YOLO COUNTY HOUSING
ENERGY PLAN
DRAFT

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Table of Contents

Executive Summary

The overwhelming evidence of the threat of climate change has conveyed to the global community an imperative to drastically reduce greenhouse gas emissions in order to mitigate severe health, human, and environmental effects. With the passage of the Global Warming Solutions Act (AB 32) in 2006, the California State Legislature set a target to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by the year 2020, a 25 percent reduction from business-usual-levels (California Air Resources Board, 2006). In executive order S-20-06, Governor Schwarzenegger directed the Secretary for Environmental Protection and the California Air Resources Board to implement measures to meet an even more ambitious GHG reduction target of 80% below 1990 levels by 2050 (Exec. Order No. S-20-06). Such a drastic reduction in statewide GHG emissions requires not only the actions of the state government, but the cooperative and innovative efforts of cities, counties, businesses, and individuals.

In the wake of the state's passage of AB32 and the mandate of executive order S-20-06 to drastically reduce statewide GHG emissions, the Board of Supervisors of Yolo County adopted the *Cool Counties Climate Stabilization Declaration* in September of 2007, committing the county to reduce its GHG emissions by 80 percent by the year 2050, equal to a reduction target of 10 percent every 5 years, beginning in year 2010 (Cool Counties, 2008). In 2008, in response to the county's commitment, the Yolo County Housing (YCH) Executive Board adopted the Yolo County Climate Action Compact, which calls for all political jurisdictions within the County to complete a number of different steps including preparing a GHG emissions inventory and designating a baseline year, establishing a GHG emissions reduction target, developing a plan with specific measures for reducing energy usage and reaching that target, implementing the plan, and finally, monitoring progress towards targets (Yolo County Housing, 2008).

In May of 2009, YCH completed a GHG inventory, the *Yolo County Housing Major Energy Flows Analysis*. The project strategically assesses the range and scope of current GHG emissions for Yolo County Housing operations and designates a baseline year (2006). In accordance with the county-wide emissions target, YCH now seeks to implement a plan to reduce its GHG emissions by 10 percent of 2006 levels every five years. The purpose of this effort is to identify short-term, specific measures that, if implemented, are expected to enable Yolo County Housing to reduce operational emissions by an additional 10 percent of 2006 levels over the period from 2010 to 2014. In addition to short-term measures, this plan identifies long-term strategies that could help YCH meet its target of 80 percent below 2006 emissions by 2050.

While reducing GHG emissions is the plan's primary goal, this energy plan is also designed to simultaneously reduce energy consumption, operating costs and GHG emissions through the development and implementation of comprehensive energy and water efficiency improvements, policy improvements, and budget-neutral incentive programs. Table 1. Summary of Energy Reduction Strategies presents the estimated greenhouse gas emissions reductions for each energy reduction strategy that has been identified. Implementation of all energy reduction strategies is expected to meet or exceed YCH's emissions reduction targets.

Table 1. Summary of Energy Reduction Strategies

Recommendations	YCH Operations (Tons GHG Reduction)	Renter Based (Tons GHG Reduction)
A. Progress Reporting and Energy Partners		
1. Monitor energy usage.	Policy Action	Policy Action
2. PG&E's CARE Program.	-	Policy Action
3. PG&E's CARE Program for Migrant Centers.	-	Policy Action
4. PG&E's Energy Partners Program.	-	Policy Action
B. Energy Types		
5. Construct solar thermal water heating systems.	-	6 tons
6. Construct solar photovoltaic energy systems.	49 tons	-
7. Divert biomass from landfills.	Policy Action	-
C. Administrative Policies and Practices		
8. Revise new development policy.	Policy Action	Policy Action
9. Zero net operational emissions growth.	Policy Action	Policy Action
D. Operations Practices		
10. Increase the fuel economy of fleet vehicles.	7 tons	-
11. Match current transportation needs.	Policy Action	-
12. Computer Power Management (CMP) software.	9 tons	-
13. Systems and appliances shutoff.	Policy Action	Policy Action
E. Systems Requirements		
14. ENERGY STAR programmable thermostats.	-	152 tons
15. Temperature settings on water heating systems.	Policy Action	Policy Action
16. ENERGY STAR tankless water heaters.	-	16 tons
17. Low-flow water fixtures.	-	128 tons
18. Eliminate excess refrigerator capacity.	1 ton	-
19. Replace refrigerators with ENERGY STAR models.	-	29 tons
20. Install checkmeters in developments.	Policy Action	Policy Action
21. High-efficiency lighting.	-	9 tons
22. Exterior wall insulation.	-	35 tons
23. Upgrade attic insulation.	-	7 tons
F. Funding Opportunities And Types		
24. Solicit and sign an Energy Performance Contract.	Policy Action	Policy Action
Total	**67 tons**	**381 tons**
Target: 10% Reduction in YCH Operational Emissions by 2014	**17 tons**	-
Target: 10% Reduction in Renter-Based Emissions by 2014	-	**161 tons**

Note: In the above table, "Policy Action" refers to an energy reduction strategy for which the emissions mitigated have not been calculated due to overlap with another measure(s) or unavailability of information required to yield an accurate estimate. However, all policy action strategies are expected to produce emissions reductions. Dashes indicate that emissions reductions are either zero or not applicable to that emissions source. Emissions reductions are shown to the nearest ton.

Introduction

Since the federal public housing program was created by the U.S. Housing Act of 1937, public housing authorities (PHAs) have provided critical housing assistance to low-income households who would otherwise be unable to afford housing services in the private market. Presently, over 3,100 PHAs directly provide public housing to approximately 1.2 million households (Econsult Corporation, 2007) and approximately 2 million households indirectly through the Housing Choice Voucher Program (HCVP) (Center on Budget and Policy Priorities, 2009). PHAs, which are responsible for both administering subsidy programs and maintaining the quality standard of their capital stock (which includes PHA-operated public housing and administrative facilities), are dependent on the U.S. Department of Housing and Urban Development (HUD) for funding in the form of operating subsidies and capital funds.

Funding Scarcity

PHAs have been chronically underfunded, particularly in the last 10 years. In 2007, a study of federal appropriations for public housing capital and operational subsidies found that between 2000 to 2006, PHAs were underfunded by $6.7 billion relative to their estimated need (Econsult Corporation, 2007). In fact, while PHAs receive $2.5 billion worth of capital funds each year, the funding required to maintain the existing public housing stock is estimated to equal $4.8 billion annually, or almost twice the actual allocation (Econsult Corporation, 2007). As a result, PHAs have been forced to defer capital improvements, including energy-saving building envelope maintenance and appliance replacement.

Rising Energy Costs

Energy prices in the United States have risen significantly faster than the overall rate of inflation and are forecast to continue to rise. The Energy Information Administration (EIA) shows that historic national average electricity rates have grown 1.2 percent faster than inflation, sometimes increasing more than 10 percent in a single year (2006) (EIA, 2009). Natural gas is currently used in more than 62 percent of U.S. homes for various heating purposes (20.5 percent of U.S. demand in 2007), and an even greater percentage is consumed by power plants for electricity production (29.7 percent of total demand in 2007) (EIA, 2007). As consumption of natural gas has increased from 1999 through 2006, real prices have increased more than 60 percent, at an annual rate of more than 6 percent above inflation (EIA, 2008).

Low income households spend a much higher percentage of their income on energy (12 percent compared to 6.5 percent for the average household), and are particularly vulnerable to increases in energy costs (Shammin & Bullard, 2009). In addition, low income households are often least able to change behavior in response to energy price increases, because they have smaller amounts of discretionary energy spending and limited ability to access capital to make energy efficiency improvements (Shammin & Bullard, 2009).

Climate Change

Since the 1990s, mounting evidence of climate change has lent urgency to the need to drastically reduce greenhouse gas (GHG) emissions in order to mitigate severe health, human, and environmental

effects. In order to adequately mitigate the potential adverse effects of climate change, the United States would need to cooperate with other industrialized countries to reduce overall GHG emissions by at least 2 percent of 1990 emissions each year through 2050 (IPCC, 2007). Actions to mitigate climate change utilizing either a carbon tax or a cap and trade system are relevant to low income households, because they will likely result in substantial price increases of both energy and of non-energy consumer goods (a carbon price of $100/ton is estimated to increase energy prices by 20%) (Shammin & Bullard, 2009). Local governments have a crucial role in GHG reduction efforts because of their visibility, purchasing power, and proximity to their constituents. Cities and counties show leadership by reducing their own operational emissions, educating their communities about similar GHG reduction practices, and implementing policies that influence the emissions of individuals and businesses within their jurisdiction. Local governments have an advantage over state governments in their ability to tailor climate solutions to the unique needs of their community.

Public housing authorities, which share the qualities of visibility, purchasing power, and proximity, also have the ability to lead in GHG reduction efforts. They provide educational programs to the populations they serve, and as part of their responsibility of administering subsidy programs, PHAs can set an example by reducing their own operational emissions. In addition, PHAs have the unique responsibility of managing capital infrastructure to provide rental housing directly to qualifying low income tenants. Unlike conventional landlords, PHAs have the goal not only to maximize the effectiveness of their limited budgets, but also to maximize the well-being of their tenants. This second goal can be furthered in part by reducing tenant GHG emissions and utility costs through energy and water efficiency improvements.

Yolo County Housing's Energy Plan

Funding scarcity, rising energy prices, and concern about climate change translates to pressure on PHAs to cut operating costs, conserve energy, and mitigate GHG emissions as a means of ensuring acceptable quality of life conditions for tenants and clients. Yolo County Housing (YCH) is similar to most other housing authorities in that it owns capital infrastructure and actively seeks to increase the well-being of its tenants by lowering utility costs. YCH is unique in that it is developing a long-term strategy specifically to reduce GHG emissions, of which reducing tenant energy consumption and costs is an integral element.

The purpose of this energy plan is identify those strategies that can simultaneously reduce energy consumption, operating costs and GHG emissions through the development and implementation of comprehensive energy and water efficiency improvements, policy improvements, and budget-neutral incentive programs. In *Table 2*, energy reduction strategies are laid out, including the estimated period of implementation for each reduction strategy that has been identified. Implementation of all energy reduction strategies is expected to meet or exceed YCH's emissions 2014 reduction target. A detailed discussion of each of the recommendations is provided in the next section.

Table 2. Timetable of Energy Reduction Strategies

Recommendations	YCH Operations Tons GHG Reduction	Renter Based Tons GHG Reduction	Action Period
A. Progress Reporting and Energy Partners			
1. Monitor energy usage.	Policy Action	Policy Action	Ongoing
2. PG&E's CARE Program.	-	Policy Action	< 1 year
3. PG&E's CARE Program for Migrant Centers.	-	Policy Action	< 1 year
4. PG&E's Energy Partners Program.	-	Policy Action	< 1 year
B. Energy Types			
5. Construct solar thermal water heating systems.	-	6 tons	1 - 5 years
6. Construct solar photovoltaic energy systems.	49 tons	-	1 - 5 years
7. Divert biomass from landfills.	Policy Action	-	1 - 5 years
C. Administrative Policies and Practices			
8. Revise new development policy.	Policy Action	Policy Action	< 1 year
9. Zero net operational emissions growth.	Policy Action	Policy Action	5 - 10 years
D. Operations Practices			
10. Increase the fuel economy of fleet vehicles.	7 tons	-	1 - 5 years
11. Match current transportation needs.	Policy Action	-	1 - 5 years
12. Computer Power Management (CMP) software.	9 tons	-	< 1 year
13. Systems and appliances shutoff.	Policy Action	-	< 1 year
E. Systems Requirements			
14. ENERGY STAR programmable thermostats.	-	152 tons	< 1 year
15. Temperature settings on water heating systems.	Policy Action	Policy Action	< 1 year
16. ENERGY STAR tankless water heaters.	-	16 tons	1 - 5 years
17. Low-flow water fixtures.	-	128 tons	< 1 year
18. Eliminate excess refrigerator capacity.	1 ton	-	< 1 year
19. Replace refrigerators with ENERGY STAR models.	-	29 tons	< 1 year
20. Install checkmeters in developments.	Policy Action	Policy Action	< 1 year
21. High-efficiency lighting.	-	9 tons	< 1 year
22. Exterior wall insulation.	-	35 tons	< 1 year
23. Upgrade attic insulation.	-	7 tons	< 1 year
F. Funding Opportunities And Types			
24. Solicit and sign an Energy Performance Contract.	Policy Action	Policy Action	1 - 5 years
Total	**67 tons**	**381 tons**	
Target: 10% Reduction in YCH Operational Emissions by 2014	**17 tons**	**-**	
Target: 10% Reduction in Renter-Based Emissions by 2014	**-**	**161 tons**	

In the above table, "Policy Action" refers to an energy reduction strategy for which the emissions mitigated have not been calculated due to overlap with another measure(s) or unavailability of information required to yield an accurate estimate. Dashes indicate that emissions reductions are either zero or not applicable to that emissions source. Emissions reductions are shown to the nearest ton. The Action Period specifies when each energy reduction strategy should be implemented to maximize the effectiveness of YCH's resources.

Recommendations

This section provides a detailed discussion of each energy reduction strategy by category.

A. Progress Reporting and Energy Partners

1. **Monitor energy usage by YCH and its tenants and report reductions in GHG emissions.**

In order to evaluate progress toward YCH's operational and renter-based emissions goals, YCH should track changes in annual energy usage of its operations and its tenants. YCH should convert these reductions in energy usage to reductions in GHG emissions and report this progress to the Climate Registry. In doing so, YCH can quantify its GHG mitigation efforts, verify its cost savings, and position itself to to potentially take advantage of any future carbon reduction credits.

2. **Encourage all residents of YCH-operated and HCVP units to enroll in PG&E's CARE program to save 20% of natural gas and electricity costs.**

3. **Encourage migrant centers that qualify for PG&E's CARE Program for Migrant Farm Worker Housing Centers to apply to receive a monthly discount on energy bills.**

PG&E offers discounted utility rates to its low-income customers through the California Alternate Rates (CARE) Program. YCH residents with individual energy meters can conveniently enroll in the CARE program online to start saving 20% (Monterey Institute of International Studies) of their natural gas and electricity costs on the next billing cycle (Pacific Gas and Electric Company, 2009b). YCH's migrant centers can qualify for the CARE program if 70 percent of energy supplied to master-metered facilities and 100 percent of energy supplied to individually-metered units is used for residential purposes (Pacific Gas and Electric Company, 2009c). In addition to saving its tenants money on their utility bills, YCH receives $15 from PG&E per household it helps enroll through its Performance-Based Contract. By establishing a policy protocol to both create and maintain a master list and to distribute reminders, there is some potential for additional reductions in GHG emissions and offsets in energy costs.

4. **Encourage and assist all residents of YCH-operated and HCVP units in applying to the Energy Partners Program to achieve substantial energy cost savings.**

The Energy Partners Program allows qualifying low-income PG&E customers to substantially reduce their natural gas and electricity costs by providing free energy education, weatherization measures, and energy-efficient appliances. The Energy Partners Program, which is funded by ratepayer fees, pays the full costs of energy-efficiency improvements, which include: attic insulation, door replacement, door weather-stripping, caulking, minor home repair, CFLs, and even new refrigerators (Pacific Gas and Electric Company, 2009d).

B. Energy Types

5. **Construct solar thermal water heating systems in developments CA 44-5 and CA 44-15.**

Installing solar thermal water heating systems is a cost effective means of substantially reducing energy costs and greenhouse gas emissions, particularly in developments that use electric water heaters (which are significantly more expensive than gas heaters) and for systems with high water heating demand. In development CA 44-5, Ridgecut, all ten units use electric water heaters and are burdened with high annual energy costs. By installing inexpensive solar thermal systems on these units, YCH can immediately and substantially lower Ridgecut tenants' energy costs, reduce GHG emissions by up to twelve tons per year, and achieve a full return on its investment in less than 5 years (compared to a system life of over 15 years). For the costs and benefits of a sample system that could be installed on a Ridgecut unit, see *Table 3* below.

Table 3. Sample Solar Thermal System Costs and Benefits

System Size	System Cost [1]	Federal Tax Credit [2]	Net Cost	Electric Rate ($/kWh) [3]
64.6 sq ft	$6,500	$1,950	$4,550	$0.24
Annual Electricity Production Equivalent (kWh) [4]		**Annual Savings**	**Simple Payback (years) [5]**	**Annual GHG Savings (tons)**
2,500		$609	7.5	0.6

[1] For a "glycol" system w/ heat exchanger and holding tank suitable for climates with freezing temperatures. Warmer climates can save money with a "Direct" system: heat exchanger and holding tank may not be installed. Source: www.find-solar.org.
[2] 30% Federal Tax Credit. Source: www.find-solar.org.
[3] Electric Rate is average calculated from YCH Energy Bill data for residents.
[4] Source: www.find-solar.org.
[5] Assuming interest rates and increases in energy costs have similar rates and do not need to be factored into calculations.

In CA 44-15, Riverbend I, YCH provides hot water to residents using a master natural gas water heater. In order to substantially reduce gas costs and GHG emissions, YCH could add a solar thermal batch collector to its water heating system in Riverbend I. Batch, or integral collector systems, essentially use a tank that is painted black to preheat the water for an existing water heater. Batch systems do not require any special equipment to function and are the most inexpensive means of harnessing solar thermal energy. By adding a solar thermal system to its water heater in Riverbend I, YCH could reduce its gas costs by fifty to eighty percent (U.S. DOE, 2009b).

6. Construct solar photovoltaic energy systems in developments with high electricity usage.

Installing solar photovoltaic (PV) energy systems is a reliable way to simultaneously reduce electricity costs and greenhouse gas emissions through the generation of clean, renewable electricity. These systems, which generate electricity whenever the sun is shining, can be used to partially offset electricity usage in developments with high energy costs. YCH should take advantage of the current federal, state, and utility incentives to install solar PV systems to the extent that it can raise long term capital. By installing PV systems in its developments, YCH can monitor energy usage and bill residents directly, help diversify the electricity grid for greater stability, and show leadership in its commitment to the environment.

Considering the high initial capital cost of installing PV systems, it is recommended that YCH install the equivalent of three 10-kilowatt systems each year in order to steadily increase the amount of renewable energy it generates. For the costs and benefits of a sample 10-kilowatt system, see *Table 4* below.

Table 4. Sample Solar PV System Costs and Benefits

System Size (watts)	Cost per watt [1]	System Cost	Federal/State Tax Credit [2]	State Utility Rebate [2]	Net Cost
10,000	$8	$80,000	$20,024	$13,253	$46,723
Annual Electricity Production (kWh) [2]	**Electric Rate ($/kWh) [3]**	**Annual Savings**	**Simple Payback (years) [4]**	**Annual GHG Savings (tons)**	
13,841	$0.2434	$3,368.90	13.87	3.29	

[1] Assuming price of $8/watt, the average rate including parts and installation for systems above 2kW. Source: www.findsolar.com/Widgets/CalculatorEmbed.aspx?t=pro&id=1276.
[2] Tax incentives, rebates, and electricity production calculated for zip code 95695 using "Kyocera Solar Clean Power Estimator." Source: www.kyocerasolar.com/products/pv_calculator.html.
[3] Electric Rate is average calculated from YCH Energy Bill data for residents.
[4] Assuming interest rates and increases in energy costs have similar rates and do not need to be factored into calculations.

7. Divert biomass from landfills to a local biomass cogeneration plant.

There is a biomass cogeneration plant located in Woodland, CA that accepts biomass deliveries from the public. YCH currently diverts scrap lumber collected from force account labor (labor done by YCH employees) from being taken to the landfill to being sent to this co-generation plant. To address lifecycle costs, YCH can require that all contractors it pays to collect biomass waste deliver that waste to a local cogeneration plant. This policy change is only a short term solution for biomass disposal.

C. Administrative Policies and Practices

8. Revise new development policy to require Energy Star appliances and systems.

9. Adopt a policy of zero net growth of directly-controlled emissions from each project.

It is quite likely that YCH will seek to expand its current housing stock in order to meet future increases in the need for low-income housing. In accordance with its goal to reduce GHG emissions, YCH should make efforts to minimize new emissions growth, both YCH-controlled and tenant-based, from new and rehabilitated developments. Considering the costs of making major energy and water efficiency improvements to tenant-occupied buildings, YCH can lower future implementation and operation costs by requiring that all major appliances, HVAC, water heating and lighting systems installed in new and rehabilitated developments meet Energy Star requirements.

Without careful planning, any new or rehabilitated development will increase YCH's operational GHG emissions and offset progress toward its reduction target. YCH can prevent this by adopting a policy of zero net growth of directly-controlled emissions from each development. In addition to installing only highly efficient appliances and systems, YCH can install renewable energy systems like solar thermal for water heating and photovoltaic for electricity generation; these systems can reduce or even reverse the GHG impact of additional YCH operations, especially if the systems are of sufficient size to generate more energy than is consumed onsite.

In addition to indirect emissions from energy consumption, YCH should consider the GHG emissions caused by rehabilitating existing buildings relative to constructing new buildings. By avoiding demolition in favor of rehabilitation, YCH can lower housing stock acquisition costs and save GHG emissions that would be generated to dispose of demolished building materials and to produce new materials. One policy action YCH can take is to require contractors to recycle waste generated from construction and rehabilitation projects and purchase green building materials. Lastly, YCH should adopt a policy to site

new and rehabilitated developments in existing villages or incorporated communities in order to reduce transportation costs and emissions for the residents of those developments.

D. Operations Practices

10. Increase the fuel economy and lower the emissions rates of YCH's fleet vehicles.

YCH can reduce its vehicle fleet GHG emissions in three ways: reducing vehicle miles traveled, purchasing more fuel efficient (lower-emitting) vehicles, and using the proper vehicle for each trip type. In 2008, YCH's operational vehicle mileage totaled 82,433 miles. At an average emissions rate of over 487 grams of CO2 equivalent per mile, YCH's eleven exclusively gasoline-powered vehicles emit over 40 tons of greenhouse gases annually (Niemeier, 2009).

Two types of vehicles that could substantially reduce vehicle fleet emissions through lower emissions per mile traveled are gasoline-electric hybrids and battery electric vehicles.

Gasoline-Electric Hybrids (Hybrids) use synergetic gasoline and electric drive technology in combination with regenerative braking to achieve better fuel economy (and corresponding lower emissions per mile) than conventional gasoline-powered vehicles. While a number of full speed midsize hybrid cars are currently available for purchase, there are only a few hybrid trucks available, and these models currently offer only small gains in fuel economy compared to their gasoline counterparts. While it may be several years before high fuel economy hybrid trucks become cost competitive and available for purchase, some midsize hybrid cars like the 2010 Toyota Prius are already cost competitive with non-hybrid cars and are capable of achieving substantial fuel savings and GHG emissions reductions compared to new gasoline-only cars (U.S. EPA and DOE, 2009e).

Battery Electric Vehicles (BEVs) have been shown to consume 50 percent less energy and emit up to 60 percent fewer GHG emissions than conventional gasoline-powered vehicles (MIT Electric Vehicle Team, 2008). As the mix of electricity generated from renewable sources in California's electricity grid increases, the comparable GHG emissions by BEVs will continue to decrease. BEVs already cost significantly less to drive per mile than gasoline-powered vehicles ($0.04/mi compared to $0.06-$0.20/mi), yet they remain a small portion of current auto sales due to the relatively high costs of manufacturing rechargeable batteries with sufficient energy storage and battery life. As advances in battery technology continue to make their way into production in the next few years, BEVs are expected to become increasingly available, reliable, and cost-effective.

Low Speed Electric Vehicles (LSVs) are currently available BEVs that are electronically limited to 25 miles per hour. By California law, LSVs are only permitted to travel on streets with posted speed limits of 35 mph or less and across streets of greater posted speed limits. YCH has three complexes of suitable size for potentially efficient LSV use: Woodland, Winters, and West Sacramento. From a GHG mitigation perspective, although LSVs have much lower emissions per mile than YCH's current fleet vehicles, in order to substantially reduce GHG emissions, LSVs would have to account for a substantial portion of overall vehicle miles traveled. Due to the stringent speed and travel restrictions to which LSVs are subject under California law, YCH would have to utilize LSVs extensively within and around its complexes in order to make purchasing such vehicles worthwhile. Given the current limitations of use for LSVs, it is recommended that YCH defer discretionary electric vehicle upgrades until full speed BEVs to come to market.

11. Update YCH's vehicle fleet to match current transportation needs, and optimize vehicle use.

Using the lowest-emitting vehicle possible for each trip is crucial to reducing YCH's vehicle fleet GHG emissions and fuel costs. For example, using a pickup truck that gets 14 miles per gallon and emits 491 grams of CO2 per mile to transport two people for 50 miles should not be considered optimal vehicle use if that same trip could be performed by a midsize car that gets 21 miles per gallon and emits only 290 gm/mi. Currently, each employee who requires a public vehicle is assigned a personal vehicle to use until that vehicle is replaced; this system is prone to great inefficiencies, because an employee who requires a large pickup truck for a small number of annual trips may use that vehicle for all trips, regardless of whether a vehicle of that size and emissions level is required. Thus, it is recommended that YCH consider alternatives wherever possible. One option to investigate would be to adopt a vehicle-sharing policy under which employees are required to use the most efficient vehicle available for each set of trips in a given day or week, based on the transportation needs for those trips. This is probably not feasible for the AMPS since vehicles are purchased for use by and required to be assigned as property to the individual AMP, but may be more feasible for vehicles at the main administrative location.

In 2008, YCH's two newest vehicles, both 2008 Dodge pickup trucks (one with 1-ton hauling capacity and the other ¾-ton) traveled only 835 miles combined (Niemeier, 2009). Because these two large pickup trucks were so underused, it seems that YCH's current vehicle fleet has an oversupply of vehicles with high hauling capacity. Thus, it is recommended that YCH use its annual vehicle procurement funds to first replace its oldest pickup trucks with the most efficient and smallest vehicles that will serve the purpose, including the possibility of low-emitting hybrid cars to maximize its GHG reductions and fuel savings. As soon as further funding becomes available, YCH should replace its Ford Taurus and Sable Mercury with hybrid cars to further increase the fuel economy of its fleet.

12. Install computer power management (CMP) software on all administrative computers, and use CMP software to set monitors to sleep after 5 minutes of inactivity and computers to sleep after 15 minutes.

Employees have no personal financial incentive to save energy while in the office; as a result, to improve computational performance, computer and monitor power management settings may be disabled and/or computers may be left on when not in use, even for extended periods. YCH can correct this problem by installing CMP software that allows a network administrator to implement CMP settings that cannot be disabled by machine users. By using free CMP software to set monitors to sleep after 5 minutes of inactivity and computers to sleep after 15 minutes, YCH can save up to $138 annually per computer (U.S. EPA and DOE, 2009a). Such systems, however, must take into consideration any ancillary usage systems such as smart phones and should be coordinated and implemented through the YCH's larger IT structure.

13. Ensure that energy-using systems and appliances are shutoff during non-work hours.

Shutting off systems and appliances in administrative spaces during non-work times is crucial to saving energy, because non-work times (nights, weekends, and holidays) constitute 70 to 90 percent of annual hours. While some energy users like refrigerators must run continuously, others, like copy machines, computers, and even HVAC systems, can be shut off during non-use times. As a result, changing operational practices to ensure that systems are consistently shut off during non-work times could substantially reduce energy costs.

YCH already shuts off many of its systems during non-work times. In order to ensure continued performance, it is recommended that YCH adopt a policy that requires shutoff of energy-using systems and appliances when they are not in use.

E. Systems Requirements

14. Install ENERGY STAR qualified programmable thermostats in all HVAC systems.

On average, air heating and cooling costs account for nearly half of a household's energy bill. ENERGY STAR qualified programmable thermostats are designed to reduce heating and cooling costs without sacrificing comfort—they do this by adjusting temperature settings during times when residents are often away from home or asleep. By installing and properly using an ENERGY STAR qualified programmable thermostat, residents can expect to save around $158 annually and pay off the initial installation cost in less than a year (U.S. EPA and DOE, 2009b).

15. Reduce temperature settings on water heating systems from 140°F to 120°F.

Although many water heater manufacturers set initial temperature settings to 140°F, most households only require temperature settings of 120°F. For each 10°F reduction in water heater settings, residents can expect to save 3 to 5 percent in energy costs (U.S. DOE, 2009a). Setting water heaters to 120°F not only reduces the danger of scalding, but it slows mineral buildup and water corrosion in the heater and pipes, helping the water heater last longer and operate at its maximum efficiency.

16. Replace standard tank gas water heaters with ENERGY STAR qualified tankless water heaters.

Standard tank water heaters consume energy 24 hours per day, year-round in order to keep the water in the tank heated to a set temperature. High efficiency tankless water heaters provide hot water only when it is demanded and can save an average household over $115 per year in gas costs (U.S. EPA and DOE, 2009d). Furthermore, because tankless water heaters only heat water on demand, water-conserving households can save heating costs for every gallon of water they don't use (compared to standard tank water heaters, which still keep the water in the tank hot). Lastly, tankless water heaters have a life expectancy of 20 years, compared to 10-15 years for standard tank water heaters.

17. Upgrade water fixtures in all units to 1.0 gpm kitchen aerators, 0.5 gpm lavatory aerators, and 1.5 gpm showerheads.

As water scarcity in California intensifies, so does the need for all users to conserve water wherever feasible. In addition to only turning on the faucet when necessary, the rate of water flow is a very important contributor to the amount water consumption. For example, a five-minute shower could use as little as 7.5 gallons of water with a new low-flow showerhead (1.5 gallons per minute) or as much as 40 gallons of water with an 8 gallon per minute (gpm) fixture. YCH's 431 conventional rental units currently have 2.2 gpm kitchen aerators, 1.5 gpm lavatory aerators, and 2.5 gpm showerheads. These fixtures, while considered to be water efficient, can still be replaced with ultra-efficient fixtures to realize immediate and substantial water and energy savings. Because water saved is water that does not have to be heated, replacing just one kitchen aerator, lavatory aerator, and showerhead in each unit could result in an annual savings of almost 3 million gallons of water and $30,000 in energy costs (Jet Stream Mfg., LLC, 2009).

18. **Eliminate excess refrigerator capacity through consolidation and sales, recycling models that are more than 10 years old through PG&E to receive free pickup and a rebate of $35 per refrigerator (Pacific Gas and Electric Company, 2009a).**

19. **Accelerate procurement plans to replace refrigerators in rental and operational facilities with ENERGY STAR models as soon as budgeting allows, starting with the oldest models to maximize energy savings.**

In most households, refrigerators consume more energy than any other kitchen appliance and often cost hundreds of dollars of electricity to run each year. Two methods can be used to reduce energy usage by refrigerators: using fewer refrigerators and using more efficient models. In administrative spaces, YCH can cut energy costs by consolidating refrigerated items into the newest, most efficient models and unplugging and selling excess refrigerators.

New ENERGY STAR qualified refrigerators consume 40 percent less electricity than conventional models sold in 2001; replacing older models yields even greater energy savings. By replacing refrigerators that were manufactured before 1993, users can expect to realize immediate energy savings from $130 to over $250 per year, resulting in a payback period as low as 3-5 years, depending on the energy usage of the original model (U.S. EPA and DOE, 2009c).

20. **Install checkmeters in developments CA 44-1, CA 44-5, CA 44-15, and CA 44-17 and issue tenant utility allowances to residents for natural gas provided by YCH.**

In developments where YCH pays for natural gas consumption, tenants have no financial incentive to conserve energy. YCH can curb over-consumption in these developments by installing checkmeters on each unit which are owned by YCH and monitor individual energy usage. Once checkmeters are installed, the Authority can issue tenants utility allowances based on their estimated energy needs. If tenants consume within their allowance, they may be allowed to retain these savings; if, however, tenants consume beyond their allowance, they must pay a surcharge.

21. **Upgrade hard-wired fixtures to high-efficiency lighting in all units in developments CA 44-15, CA 44-25, and CA 44-28 as recommended by National Facility Consultants (NFC) in its energy audit of YCH.**

New compact fluorescent lamps (CFLs) use 75% less energy and have a much longer lifespan than incandescent bulbs. Upgrading hard-wired fixtures to high-efficiency bulbs allows for immediate energy savings and lower long-term maintenance costs.

22. **Add exterior wall insulation to all units in development CA 44-7 as recommended by NFC in its energy audit of YCH.**

Wall insulation significantly lowers short- and long-term building heating and cooling costs by reducing the amount of heat transferred through the walls. Exterior wall insulation does not reduce living space and can be installed without disrupting occupancy.

23. **Upgrade attic insulation in all units in developments CA 44-2, CA 44-4, and CA 44-5 as recommended by NFC in its energy audit of YCH.**

Attic insulation significantly lowers short- and long-term building heating and cooling costs by reducing the amount of heat transferred through the attic.

F. Funding Opportunities and Types

There are a number of different funding mechanisms. In the next section, we review the range of sources that are available.

Capital Fund

The Capital Fund Program, which is administered by the Office of Capital Improvements, provides funds to Public Housing Authorities (PHA) in the form of annual formula grants. These grants can be used to make development, financing, modernization, and management improvements. For YCH, Capital Funds are a primary source of funding for making upgrades to its vehicle fleet and replacing refrigerators, water heaters, HVAC systems, and stoves in its rental units. By revising these procurement policies to require ENERGY STAR systems and high efficiency vehicles, YCH can consistently and substantially reduce GHG emissions with minimal need for additional funding.

Capital Fund Financing Program

The Capital Fund Financing Program is a mechanism under the Office of Capital Improvements that allows PHAs to borrow private funds with a promise to pay debt service from future Capital Fund grants. Capital Fund Financing proposals can be approved within 2-3 months and can have repayment terms of up to 20 years. It is recommended that YCH consider utilizing the Capital Fund Financing Program as a means of accelerating procurement plans for which an annual budget allocation is made to replace inefficient appliances, systems, or vehicles.

Energy Performance Contracting

24. Solicit and sign an Energy Performance Contract in order to develop, implement, and retain the cost savings from comprehensive short- and long-term energy efficiency improvements throughout operations buildings and rental units.

Energy Performance Contracts (EPCs) allow housing authorities to implement large-scale energy efficiency improvements and pay back the cost of implementation over time with utility cost savings. EPCs are performed by an Energy Savings Company (ESCO), which is responsible for conducting a comprehensive energy audit, developing cost-saving recommendations, obtaining financing for the project, and implementing the recommendations approved by the housing authority.

Concluding Comments

There are an ever increasing number of local, state, and federal funding opportunities that will continue to arise. YCH should take advantage of these opportunities as appropriate. There are also other ways in which energy reductions can be achieved. These include participation in alternative transportation programs, increasing office and site recycling efforts, and finally pursuing targeted and strategic initiatives that may lead to a utility status (i.e., energy or water). In particular, we note that the YCH should explore the long-term creation of a publicly owned water district.

California allows private water companies and three types of publicly owned water districts. Assuming that YCH would be required to form a public entity, the formation procedures are outlined by the CPUC (CPUC, 2001). The approval of the Local Agency Formation Commission (LAFCO) and the authorization

of the county are required, and organizational structures vary depending on the breadth of authority requested and jurisdictional boundaries.

Application materials generally include: statement of the nature of services, description of boundaries, map, data and info required by the Commission and executive officer, and names of contact people. A petition by the majority of residents within the boundaries is usually also required. Factors that play a role in the consideration of an application include population, population density, land area and use, per capita value, topography, natural boundaries, drainage basins, proximity to other populated areas, potential for growth during the next 10 years. In addition, present and future need for organized community services, present cost and adequacy of governmental services, probable effects of incorporation; effect on adjacent areas, local government structures; conformity of the proposal and its effects on commission policies on development, and any effect of the proposal on physical and economic integrity of preserved agricultural land and open space uses are also considered.

Three more factors may be particularly relevant to YCH's ability to form a water district: 1) the definiteness of boundaries, nonconformance of boundaries to lines of assessment/ownership; 2) conformity with city or county general and specific plans, and 3) the "sphere of influence" of any local agency which may be applicable. The benefits of YCH becoming a water district include the ability to bill residents directly for water consumption and encourage water conservation. It is recommended that YCH pursue the possibility of forming a water district by meeting with the LAFCO Executive Director as a first step.

Inventory Scope

The portion of GHG emissions under YCH's direct operational control consists of direct emissions from operating its vehicle fleet and indirect emissions from electricity used to operate YCH-owned streetlights, exterior lights, and administrative and tenant-services spaces. The GHG emissions addressed in this plan that are not under YCH's direct operational control include tenant-based energy consumption in Housing Choice Voucher Program (HCVP) units, YCH subsidiary operations, the migrant centers, and YCH's conventional rental units. Although YCH does not have direct control over these emissions, they are within YCH's sphere of influence and may be reduced using effective policy measures. Although this plan does not include specific recommendations to reduce GHG emissions outside of YCH's sphere of influence, some measures in this plan may serve as benchmarks for other organizations seeking to meet emissions reduction targets.

In order to maximize the effectiveness of YCH's limited resources, this plan focuses on GHG reduction measures that have positive net benefits. Operation and maintenance measures are enforceable changes in behavior that have low implementation costs and are designed to reduce energy and water consumption to realize immediate cost savings. Energy and water efficiency measures are short- to long-term measures that require an initial capital expenditure but are cost effective over a period of time; these measures include building weatherization, appliance replacement, and equipment upgrades and have payback periods of zero to fifteen years. In addition to individual efficiency and conservation measures, this plan includes policy changes and initiatives that are expected to indirectly reduce GHG emissions within YCH's jurisdiction. For consistency, all GHG reductions and emissions referred to in this report are annual figures unless specified otherwise.

YCH's target to reduce emissions by 10% of 2006 levels from 2010-2014 applies to emissions under its direct operational control. In addition to this binding target, this plan addresses a parallel, nonbinding target to reduce emissions from tenants living in YCH-owned housing. Because emissions under direct operational control are distinct from renter-based emissions, this plan specifies the type of emissions reduced by each measure. For measures that reduce both emission types, separate estimates are provided.

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Appendices

Appendix A: Table of Recommendation Details

Table 5 shows basic cost-benefit calculations for key energy reduction strategies. See *Table 6* for the assumptions and sources associated with these calculations.

Table 5. Energy Reduction Strategy Details

Recommendations	Cost per Unit	kWh Savings	Therm Savings	Annual Savings	Simple Payback	GHG Reduction per Unit	# of Units	Total GHG Reduction	Total Cost	Net Present Value
YCH Operational Measures						**YCH Subtotals (to right)**		**10.58 tons**	**-$140**	$127,825
Install Computer Power Management Software [1]	$0	779	0	$138	0 years	0.19 tons	51	9.44 tons	$0	$113,972
Eliminate Excess Refrigerator Capacity [2]	-$35	1195	0	$212	0 years	0.28 tons	4	1.14 tons	-$140	$13,853
Energy Conservation Measures (ECMs)						**ECM Subtotals (to right)**		**251.95 tons**	**$863,497**	$1,552,038
Install Solar Photovoltaic Systems [4]	$46,723	13841	0	$3,369	13.9 years	3.29 tons	15	49.35 tons	$700,845	$114,751
ENERGY STAR Tankless Water Heater Upgrades [6]	$333	0	86	$115	2.9 years	0.53 tons	30	15.82 tons	$10,000	$45,674
Install ENERGY STAR Programmable Thermostats [3]	$92	316	45	$139	0.7 years	0.35 tons	431	151.84 tons	$39,652	$927,123
ENERGY STAR Refrigerator Upgrades [5]	$450	813	0	$198	2.3 years	0.19 tons	150	29.00 tons	$67,500	$411,780
Install Solar Thermal Systems [7]	$4,550	2500	0	$609	7.5 years	0.59 tons	10	5.94 tons	$45,500	$52,710
National Facility Consultant (NFC) Measures [9]						**NFC Subtotals (to right)**		**50.13 tons**	**$162,958**	$94,369
Upgrade Fluorescent Lighting	$242	271	0	$31	7.7 years	0.06 tons	133	8.56 tons	$32,217	$34,963
Install Wall Insulation	$1,452	42	78	$135	10.8 years	0.48 tons	72	34.90 tons	$104,534	$51,838
Upgrade Attic Insulation	$468	96	15	$37	12.5 years	0.12 tons	56	6.67 tons	$26,207	$7,569
Water Conservation Measures (WCMs) [8]		**Mgal Savings**				**WCM Subtotals (to right)**		**128.38 tons**	**$7,578**	$520,951
Convert kitchen aerators from 2.2 gpm to 1.0 gpm	$5	2.2	15	$23	0.2 years	0.09 tons	421	38.52 tons	$2,105	$157,480
Convert lavatory aerators from 1.5 gpm to 0.5 gpm	$5	1.1	8	$12	0.4 years	0.05 tons	421	20.54 tons	$2,105	$82,323
Convert showerheads from 2.5 gpm to 1.5 gpm	$8	3.7	27	$42	0.2 years	0.16 tons	421	69.33 tons	$3,368	$281,148
WCMs in Units with Electric Water Heaters (WCMe)			**kWh Savings**			**WCMe Subtotals (to right)**		**2.14 tons**	**$180**	$36,720
Convert kitchen aerators from 2.2 gpm to 1.0 gpm	$5	2.2	284	$72	0.1 years	0.07 tons	10	0.68 tons	$50	$11,594
Convert lavatory aerators from 1.5 gpm to 0.5 gpm	$5	1.1	142	$36	0.1 years	0.03 tons	10	0.34 tons	$50	$5,772
Convert showerheads from 2.5 gpm to 1.5 gpm	$8	3.7	474	$120	0.1 years	0.11 tons	10	1.13 tons	$80	$19,353
							Totals	**441.04 tons**	**$1,033,893**	$2,295,183

Table 6. Assumptions and Sources

[1] Assuming monitors consume 73W active/3W inactive, desktops consume 84W active/6W inactive, monitors sleep after 5 min., desktops after 15 min., 36% of computers shut off at night is based upon 2004 Lawrence Berkeley National Lab Report entitled "After-hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment". Source: U.S. EPA and DOE. "Energy Star Computer Power Management Savings Calculator." 10 Jul. 2009. http://www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc.xls.
[2] Assuming old refrigerator is 1990-1992 model with top freezer that uses 1,195 kWh annually, receiving $35 PG&E rebate with free pickup. Source: U.S. EPA and DOE. "Refrigerator Retirement Savings Calculator." 24 Jun. 2009. www.energystar.gov/index.cfm?fuseaction=refrig.calculator&which=4&rate=0.14&rconfig=Top+Freezer&screen=4&manu=1990-1992&tvol=19.0-21.4+Cubic+Feet&submit.x=22&submit.y=10&model=.
[3] Assuming $92 per unit cost (Industry Data 2008), 62°F setback during heating days, 82°F nighttime setup/85°F daytime, typical temp. 70°F heating days, 78°F cooling days, costs vs. conventional unit. All calculations based on installation in a residence, but all principles are applicable to administrative and common spaces. Source: U.S. EPA and DOE. "Programmable Thermostat Savings Calculator." 9 Jul. 2009. www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorProgrammableThermostat.xls.
[4] Assuming price of $8/watt, the average rate including parts and installation for systems above 2kW. Source: www.findsolar.com/Widgets/CalculatorEmbed.aspx?t=pro&id=1276. Tax incentives, rebates, and electricity production calculated for zip code 95695 using "Kyocera Solar Clean Power Estimator." Source: www.kyocerasolar.com/products/pv_calculator.html.
[5] Assuming ENERGY STAR refrigerator costs $500 from Capital Fund allocation. Replaces a top freezer 1990-1992 model that uses 1,195 kWh annually. Source: U.S. EPA and DOE. "Refrigerator Retirement Savings Calculator." 28 Jul. 2009. www.energystar.gov/index.cfm?fuseaction=refrig.calculator&which=4&rate=.2434&rconfig=Top+Freezer&screen=4&manu=1990-1992&tvol=16.5-18.9+Cubic+Feet&submit.x=83&submit.y=7&model=.
[6] Source: U.S. EPA and DOE. "Whole-home gas tankless water heaters." 28 Jul. 2009. www.energystar.gov/index.cfm?c=gas_tankless.pr_savings_benefits
[7] For a "glycol" system w/ heat exchanger and holding tank suitable for climates with freezing temperatures. Warmer climates can save money with a "Direct" system: heat exchanger and holding tank may not be installed. Source: www.find-solar.org.
[8] Cost per units from www.fypower.org/res/tools/products_results.html?id=100160. Average kitchen sink usage of 5 minutes/day and average bathroom sink usage of 3 minutes/day. Source: www.deltafaucet.com/company/green/green-tools/project-estimator.html. Energy savings estimates from Source: Jet Stream Mfg., LLC. "2-Minute Savings Calculator." 29 Jul. 2009. http://jet-streamshowerhead.net/calc.html.
[9] Source: NFC Energy Audit.
[10] Source: Department of Housing and Urban Development. "HUD Incentive Matrix—Add-On Incentive vs. Rolling Base Incentive." http://www.hud.gov/offices/pih/programs/ph/phecc/eperformance/incentivematrix.xls.

PG&E CO2 Emissions Rates		Reduces YCH Operational Emissions									
Electric (lbs per kWh)	0.524	Reduces Renter-Based Emissions									
Natural Gas (lbs per therm)	13.446										
Conversions											
1 metric ton (in lbs)	2,204.62										
Calculated Utility Rates											
Electric ($/kWh)	$0.1778	Average electric rate for YCH									
	$0.2434	Average electric rate for Residents									
Gas ($/therm)	$1.4875	Average natural gas rate from YCH Energy Bills Data									
	$1.9123	Average gas rate for YCH									
	$1.3645	Average gas rate for Residents									
Water rate ($/Mgal)	$1.3800	Average water rate for Residents from Honeywell Report									
Utility Rate Escalation [10]	4%	**NPV Term**									
Annual Inflation Rate [10]	3.1%	15 years									

Table 7 details the composition of YCH's vehicle fleet in 2008, including mileage, CO2 emissions and fuel use. Emissions of other GHG gases, while present, are small and do not significantly affect total emissions.

Table 7. YCH Vehicle Fleet

No.	Year	Make/Model	Total Mileage	Annual Mileage	CO2 Emissions (gm/mi)	Total Emissions (MT/year)	Resale Value [3]	Fuel Economy (mpg) [1]	Estimated Fuel Cost ($/yr) [2]
12	1990	Mercury Sable	100395	8366	290.989	2.43	$1,285.00	21	$1,195
16	1994	Ford Taurus	139461	11622	290.989	3.38	$1,285.00	20	$1,743
17	1994	Ford 1/2 ton	171200	14267	491.89	7.02	$1,800.00	15	$2,853
20	1996	Ford 3/4 ton	126834	10570	491.89	5.20	$3,100.00	14	$2,265
22	1999	Ford 3/4 ton	131428	10952	491.89	5.39	$3,550.00	14	$2,347
24	2001	Dodge 1/2 ton	107309	8942	491.89	4.40	$4,100.00	16	$1,677
25	2001	GMC Safari Van	42608	3551	1532.184	5.44	$4,375.00	17	$627
26	2002	Dodge 3/4 ton	79344	6612	491.89	3.25	$5,125.00	14	$1,417
27	2002	Dodge 3/4 ton	80708	6726	491.89	3.31	$5,025.00	14	$1,441
28	2008	Dodge 1-ton	6530	544	491.89	0.27	$18,700.00	14	$117
29	2008	Dodge 3/4 ton	3491	291	491.89	0.14	$15,935.00	15	$58
		Totals	**989308**	**82443**		**40.23**	**$64,280.00**	**15.8**	**$15,740**

[1] U.S. DOE. Source: www.fueleconomy.gov/feg/findacar.htm.

[2] Assuming gasoline costs $3/gallon (lower bound estimate)

[3] Source: Kelley Blue Book Co., Inc. "Private Party Value." www.kbb.com.

Table 8 shows the costs and benefits of replacing each of three YCH-owned vehicles with a 2010 Toyota Prius, which is used as an example of a low-emitting, midsize hybrid vehicle (this plan recommends purchasing vehicles that are similar to the 2010 Toyota Prius in terms of fuel economy and emissions levels, but it does not recommend a particular make or model).

Table 8. Vehicle Replacement Recommendations

No.	Year	Old Model	New Model	Annual Mileage	Old Emissions (gm/mi)	New CO2 Emissions (gm/mi)	Emissions Saved (gm/mi)	Emissions Saved (MT/yr)
17	1994	Ford 1/2 ton	2010 Toyota Prius	14267	491.89	173.333	318.557	4.5
16	1994	Ford Taurus	2010 Toyota Prius	11622	290.989	173.333	117.656	1.4
12	1990	Mercury Sable	2010 Toyota Prius	8366	290.989	173.333	117.656	1.0

No.	Net Cost	Old Fuel Economy (mpg)	New Fuel Economy (mpg)	Old Operating Cost ($/mi)	New Operating Cost ($/mi)	Annual Savings	Simple Payback (yrs)	Total Emissions Saved
17	$20,200	15	50	$0.20	$0.06	$1,997.38	10.11	6.9
16	$20,715	20	50	$0.15	$0.06	$1,045.98	19.80	
12	$20,715	21	50	$0.14	$0.06	$693.18	29.88	

Appendix B: Energy Plans and Climate Action Plans

In observance of the actions of states, counties, cities, and housing authorities around the country, there appears to be a clear distinction between what is called an Energy Plan and a Climate Action Plan. An Energy Plan identifies a range of activities that encourage energy efficiency and conservation; Energy Plans often focus on upgrading the energy efficiency of new and existing buildings under the jurisdiction of the planner. While an Energy Plan's primary purpose is to realize energy cost savings, a Climate Action Plan's primary purpose is to achieve a specified greenhouse gas emissions reduction target. In addition to plans for energy efficiency improvements, Climate Action Plans incorporate a broad range of strategies for reducing greenhouse gas emissions, including policies in the areas of Transportation, Land Use, Agriculture, Forests, Water, and Solid Waste.

This report contains elements of both an Energy Plan and a Climate Action Plan, because it focuses on implementing energy conservation and efficiency measures in order to meet a specific greenhouse gas emissions reduction target.

Appendix C: PG&E Programs

PG&E's energy programs for low-income residents are an excellent resource to YCH, because they allow YCH's tenants and HCVP participants to receive energy discounts and conserve energy at no cost to the Authority. All residents served by YCH who are PG&E customers should qualify for the CARE Program, and likewise for the Energy Partners Program, except those whose residence has already been served by the program since 2002.

Because participation in these programs saves YCH money (by reduced weatherization and refrigerator replacement costs), lowers resident energy costs, and reduces greenhouse gas emissions through energy conservation, YCH should make a serious effort to educate and assist all of its tenants and HCVP participants in enrolling in both the CARE Program and the Energy Partners Program. YCH can do so in several ways: first, by providing its new residents with information about these programs when they sign to live in YCH-operated units; second, by informing HCVP renters and owners about these programs whenever they sign a lease agreement; third, by sending a newsletter with energy saving tips and information about these programs to all current YCH residents and HCVP participants; and lastly, by assisting all interested residents in filling out an online enrollment (CARE) and referral form (Energy Partners) or calling PG&E's Smarter Energy line.

PG&E California Alternate Rates (CARE) Program

PG&E offers discounted utility rates to its low-income customers through the California Alternate Rates (CARE) Program. YCH residents with individual energy meters can conveniently enroll in the CARE program online to start saving 20% of their natural gas and electricity costs on the next billing cycle. YCH's migrant centers can qualify for the CARE program if 70% of energy supplied to master-metered facilities and 100% of energy supplied to individually-metered units is used for residential purposes.

Residents with internet access can enroll in the CARE program by filling out a single page online form at www.pge.com/myhome/customerservice/financialassistance/care/enrollrecertify/index.jsp. Residents without internet access can receive an application by mail by calling PG&E at 1-866-743-2273. If

possible, it is recommended that all residents enroll online for ease of renewal and minimum time commitment.

PG&E Energy Partners Program

The Energy Partners Program allows qualifying low-income PG&E customers to substantially reduce their natural gas and electricity costs by providing free energy education, weatherization measures, and energy-efficient appliances. The Energy Partners Program, which is funded by ratepayer fees, pays the full costs of energy-efficiency improvements, which include: attic insulation, door replacement, door weather-stripping, caulking, minor home repair, CFLs, and even new refrigerators.

PG&E's website lists the program's three steps. The first step is education and assessment, in which a PG&E certified contractor visits the customer's home to qualify the customer for the program, provide the customer with energy saving tips, and assess the residence for weatherization improvements. The second step is measure installation and delivery, in which a PG&E certified contractor team visits the residence to make weatherization improvements; in this step, refrigerator contractors may deliver a new refrigerator. For the third step, PG&E's Central Inspection Program performs a safety inspection of the residence after measures have been installed.

The simplest way for residents with internet access to sign up for the Energy Partners Program is to fill out a short referral form, which can be found at www.pge.com/forms/epsignup.shtml, after which they will be contacted by a PG&E certified contractor to begin the three step process. Residents without internet access can call PG&E's Smarter Energy line at 1-800-933-9555 to create a referral for a local PG&E certified contractor.

Appendix D: Energy Performance Contracts

Energy Performance Contracts (EPCs) allow housing authorities to implement large-scale energy efficiency improvements and pay back the cost of implementation over time with utility cost savings. EPCs are performed by an Energy Savings Company (ESCO), which is responsible for conducting a comprehensive energy audit, developing cost-saving recommendations, obtaining financing for the project, and implementing the recommendations approved by the housing authority.

Before signing an EPC, a housing authority must obtain a waiver from HUD that will allow it to retain two kinds of savings: monitored meter savings and stipulated allowance reductions. Monitored meter savings are relatively straightforward—they are the savings that the housing authority realizes as a result of energy efficiency improvements that lower its own operational utility costs. These improvements often include fluorescent lighting upgrades, low water-flow faucet aerators and toilets, and energy-efficient appliances in administrative and common spaces.

Stipulated allowance reductions savings result from the ability of housing authorities to lower utility allowances for residents living in authority-owned units that recently received energy efficiency upgrades. Tenants of authority-owned units usually pay rent directly to the housing authority and their utility bills directly to the utility provider. On an annual basis, housing authorities are charged with calculating a monthly utility allowance for each tenant household by estimating the monthly utility costs that an energy-conserving household occupying an equally configured unit would incur. Each month, housing authorities pay utility allowances to their tenants (or reduce the required rent by an equal amount), and the tenants are responsible for paying their utility provider. It is important to note that if

tenants consume less energy and water than the amount of their utility allowance, they keep the difference; vice versa, if tenants have higher utility costs than their allowance, they will pay more out of pocket.

When a housing authority plans to make energy- and water-efficiency improvements to its rental units under an EPC, it submits to HUD its calculated pre-retrofit and post-retrofit utility allowances; the post-retrofit allowances are reduced under the expectation that the tenants will have lower energy and water costs as a direct result of the improvements. If HUD approves the waiver, then the housing authority is allowed to retain the savings resulting from stipulated allowance reductions and use them to make loan payments to the ESCO.

Loan terms under an EPC usually have a maximum repayment period of 15 years. Once the loan has been paid off, the housing authority receives 60% of the additional net benefits, and the ESCO receives the remaining 40% in addition to any annual monitoring fees it is due.

Appendix E: Graph of YCH's Operational Scope Emissions

This graph shows the 2006 and 2008 emissions within YCH's operational scope in four categories: Electricity, Natural Gas, Lighting, and Vehicle Fleet. The Natural Gas emissions category consists entirely of emissions from providing natural gas for resident consumption and arguably should be considered part of Renter-Based emissions. In this case, YCH's direct operational emissions in 2008 consisted of 121.5 metric tons of CO2 from indirect electricity emissions (Scope 2) and 40.3 metric tons from mobile combustion emissions (Scope 1).

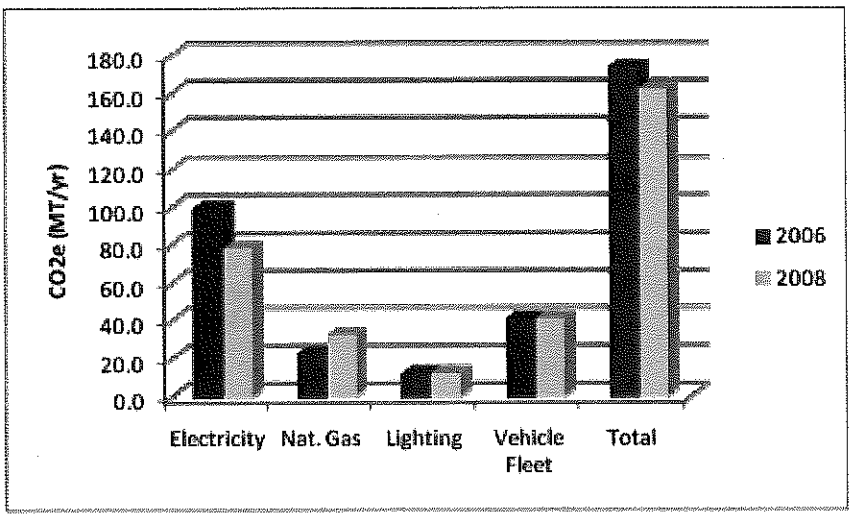

Figure 6. YCH Scope 1,2 emissions

Appendix F: Emissions Sources and Types

Before developing strategies to effectively reduce GHG emissions, it is important to first identify the types of emissions and their respective sources. There are two types of emissions addressed in this plan: Scope 1 and Scope 2. Scope 1 emissions originate directly from the point of energy consumption, for example, burning natural gas for heating or gasoline for transportation. Scope 2 emissions result indirectly from the consumption of electricity whose generation resulted in GHG emissions.

As defined by the 2009 GHG inventory, YCH has direct operational control over Scope 1 emissions from its vehicle fleet and Scope 2 emissions from electricity that YCH purchases from Pacific Gas and Electric

(PG&E) to run its main administrative building, administrative and common spaces in its housing developments, and YCH-operated streetlights.

Renter-based emissions addressed in this report include Scope 1 emissions from natural gas consumption for heating and Scope 2 emissions from electricity usage in YCH-operated units. These emissions, though not directly controlled by YCH, can be influenced by energy efficiency and conservation measures implemented by the housing authority.

Concerning renter-based emissions from HCVP participants, YCH's influence is constrained by HUD regulations. Yet, some recommendations in this plan, such as encouraging participation in PG&E programs and providing information about energy conservation, may facilitate GHG reductions from HCVP tenants and owners.