the occupancy schedule. The proposed heating hot water system schedule is Monday to Friday, 8:00 AM to 6:00 PM and off on weekends. The estimated savings associated with schedule optimization is presented in Table 2.2. Note that natural gas savings are based on implementation of M2 after installation of a high efficiency boiler per M1.

M3 – AC-1 Schedule Optimization
AC-1 has a baseline (existing) schedule as shown in Table 2.1a. Discussions with the facilities personnel indicated that further optimization of the AC-1 schedule to match the current occupancy schedule is important and feasible. Table 2.1b shows the proposed schedule for AC-1. The proposed schedule should give ample ramp-up time for the AC unit to deliver the necessary conditioning once the building is occupied.

Table 2.1a
AC-1 Baseline Schedule

	Baseline Schedule	
	Start	Stop
Mon	6:00 AM	7:00 PM
Tues	8:00 AM	7:00 PM
Wed	8:00 AM	7:00 PM
Thur	8:00 AM	7:00 PM
Fri	8:00 AM	7:00 PM
Sat	OFF	OFF
Sun	OFF	OFF

Table 2.1b
AC-1 Proposed Schedule

	Proposed Schedule	
	Start	Stop
Mon	8:00 AM	6:00 PM
Tues	8:00 AM	6:00 PM
Wed	8:00 AM	6:00 PM
Thur	8:00 AM	6:00 PM
Fri	8:00 AM	6:00 PM
Sat	OFF	OFF
Sun	OFF	OFF

A summary outlining potential measures, estimated energy savings, estimated cost and incentive details of the proposed measures is provided in Table 2.2 below.

Table 2.2
Estimated Energy Savings Summary

EEM	Measure Description	Peak Demand Savings (kW)	Electrical Energy Savings (kWh / yr)	Natural Gas Energy Savings (Thrm / yr)	Energy Cost Savings ($ / yr)	Measure Cost ($)	Simple Payback Period (years)	Incentive Rebate ($)	Adjusted Payback Period (years)
M1	Boiler Retrofit	0.0	0	2,182	$2,182	$43,140	19.8	$2,182	18.8
M2	HHW System Schedule Optimization	0.0	11,670	4,949	$7,516	$1,320	0.2	$660	0.1
M3	AC-1 Schedule Optimization	0.0	12,641	309	$2,781	$1,320	0.5	$660	0.2
Total		**0.0**	**24,311**	**7,440**	**$12,479**	**$45,780**	**3.7**	**$3,502**	**3.4**

Next steps

1. The City should review the energy efficiency measures in this report and provide comments to QuEST.
2. The City will select the measures it wishes to implement and sign a program participation agreement.
3. QuEST will submit energy savings calculations to PG&E for review and pre-installation approval.
4. Once the calculations are approved by PG&E, the City is permitted to commence installation of measures.

5. The City will implement the measures and maintain invoices for all work performed by internal or contracted staff.
6. QuEST will verify that measures were implemented and submit verification documentation to PG&E.
7. QuEST pays the incentive upon post-installation approval from PG&E.

3. Additional measures

Some potential measures which are not described in Section 2 should be considered, but were either difficult to quantify or not offered by the MIT Program. Further investigation of these measures is warranted.

- Upgrade of the existing Delta EMCS Controls
- Supply Air Temperature Reset
- Re-program economizer operation
- Duct Static Pressure Reset
- Heating Hot Water Supply Temperature Reset

APPENDIX 7: ENERGY USE BENCHMARKING STUDY

The East Bay Energy Watch (EBEW)[1] benchmarked the energy performance of the buildings and facilities operated by the City of Emeryville. The purpose of energy benchmarking is to measure changes in energy performance of a building, or portfolio of buildings, against an established baseline. Buildings can be benchmarked against their own historic baseline, or using the energy performance of other, similar buildings. It should be noted that Energy Star Portfolio Manager, the industry-standard benchmarking tool, does not standardize energy use by building operations for the many types of buildings local governments manage. Therefore, benchmarking should not be the only tool in a facility manager's toolbox. It provides a platform on which an agency can collect and organize its energy data, draw comparisons on building energy performance using very limited information, and form questions that require deeper investigation.

The data presented below provides a snapshot of benchmarking results. Benchmarking utilizes 12-month periods of energy use data; the end of each building's baseline and current energy period is indicated in Table 1[2]. All energy sources (e.g. electricity and natural gas) used in a building are converted to kBtu and standardized by floor area. Figure 1 compares baseline to current energy performance for each building. Energy performance of all buildings improved over time. The largest and most used buildings—City Hall and the Police Department—remain the most energy intense. In general, this is true for the majority of local governments. Both of these buildings are, by far, the most expensive in terms of energy costs (Figure 2).

Table 1. City buildings, space type as designated by Energy Star, and 12-month baseline and current energy period ending dates.

Emeryville Building	Baseline Period End Date	Current Period End Date	Space Type
Child Dev. Center	5/31/2010	5/31/2015	Pre-School/Daycare
City Hall	5/31/2010	5/31/2015	Office
Corp. Yard	5/31/2010	5/31/2015	Services - Other
Police Dept.	5/31/2010	5/31/2015	Police Station
Recreation Dept.	12/31/2008	12/31/2011	Social/Meeting Hall
Fire Station 1	5/31/2010	6/30/2015	Fire Station
Fire Station 2	5/31/2010	6/30/2015	Fire Station
Senior Center	5/31/2010	6/30/2015	Social/Meeting Hall

Benchmarked against the energy performance of other, similar buildings in the region, Emeryville's buildings generally perform better, with the exception of City Hall (Figure 3). The high variability of similar buildings' performance, illustrated by Figure 3, may represent both the relative efficiency of each

[1] The East Bay Energy Watch (EBEW) is a partnership between Pacific Gas and Electric Company (PG&E) and local governments, non-profit and for-profit energy service providers in the East Bay dedicated to providing innovative energy efficiency solutions for residents and businesses in communities throughout Alameda and Contra Costa Counties.

[2] Energy period ending dates necessarily differ based on availability of energy data.

building, but also the differences in their patterns of use. It is recommended that the City of Emeryville examine the patterns of energy use in all of their facilities[3] using simple tools like PG&E's MyEnergy database (www.pge.com/myenergy), and explore opportunities for energy efficiency retrofits or other efforts to reduce the energy intensity of the buildings they operate. Most energy efficiency projects are eligible for rebates from PG&E, and some projects may qualify for 0% interest On-Bill Financing.

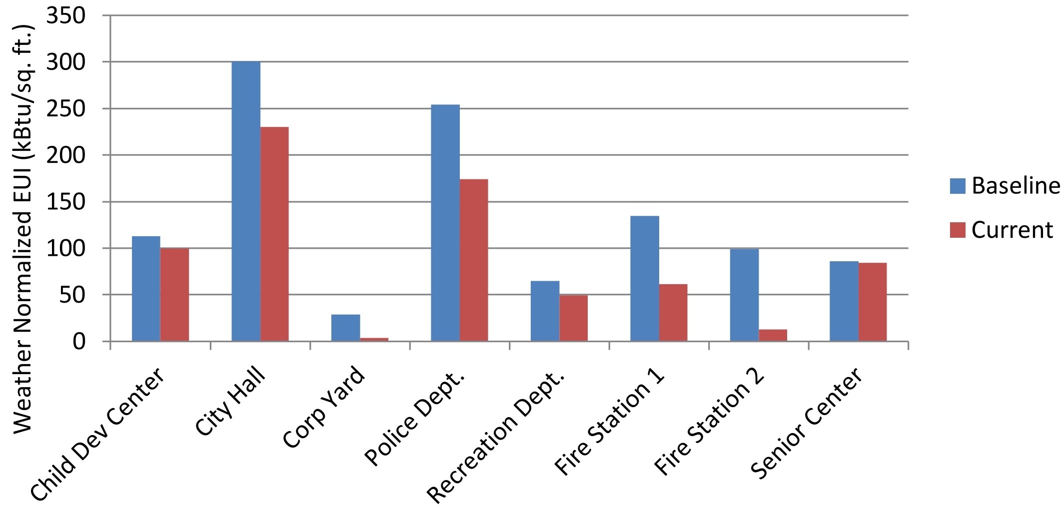


Figure 1. Comparison of baseline period EUI (energy use intensity; kBtu/ft^2) to current period EUI, by building operated by City of Emeryville.

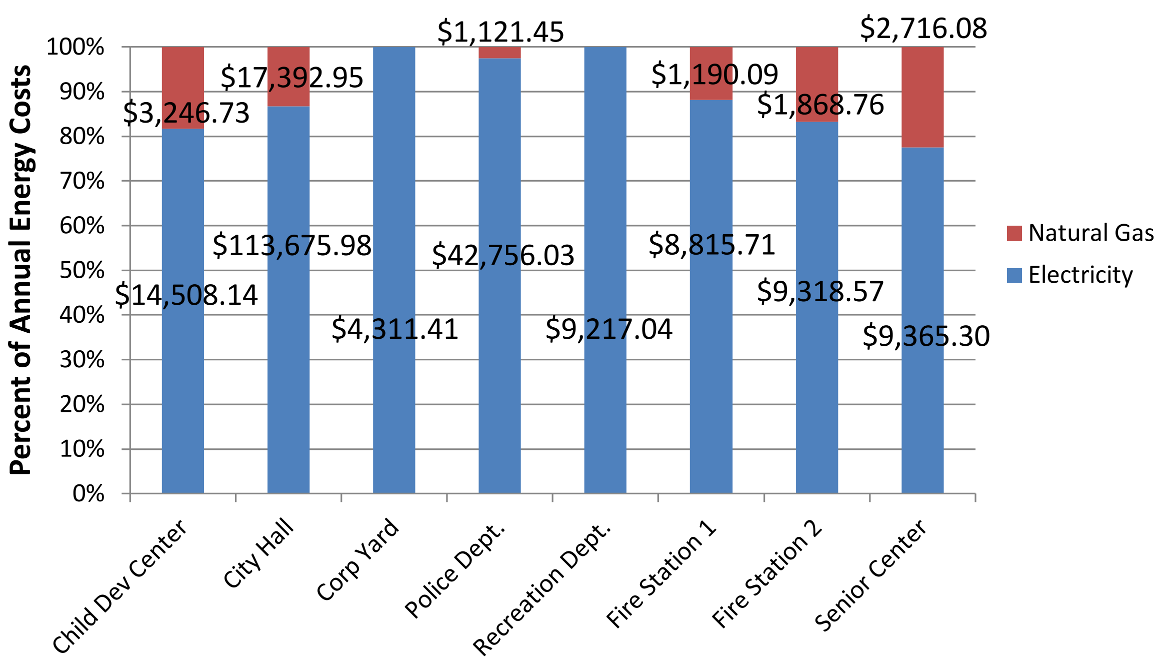


Figure 2. Comparison of current period energy costs and their percent distribution by energy source.

[3] Local governments use energy to operate numerous irrigation controllers, traffic and street lights, and park facilities. Benchmarking is not an appropriate exercise for these non-building end uses, but the usage and costs of all energy should be organized and monitored using a variety of available tools.

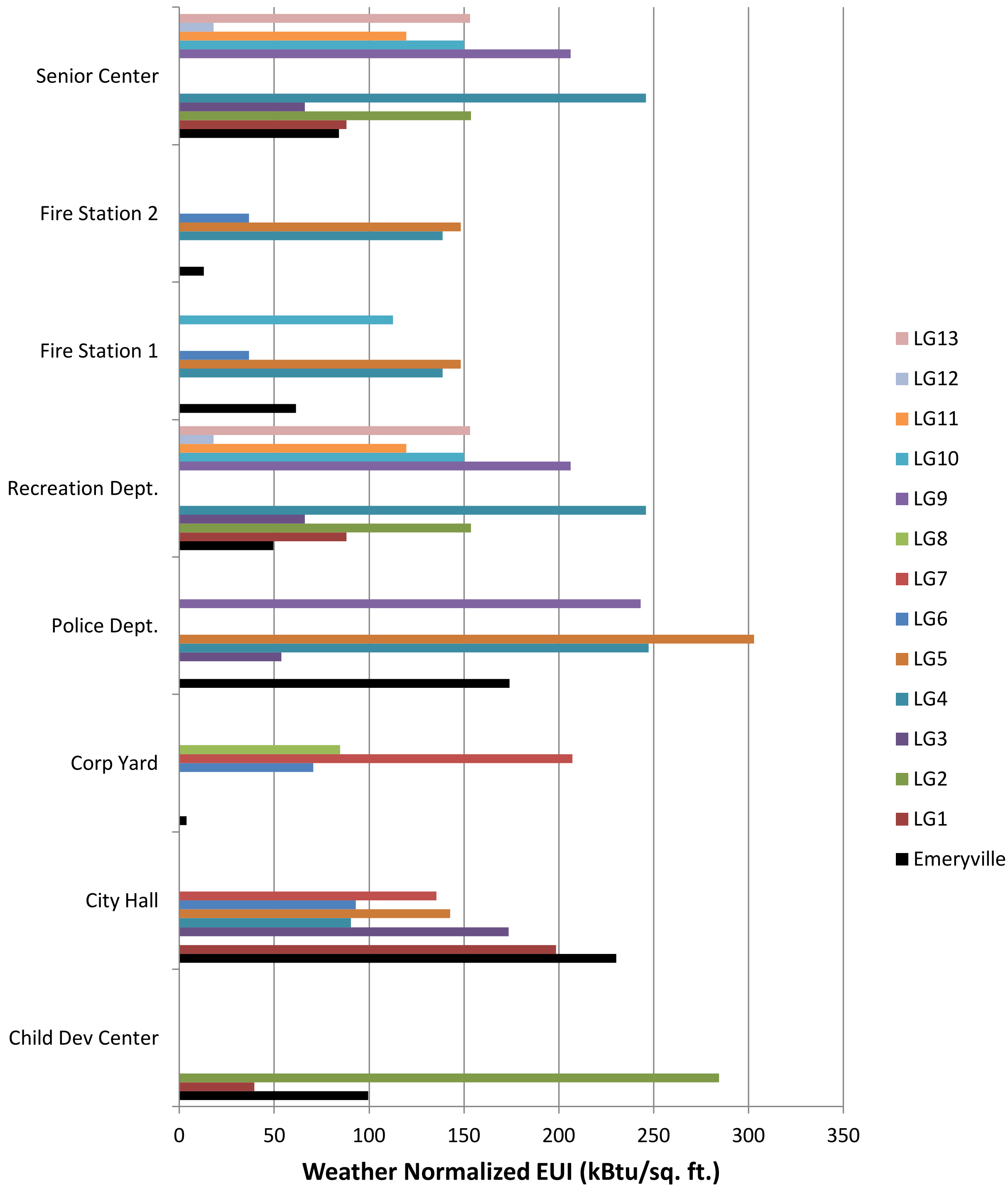


Figure 3. Comparison of current period EUI across similar buildings operated by other East Bay local governments (LG1-13). Community centers, recreation buildings, and senior centers in the region were all included in comparisons of the Emeryville Senior Center and Recreation Department because their patterns of use are not consistent or typical.