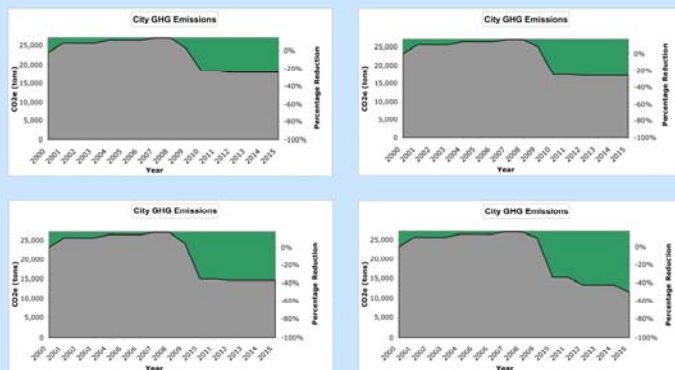


City of Santa Rosa Greenhouse Gas Emissions Reduction Action Plan Analysis

Final Report

July 18, 2008

Climate Protection Campaign



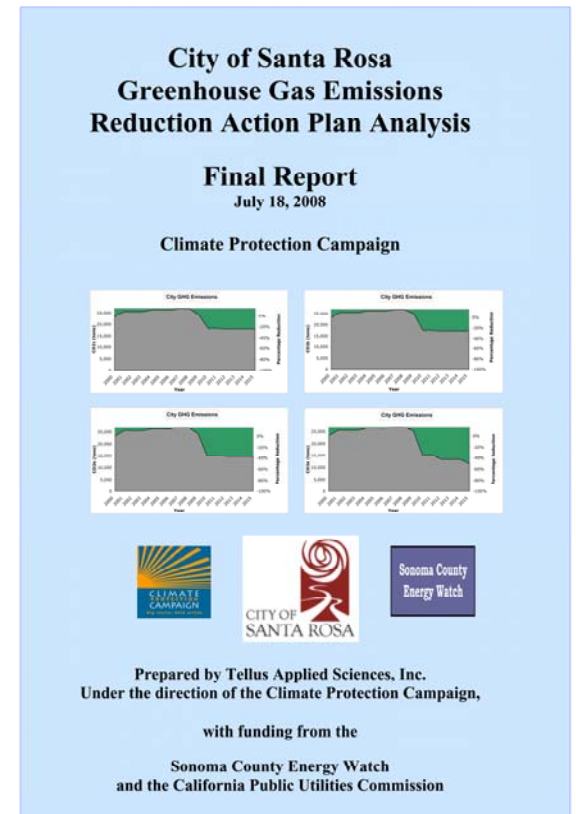
Prepared by Tellus Applied Sciences, Inc.
Under the direction of the Climate Protection Campaign,

with funding from the

Sonoma County Energy Watch
and the California Public Utilities Commission

Five Milestones

- Create GHG Inventory
- Set Reduction Target
- Create Plan
- Implement Plan
- Monitor and Adjust



Milestone One

Establish 2000 Baseline

In 2000, 23,000 CO2e tons identified

Additional 3,800 CO2e tons to baseline 2000

| Increases in Energy Consumption from 2000 to 2007 | | | |
|--|-----------------|----------------|--------------------|
| End Use | kWh | Therms | Fuel (gals) |
| Buildings (City Hall) | -201,966 | 0 | 0 |
| Pools and Rec | 0 | 159,127 | 0 |
| CNG Vehicles | 0 | 6,292 | 0 |
| Laguna Waste Treatment Plant | 0 | 316,616 | 0 |
| Laguna Waste Treatment Plant | 1,884,262 | 0 | 0 |
| Streetlights | -2,462,694 | 1,068 | 0 |
| Employee Commute 1 | 0 | 0 | 33,774 |
| Employee Commute 2 | 0 | 0 | 33,774 |
| Fleet Purchases | 0 | 0 | 30,244 |
| Totals | -780,398 | 483,103 | 97,792 |

Table 1: Increases in Energy Consumption from 2000 to 2007

2000 Baseline

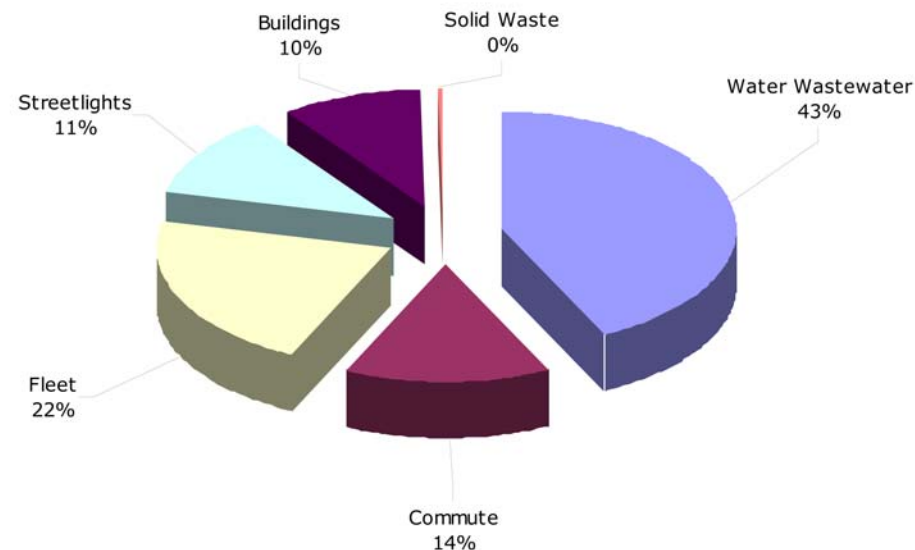
| SECTOR | 2000 | Adjusted | 2008 | Change |
|-----------------|---------------|-----------------|---------------|---------------|
| Buildings | 2,286 | 3,386 | 3,155 | (231) |
| Street Lighting | 2,602 | 2,602 | 2,006 | (596) |
| Fleet | 5,020 | 5,020 | 5,343 | 323 |
| Employee | 3,969 | 3,969 | 4,668 | 699 |
| Water-Waste | 9,946 | 9,946 | 12,630 | 2,684 |
| Solid Waste | 80 | 80 | 80 | - |
| PV | - | - | (42) | (42) |
| Total | 23,903 | 25,003 | 27,840 | 2,837 |

Milestone Two

Greenhouse Gas Reduction

City Council (August 2, 2005)

- 1) Target of 20% from 2000 Levels by 2010.
- 2) Target of 25% from 1990 Levels by 2015.



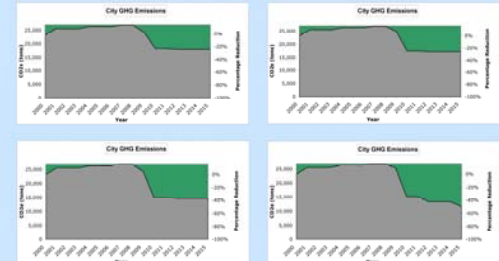
Milestone Three

- Create GHG Inventory
- Set Reduction Target
- **Create Plan**
- Implement Plan
- Monitor and Adjust

City of Santa Rosa Greenhouse Gas Emissions Reduction Action Plan Analysis

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City of Santa Rosa Greenhouse Gas Emissions Reduction Action Plan Analysis

Sam Pierce, P.E. Tellus Applied Sciences, Inc.
Climate Protection Campaign





Plans

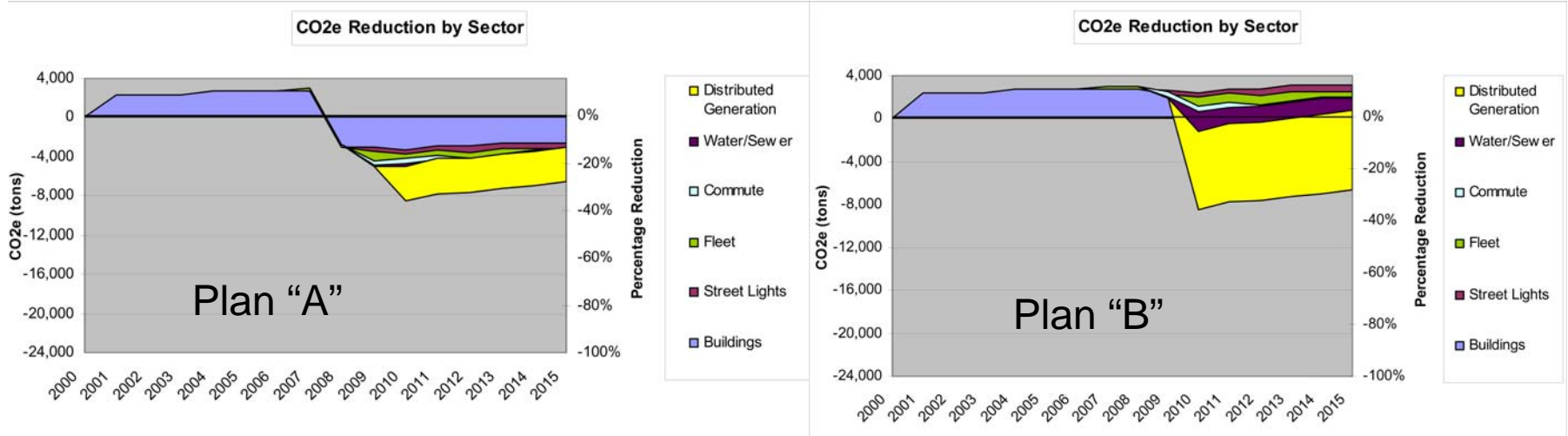


Plan A

35 Measures: building efficiencies, PG&E Climate Smart, Street light LED . . .

Plan B:

39 Measures: staff added, Fleet management software, photovoltaic, power purchase agreement, vehicle replacement . . .





Plans

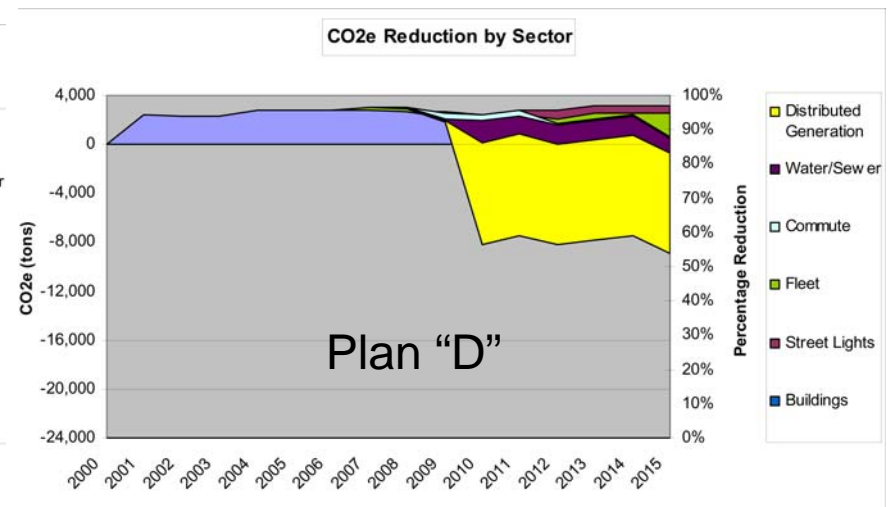
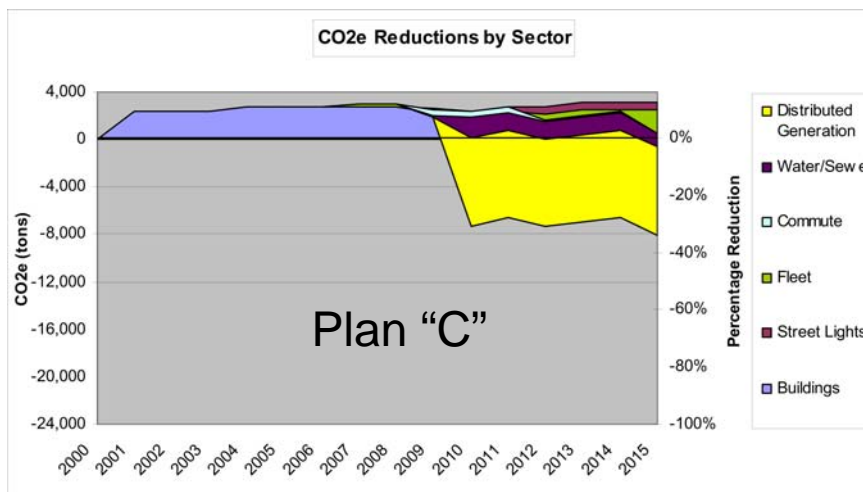


Plan C

41 Measures: Includes Plan A and B measures plus more aggressive fleet replacement with electric plug-in hybrids and diesel hybrids, plus 1.03 MW PV.

Plan D

41 Measures: includes most of Plan C replace 1.03 MW PV with 4 MW PV, . . .



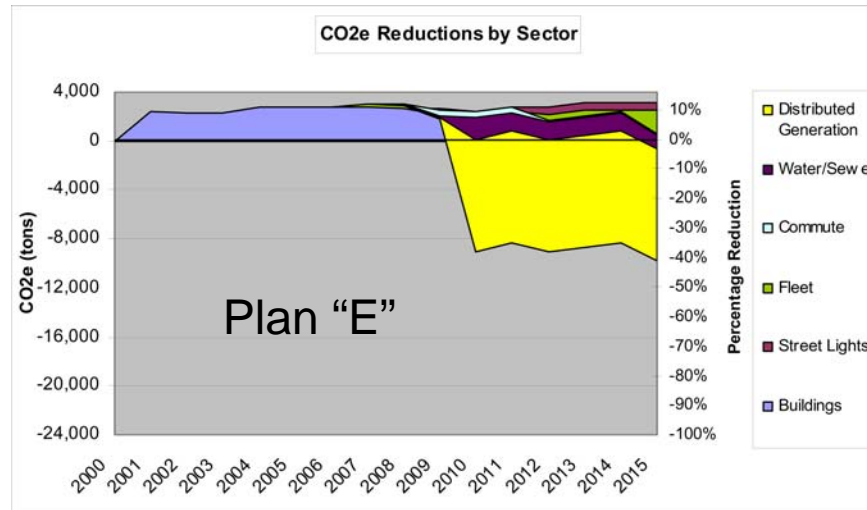


Plans



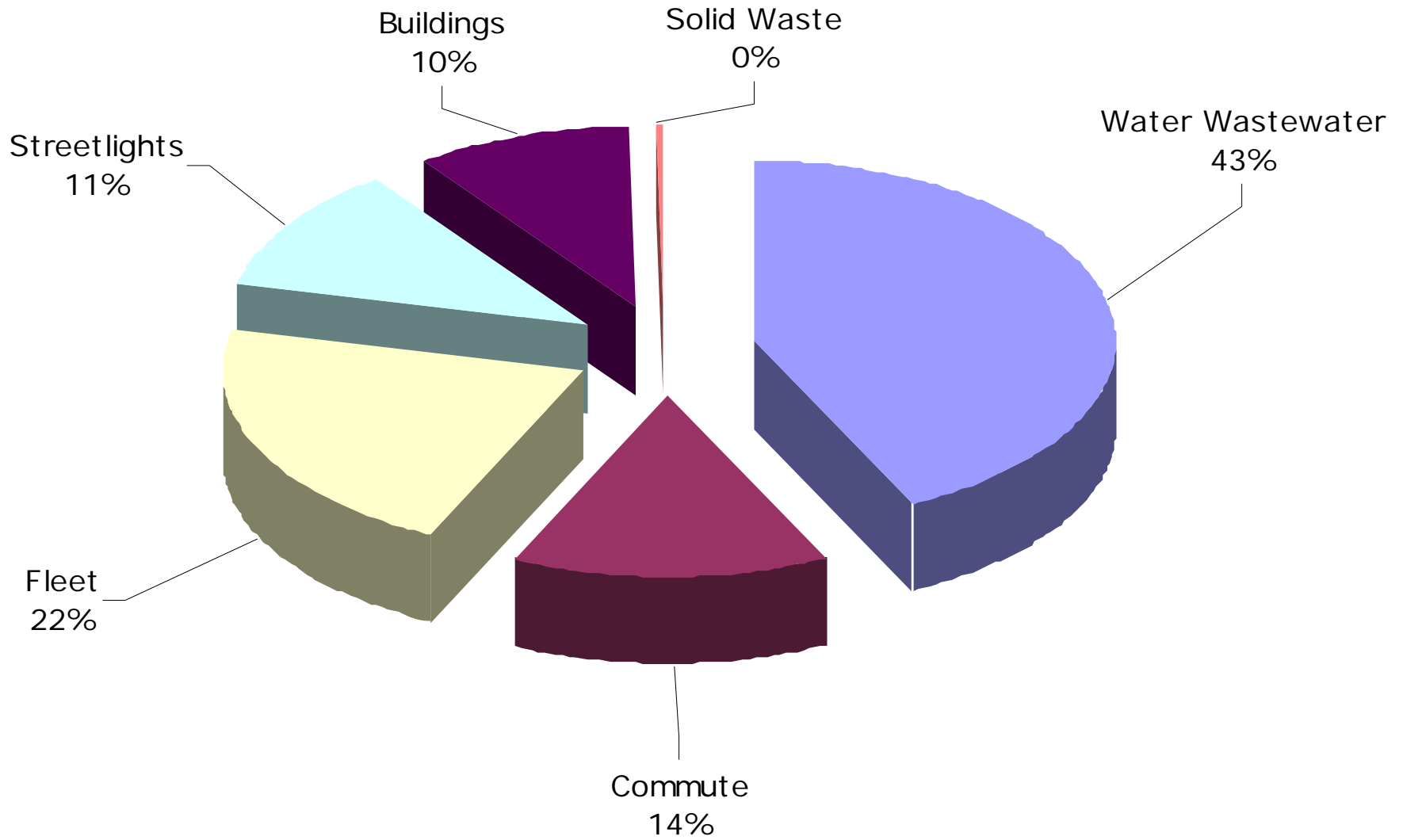
Plan E

Includes all building efficiency, fleet and equipment measures of Plan D replaces 4 MW PV with 7 MW system.





Baseline GHG Emissions by Sector





GHG and Energy Cost



Future Energy Cost Mitigation

Escal. Rate

N.Gas and Elec.= 3.5%

Diesel and Gas = 8%

Annual Energy Cost

\$23,265,093 No Action

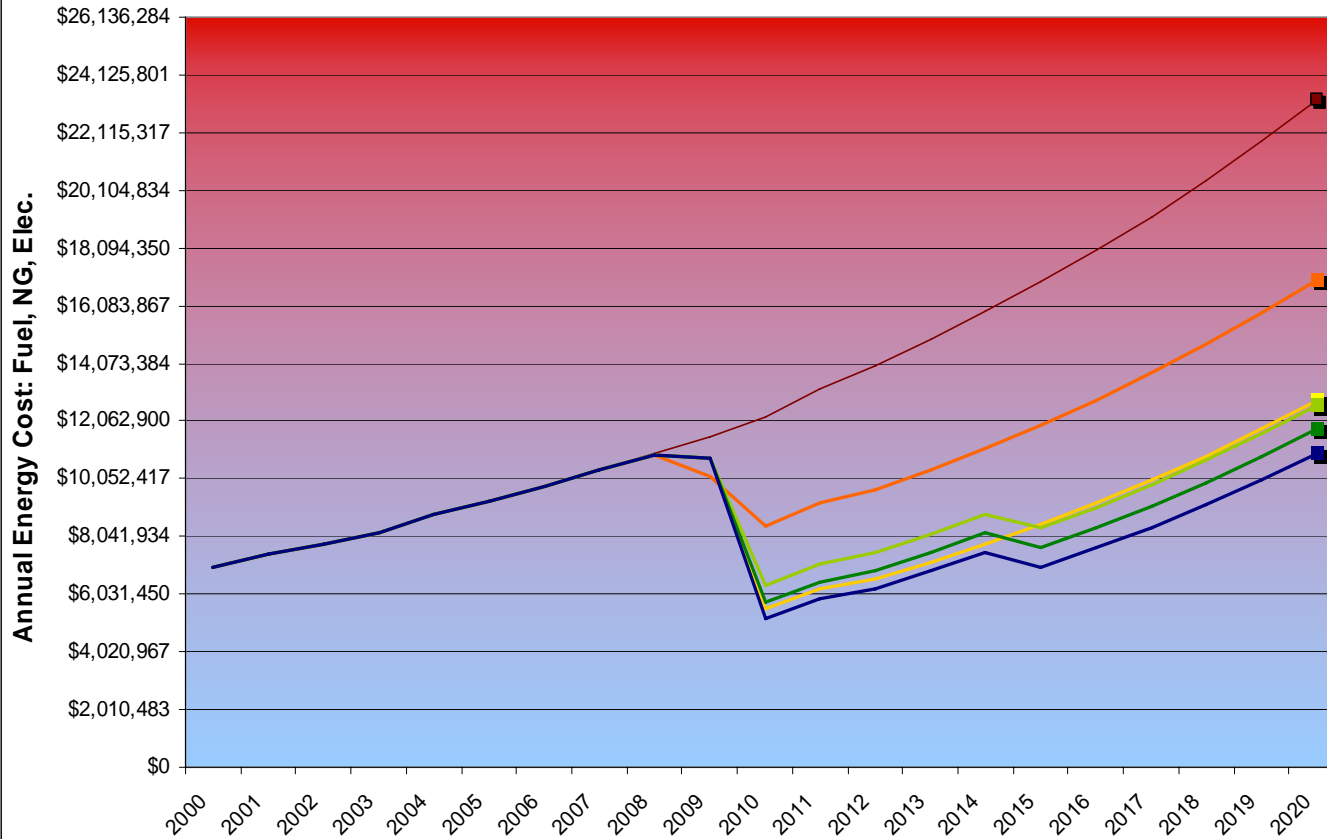
\$16,981,175 Plan A

\$12,782,659 Plan B

\$12,595,336 Plan C

\$11,782,684 Plan D

\$10,966,389 Plan E





Measure Variables



| Measure Summary | Description | Category | Status | Financed | Implement Date |
|------------------------|-------------------------------|-----------------|---------------|-----------------|-----------------------|
| Measure 6 | MSCS Office Ltng Upgrade | Building | Future | yes | 2008 |
| Measure 33 | Streetlighting: Reduce Lumins | Streetlighting | Future | no | 2009 |
| Measure 23 | Finley Swim Pool Optimization | Building | Future | yes | 2009 |
| Measure 35 | PV 1.03 MW | PV | Future | yes | 2010 |
| Measure 47 | BioDiesel B20 | Fleet | Future | no | 2009 |



Measure Results



| Measure Summary | Description | Net Capital Cost | O&M incremental Benefit | Annual Cost Savings | Annual CO2 Reduction | % of Total GHG |
|-----------------|-------------------------------|------------------|-------------------------|---------------------|----------------------|----------------|
| Measure 6 | MSCS Office Ltng Upgrade | 38,027 | 0 | 6,094 | 20,552 | 0.0% |
| Measure 33 | Streetlighting: Reduce Lumins | 0 | 0 | 231,424 | 780,456 | 1.4% |
| Measure 23 | Finley Swim Pool Optimization | 10,039 | 0 | 18,918 | 63,799 | 0.1% |
| Measure 35 | PV 1.03 MW | 8,241,643 | -20,600 | 202,713 | 625,489 | 1.2% |
| Measure 47 | BioDiesel B20 | 50,000 | 0 | 0 | 944,534 | 1.7% |



Action Plan Development



| Action Plan | | | | | Measure Summary | Description | Financed | Implement Date |
|-------------|---|---|---|---|-------------------|-------------------------------|----------|----------------|
| A | B | C | D | E | | | | |
| y | y | n | y | y | Measure 6 | MSCS Office Ltng Upgrade | yes | 2008 |
| y | y | y | n | n | Measure 33 | Streetlighting: Reduce Lumins | no | 2009 |
| n | y | n | y | y | Measure 23 | Finley Swim Pool Optimization | yes | 2009 |
| n | n | y | y | y | Measure 35 | PV 1.03 MW | yes | 2010 |
| n | n | n | n | y | Measure 47 | BioDiesel B20 | no | 2009 |



Action Plan Results



| GHG Action Plan Summary | | | | | |
|------------------------------|--------------|--------------|--------------|---------------|----------------|
| Analysis | Plan A | Plan B | Plan C | Plan D | Plan E |
| % Reduction below 2000 (net) | 21.5% | 31.8% | 36.0% | 43.9% | 46.7% |
| % Reduction below 1990 (net) | -3.7% | 9.9% | 15.5% | 25.9% | 29.5% |
| SPB | 4.3 | 1.2 | 0.3 | 17.9 | 22.7 |
| IRR | 49.7% | 121.6% | 343.2% | 7.6% | 2.0% |
| NPV | \$10,385,613 | \$15,951,859 | \$26,663,090 | \$4,673,275 | (\$11,186,667) |
| Annual Cash Flow | Plan A | Plan B | Plan C | Plan D | Plan E |
| 2008 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 2009 | (\$74,642) | \$2,978 | \$2,978 | (\$368,438) | (\$368,438) |
| 2010 | \$21,021 | (\$50,393) | (\$393) | (\$384,808) | (\$384,808) |
| 2011 | \$20,973 | \$254,586 | \$51,092 | (\$2,094,780) | (\$5,580,045) |
| 2012 | (\$10,119) | \$249,681 | (\$14,004) | (\$2,155,188) | (\$5,621,768) |
| 2013 | \$238,929 | \$525,848 | \$275,849 | (\$1,860,482) | (\$5,307,723) |
| 2014 | \$269,988 | \$584,993 | \$324,490 | (\$1,806,818) | (\$5,234,044) |
| 2015 | \$332,578 | \$676,669 | \$1,010,571 | (\$1,115,539) | (\$4,522,049) |
| 2016 | \$372,209 | \$496,003 | \$852,636 | (\$1,268,094) | (\$4,653,163) |
| 2017 | \$406,700 | \$561,690 | \$941,851 | (\$1,173,312) | (\$4,536,189) |
| 2018 | \$469,940 | \$657,235 | \$1,051,052 | (\$1,058,347) | (\$4,398,256) |
| 2019 | \$506,927 | \$727,678 | \$1,146,758 | (\$956,676) | (\$4,272,814) |
| 2020 | \$600,179 | (\$341,626) | \$103,599 | (\$5,445,791) | (\$12,224,324) |
| 2021 | \$730,106 | \$1,166,875 | \$1,551,473 | (\$524,028) | \$3,097,224 |
| 2022 | \$771,179 | \$1,245,106 | \$1,576,698 | (\$492,190) | \$3,155,419 |
| 2023 | \$1,235,995 | \$1,748,403 | \$2,189,997 | \$127,954 | \$3,802,842 |
| 2024 | \$1,280,039 | \$1,832,297 | \$2,303,895 | \$248,936 | \$3,952,058 |
| 2025 | \$1,325,648 | \$1,919,174 | \$2,787,334 | \$739,708 | \$4,472,052 |



Action Plan Results and Community Benefits



| Plan D: | 10,521 | Tons CO2 Avoided | 43.9% | % Reduction |
|--|--------|--------------------------|-------|-------------|
| <u>Community Benefit (over 25 year life of plan)</u> | | <u>Financial Metrics</u> | | |
| \$\$\$ Avoided Utility Company Payments | | \$24,974,343 | SPB | 17.9 |
| \$\$\$ Avoided Fuel Purchases | | \$8,528,197 | IRR | 7.6% |
| \$\$\$ Invested Locally in GHG Projects | | \$212,311,137 | NPV | \$4,673,275 |



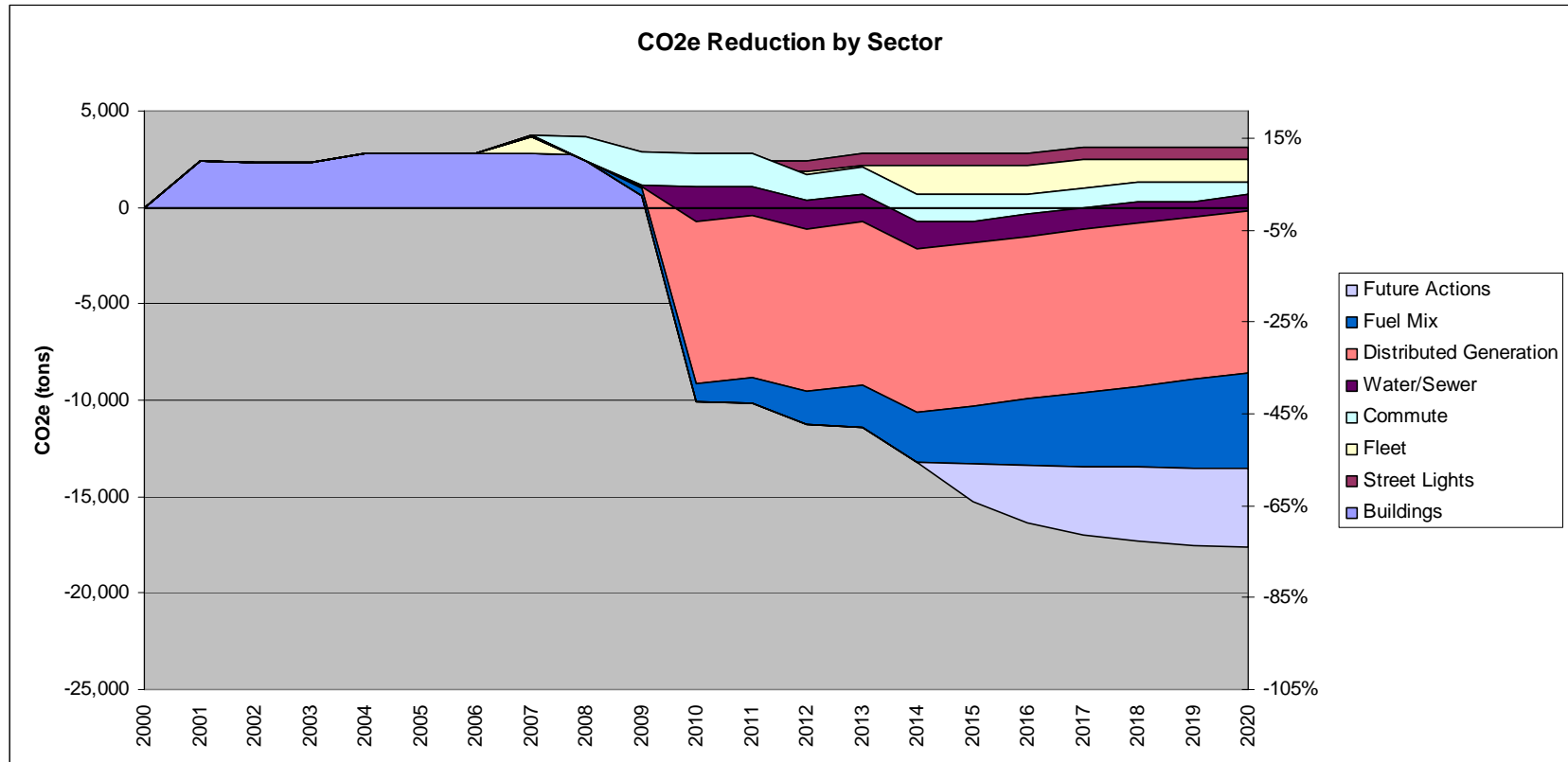
Action Plan Detailed Cash Flow Analysis



| Year | Cash Flow (gross) | Annual Debt Service Payments | Net Cash Flow | Outstanding Principal |
|------|-------------------|------------------------------|---------------|-----------------------|
| 2008 | \$0 | \$0 | \$0 | \$74,207 |
| 2009 | \$22,024 | (\$19,046) | \$2,978 | \$1,636,218 |
| 2010 | \$423,157 | (\$423,549) | (\$393) | \$34,607,848 |
| 2011 | \$1,758,283 | (\$3,455,193) | (\$1,696,910) | \$32,519,665 |
| 2012 | \$1,700,061 | (\$3,443,453) | (\$1,743,392) | \$34,353,616 |
| 2013 | \$2,188,998 | (\$3,623,271) | (\$1,434,274) | \$32,087,312 |
| 2014 | \$2,257,579 | (\$3,623,271) | (\$1,365,693) | \$32,703,490 |
| 2015 | \$3,299,380 | (\$3,958,354) | (\$658,974) | \$30,036,923 |
| 2016 | \$3,156,481 | (\$3,952,030) | (\$795,550) | \$27,271,351 |
| 2017 | \$3,267,803 | (\$3,952,030) | (\$684,228) | \$24,396,539 |
| 2018 | \$3,372,364 | (\$3,924,509) | (\$552,145) | \$21,435,694 |
| 2019 | \$3,491,751 | (\$3,924,509) | (\$432,758) | \$18,357,895 |
| 2020 | (\$1,033,976) | (\$3,869,559) | (\$4,903,535) | \$15,213,473 |
| 2021 | \$3,743,331 | (\$3,706,124) | \$37,207 | \$12,108,281 |
| 2022 | \$3,794,813 | (\$3,706,124) | \$88,688 | \$8,880,433 |
| 2023 | \$4,013,005 | (\$3,283,842) | \$729,163 | \$5,947,369 |
| 2024 | \$4,155,029 | (\$3,283,842) | \$871,187 | \$2,898,449 |
| 2025 | \$4,302,071 | (\$2,918,332) | \$1,383,738 | \$94,605 |



Greenhouse Gas Reduction 2000-2020



Work in Progress

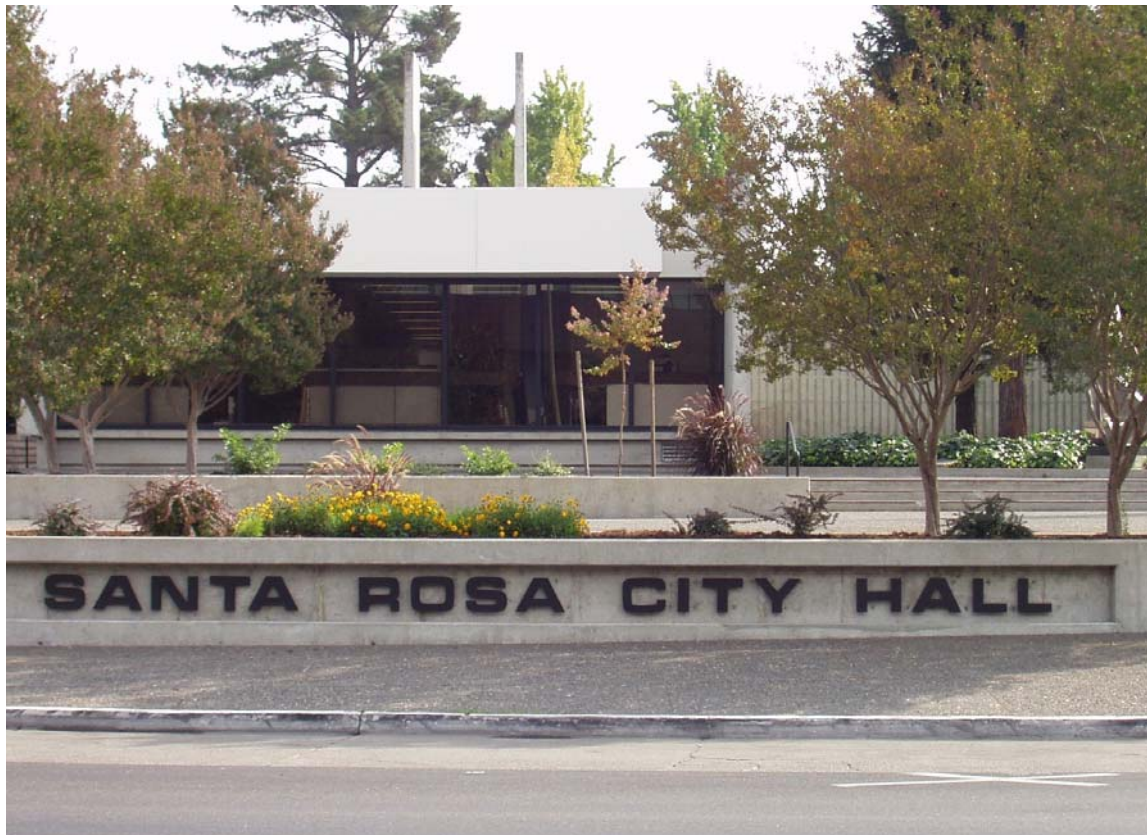
- 1) The City of Santa Rosa completed many energy efficient and greenhouse gas reductions measures before 2000.
- 2) The City of Santa Rosa continues to implement projects and programs that reduce greenhouse gas.



City Facilities

Mark Armstrong

Facilities Maintenance/Operations Coordinator



1992 to 2000

- Compact fluorescents: 584 installed
- High efficiency T-8 fluorescent lamps and electronic ballasts: 20 projects replaced 8,600 lamps and 3800 ballasts
- 20 premium efficiency motors
- 10 variable speed drives
- HVAC control systems in 6 buildings
- Window film in 4 buildings



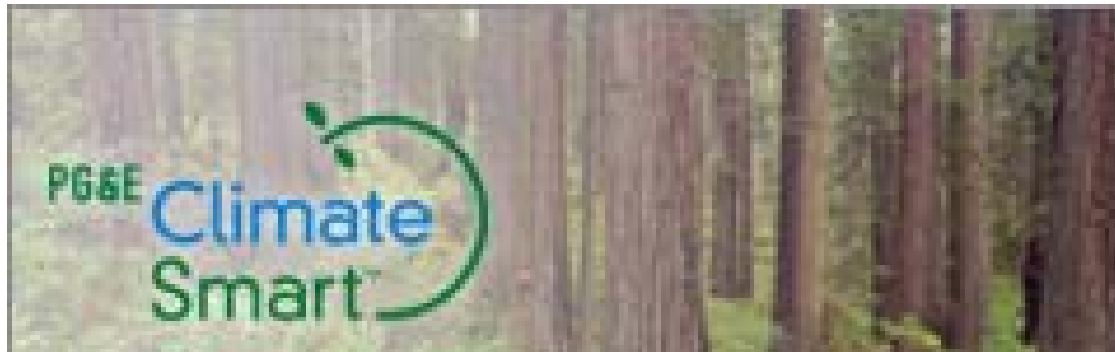
2000 to 2008

- Cool Roof installations: PSB, City Hall, Annex, and Chamber Building
- High Efficiency HVAC: PSB, City Hall, MSCN, Steele Lane
- Lighting Upgrades to 3rd generation T-8 fluorescents: City Hall, Annex, PSB, Chamber, and Finley Community Center



PG&E Climate Smart

Program offsets all building GHG emissions: small surcharge on energy bills goes to GHG reduction projects (forest restoration, methane gas recovery)



Energy and Cost Savings

- Natural Gas use reduced 23% (since 1997?)
 - 2007 cost savings of \$83,000
 - 1992-2007 cumulative savings: \$638,000
- Electricity use reduced 18%
 - 2007 cost savings of \$143,000
 - 1992-2007 cumulative savings: \$1.6 million
- \$74,000 in PGE rebates



Street Light Program

Steve Widders - Senior Electrical Technician



Street Light Program

- Public Works de-energized 1200 street lights in 2002/03.
- De-energizing additional street lights was recently approved by the City Council as a Budget Reduction Strategy.
- Energy reductions = Greenhouse Gas reductions.



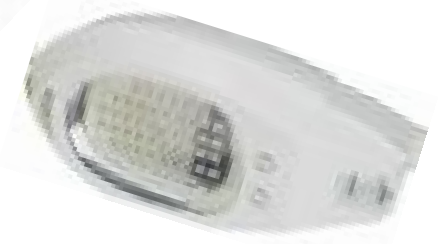
Street Light Program

- Public Works experimenting with programmable photocells can reduce energy by 50%.
- Public Works following Light Emitting Diode (LED) street light technology which reduces energy by 20-30%.



Street Light Program

- Existing issues with LEDs: cost, fading and heat dissipation.
- Public Works applying for grants for programmable photocell ar LED light projects.



LED Traffic Light Program

City replaced all incandescent traffic signal heads with LEDs reducing traffic signal energy by 90%.



Garage/Fleet Management

Jon Merian – Fleet Superintendent



Hybrid Vehicles

When applicable, hybrid vehicles are purchased to perform City business.



20% Bio Diesel

Bio Diesel is currently used in selected trucks in our fleet



Idle Policy

Buses, trucks, sedans, and off road equipment all will have an updated idling policy in the near future.



Diesel Particulate Filter

Diesel Particulate Filters have been installed to reduce particulate matter by 85% and Nox by 25% with most filters



Plug-in Hybrids & Electric Vehicles

Vehicle manufacturers will soon be offering plug-in hybrids and electric vehicles with a range of miles that will work very well for fleet vehicles.



Prior to Year 2000

- The City fleet was purchasing clean air vehicles prior to the year 2000
- Today's Fleet is more efficient with better mileage and cleaner vehicles.

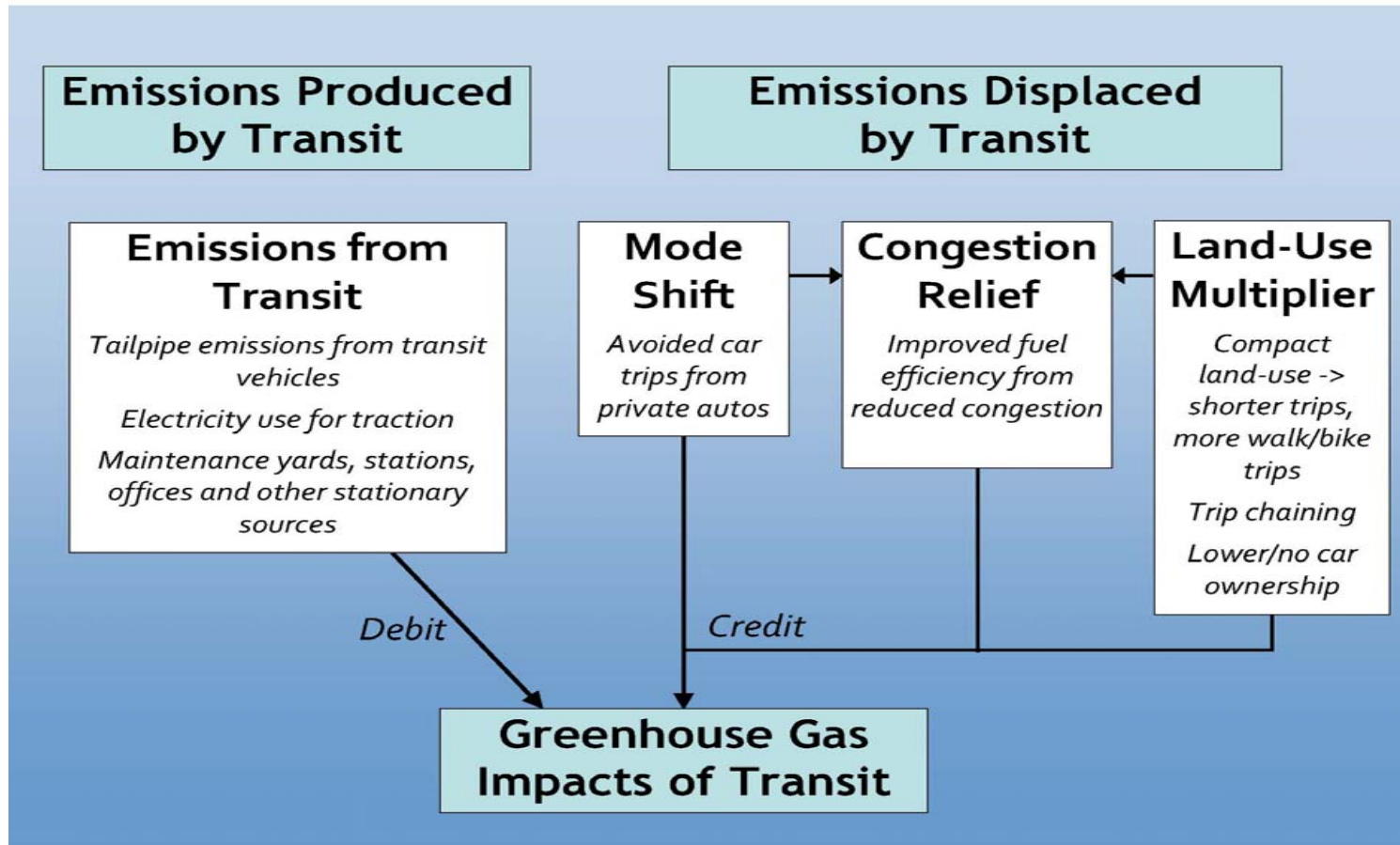


Transit & Parking Department

Joanne Parker – Transit Planner



Tracking CityBus' Contribution to GHG Reduction



Emissions *Produced* by CityBus – Current and Future

- Transit Fleet Conversion to Hybrid (Diesel/Gasoline Electric)
 - 2000-2008
 - 1 bus renovated, 3 expansion buses received, 4 more buses under contract
 - Lower emissions, less noise, better fuel efficiency, lower maintenance costs
 - 2009 onward
 - 13 buses due for replacement by 2010, all new buses will be hybrids
 - While fleet will convert to hybrid, more service on the streets will increase mileage
- Bus Shelters/Facilities
 - 2000-2008
 - 2 lighted shelters converted to solar, 12 new solar shelters added, reclaimed water used for all bus stop/Transit Mall cleanings, eco-friendly cleaning solutions
 - 2009 onward
 - All new lighted shelters will be solar and as new technologies become available they will be deployed for use in the maintenance yard



Emissions *Displaced* by Transit - Current

- Employee Related – Commute: **Commute is 14% of city emissions**
 - CityBus free for Employees
 - Free Ride Program
 - 2008 employee participation level
 - 119 employees
 - 9,212 trips reduced (estimated at 1.5% of all employee commute trips)
 - Bicycles
 - On site bicycle parking provided
 - 3 bicycles available for check out for work travel since August 2008, 0 used
- Non-Employee Related: **Transportation is 60% of countywide emissions**
 - CityBus ridership at approx. 11,000 trips/average weekday
 - Free Ride Program
 - Approx. 1,000 participants (2007) to nearly 1,600 participants (2008)
 - TBD on overall impact of transit to GHG emissions within Sonoma County

Emissions *Displaced* by Transit - Future

- Employee Related – Policies to Consider
 - Tax benefits for transit/bicycle use (\$115/mo pre-tax for transit/vanpool)
 - Employee dependent benefit - free transit passes for CityBus
 - Recognition of employee parking benefit received
 - Parking permit, department garage parking vouchers, try parking cash out program
 - Telecommute program
 - Increasing flexible schedule options (esp. related to school schedules)
 - On-site childcare opportunities
 - On-site bicycle-related amenities (showers, changing facilities)
- Non-Employee Related – Policies to Consider
 - Commuter Benefits Ordinance: Pre-tax benefit for transit/bicycle
 - Encourage compact and transit friendly land use in Santa Rosa
 - Secure bicycle parking facilities at major destinations/transit locations
 - Encouraging childcare facilities in major employment districts
 - Further conditioning development to provide adequate transit facilities/support

Utilities Department

Dell Tredinnick - Project Development Manager

Tasha Wright -Administrative Analyst



Solar Projects



LTP: 21 kW



Fueling Station: 29.3 kW



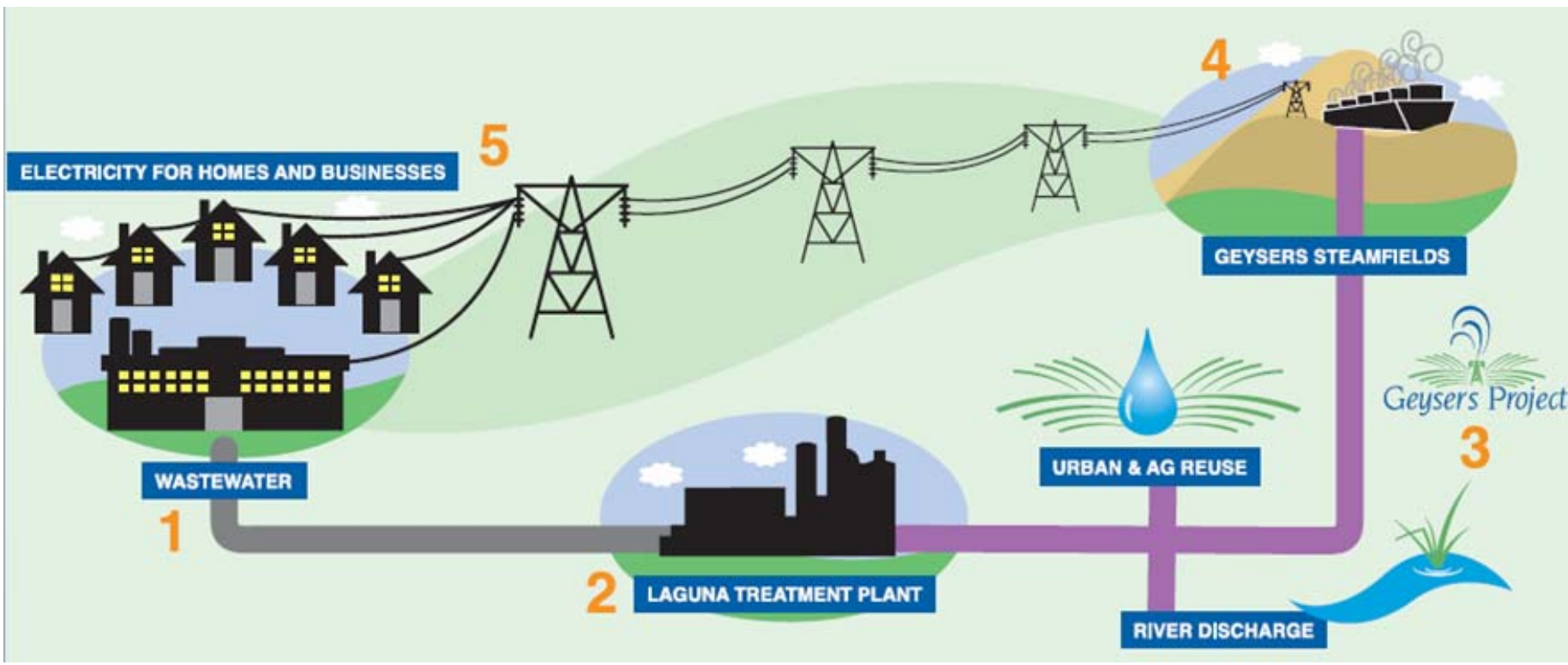
Alpha Farm: 31 kW



Station 4: 28kW

Renewable Energy: Recycle Water and Geysers Project

The City of Santa Rosa pumps 16 million gallons of recycled water per day to recharge the Geysers steam fields which in turns produces an extra 150 mega watts of clean green electricity each year.

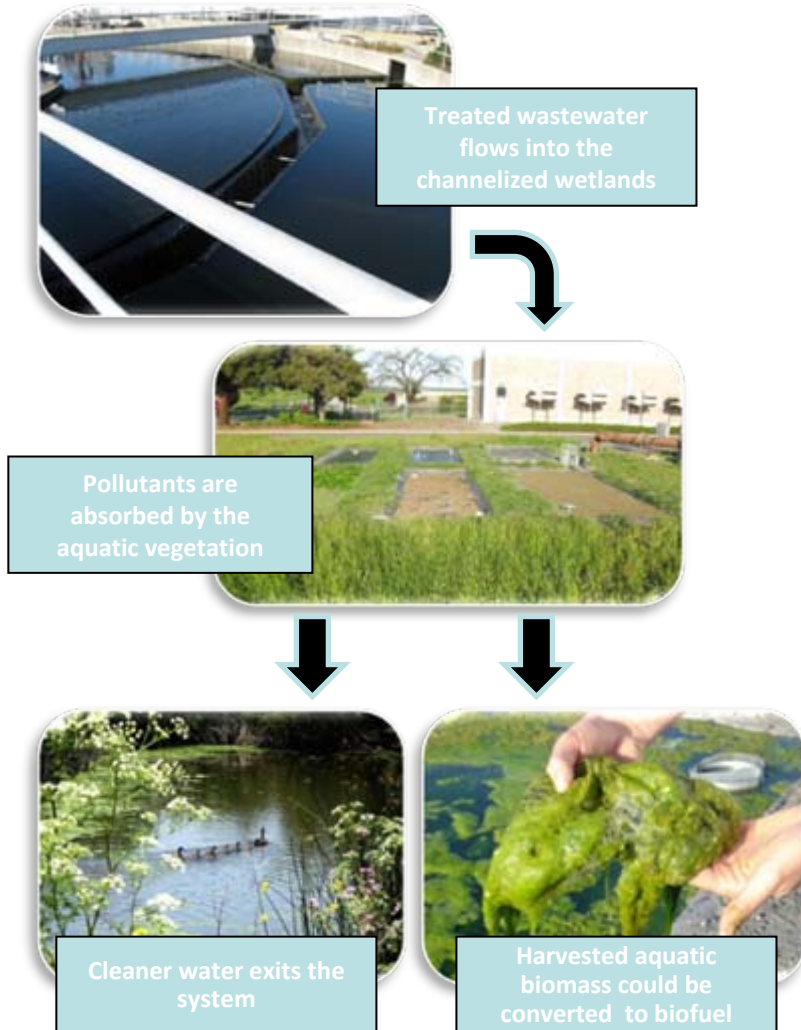


Alternative Energy: Production of Biofuel

- Waste grease from restaurants
- Algae grown in wastewater



Renewable Energy: Aquatic Biomass to Fuel



Project

Purifying Wastewater

Producing Clean, Renewable Energy

Grant Funding

\$75,000 BAAQMD

\$70,983 California Energy Commission

Awards

ICLEI 2008 Climate Innovation Award

IREC 2007 Innovation Award



First SR-BIG Projects

Four categories of housing currently represented in our program:

Affordable
Habitat for Humanity



Production
Christopherson Homes

Custom
Willow Properties



Municipal
Bennett Valley Golf Course and Clubhouse

Environmentally Preferable Purchasing (EPP) Policy



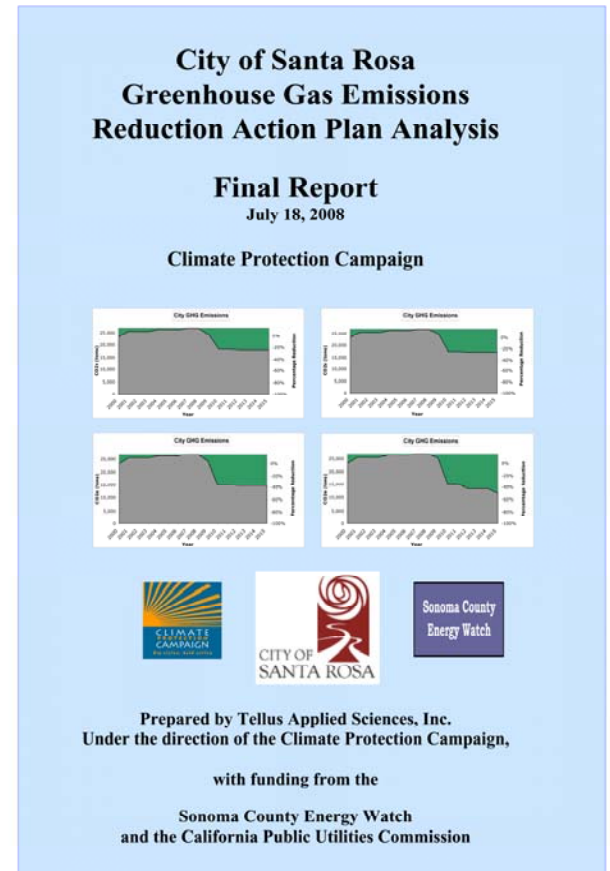
The City of Santa Rosa spends over \$26,000,000 on goods and services each year.

- Influence the market
- Reduce negative impacts
- Adopted March 2007



GHG Report

- 2000 Baseline Adjustments
- Measures Not Included
 - Diesel Particulate Filters
 - New Technology/Applications
 - 9/80 Work Schedules
 - Building Conversions (Reuse)
 - Funding Source Stimulus Package
- Review & Revise Analysis



Recommendations

- 1) Receive Report as a guideline.
- 2) City Council and Staff continue to collaborate identifying measures combined with policy changes to take advantage of opportunities that are cost effective, affordable and sustainable to reach GHG Target.
- 3) Staff update City Council on progress in six months.

