Strategy Effectiveness Analysis

Technical Report

August 1st, 2012

Prepared by:

Alamo Area Council of Governments

**Prepared in Cooperation with the
Texas Commission on Environmental Quality**

The preparation of this report was financed through grants from the State of Texas through the Texas Commission on Environmental Quality

<table>
<tr><td colspan="3">Title: Strategy Effectiveness Analysis</td><td colspan="3">Report Date: August 1st, 2012</td></tr>
<tr><td colspan="3">Authors: AACOG Natural Resources/ Transportation Department</td><td colspan="3">Type of Report: Technical Report</td></tr>
<tr><td colspan="3">Performing Organization Name & Address:
Alamo Area Council of Governments
8700 Tesoro Drive Suite 700
San Antonio, Texas 78217</td><td colspan="3">Period Covered:</td></tr>
<tr><td colspan="6">Sponsoring Agency:
Prepared in cooperation with the Texas Commission on Environmental Quality.
The preparation of this report was financed through grants from the State of Texas through the Texas Commission on Environmental Quality.</td></tr>
<tr><td colspan="6">Abstract:
As part of its role in regional air quality planning, the Alamo Area Council of Governments (AACOG) continues to maintain relationships with local governments and organizations to develop ozone precursor emissions reduction policies. AACOG researches, identifies and quantifies possible State Implementation Plan (SIP) control strategies that are implemented by local jurisdictions and agencies. In doing so, AACOG will monitor and analyze local control strategies according to the standards developed by the TCEQ Air Quality Planning Section. This report includes analysis of recently developed control strategies in energy efficiency, transportation management, and renewable energy. The most effective control measures are CPS Energy’s STEP program and solar energy projects. The STEP program reduces annual NO_X emissions by 257.64 tons and the solar projects reduce annual NO_X emissions by 41.65 tons. Mission Verde Sustainability Plan, with a reduction 34.18 tons of NO_X per year, is also an effective control measure.</td></tr>
<tr><td colspan="2">Related Reports:</td><td colspan="2">Distribution Statement:
Alamo Area Council of Governments, Natural Resources/Transportation Department</td><td colspan="2">Permanent File:
Alamo Area Council of Governments, Natural Resources/Transportation Department</td></tr>
</table>

Executive Summary

The Clean Air Act, which regulates air pollutants considered harmful to public health and the environment, relies on state and local agencies to develop air quality control strategies necessary to maintain or attain compliance with federal air quality standards. Local agencies are in key positions to provide air quality planning because of their knowledge of industries, geography, meteorology, travel patterns, and other factors influencing air quality. As these factors are not static, it requires diligence on the part of local agencies to continually analyze how changes in regional emission patterns, as well as regulations, impact local air quality. AACOG will continue participating in efforts to develop appropriate and effective air quality control strategies, which can include transportation projects and land use planning, commuter trip reduction programs, airport measures, retrofit programs, voluntary emissions reductions from stationary sources, economic incentive, and public awareness programs. As part of this process, AACOG identified and quantified emission benefits from a range of control strategies.

In the event that the region exceeds the federal ozone standard, the air quality controls presented in this report can be considered for inclusion in future State Implementation Plans (SIP). Control strategies evaluated in this report for impacts on ozone precursor emissions in the San Antonio region include:

- San Antonio's Mission Verde Sustainability Plan
- Save for Tomorrow Energy Plan
- Traffic Signalization
- Solar Energy Projects
- Commuter Rail between San Antonio and Austin

The overall goal of these strategies is to reduce consumption of fossil fuels, which are major sources of ozone precursor emissions.

San Antonio's Mission Verde Sustainability Plan is an economic approach to sustainability with a focus on energy conservation, which calls for diversification of energy sources, updates to the transportation system, creation of green jobs, and reuse and revitalization of San Antonio's resources. In 2014, this strategy is expected to reduce annual NO_X and VOC emissions by 34.18 tons and 1.42 tons.

The STEP program, sponsored by CPS Energy, comprises of energy conservation efforts with a goal of saving 771 MW of electricity between 2009 and 2020. This goal is reached by providing financial incentives to residential and commercial customers for improve heating, ventilation, insulation, and air conditioning systems. Increasing the use of compact fluorescent lamps and programmable thermostats, expand lighting retrofits, and other commercial programs are also used to reduce energy consumption. This strategy is expected to reduce annual NO_X and VOC emissions by 257.64 tons and 10.79 tons. The results indicate significant ozone precursor emission reductions from the implementation of the STEP program.

The traffic light optimization and synchronization strategy results in decreases in travel time and vehicular delay with increases in average vehicle speeds. Implementation has been undertaken by the San Antonio-Bexar County MPO with the intention to improve traffic flow in San Antonio. Emission reductions from traffic light re-timing are 16.14 tons of NO_X and 3.53 tons of VOC.

CPS Energy, San Antonio's utility company, is committed to generate up to 400 megawatts of electricity from solar energy by 2020.[1] Large and small scale projects are funded or implemented by CPS Energy to achieve the goals of San Antonio's solar energy policies. Emission reductions are calculated based on the power produced by the Blue Wing Solar Farm, Tessman Road Landfill, Pearl Brewery, and SunEdison projects. Solar projects will reduce NO_X emissions by 41.65 tons and VOC emissions by 1.73 tons annually.

The primary purpose of commuter rail is to create a transportation alternative to the congested I-35 corridor. While travel by private automobile will remain the dominant form of passenger transport, the rail project will act as a supplement to the existing highways that connect Austin and San Antonio. Commuter rail can reduce emissions by 8.28 tons of NO_X and 2.82 tons of VOC per year.

In the future, as technology and air quality regulations continue to change, newer control measures may be adopted by local jurisdictions. These measures must be evaluated to determine potential impacts on local air quality. AACOG will continue monitoring these control strategies to determine future emission reductions and AACOG will evaluate them according to the standards promulgated by regulatory agencies.

[1] CPS Energy, Aug. 2010. "Capturing South Texas Sun for San Antonio Power". Available online: http://www.cpsenergy.com/Services/Generate_Deliver_Energy/Solar_Power/index.asp. Accessed 01/10/2012.

Table of Contents

List of Tables

List of Figures

List of Equations

1. Introduction

As part of its role in regional air quality planning, the Alamo Area Council of Governments (AACOG) continues to maintain relationships with local governments and organizations to develop ozone precursor emissions reduction policies. AACOG researches, identifies, and quantifies air quality benefits of control strategies implemented by local organizations and entities in the region. Analysis of local emission control measures described in this report is focused on recently implemented control strategies for energy efficiency, traffic management, and renewable energy projects. Conducting these evaluations involved estimating the ozone precursor emission reductions from implementation of the following projects:

- San Antonio's Mission Verde Sustainability Plan
- Save for Tomorrow Energy Plan (STEP)
- Traffic Re-signalization
- Solar Energy Projects
- Commuter Rail

Studied Pollutants
Since Nitrogen Oxides (NO_X) and Volatile Organic Compounds (VOC) in presence of sunlight produces ozone, which is an EPA-regulated pollutant, they are the focus of this report. Daily and annual emissions reductions are calculated for each control strategy.

Geographical Area Covered
For the exception of the commuter rail project, which covers Comal, Guadalupe, and Bexar counties within the San Antonio–New Braunfels MSA, emission reductions will be calculated for Bexar County only.

Quality Check/Quality Assurance
Equations, data sources, and methodology used for calculating emissions reductions of control strategies will be reviewed throughout the process and before any finalization of the results. "QC/QA activities include technical reviews, accuracy checks, and the use of approved standardized procedures."[2]

When errors and omissions were identified, they were correct immediately and all documentation was updated accordingly. All emission reduction calculation methodology are documented and described in detail, so external officials and other interested parties can replicate the results. For every control strategy, documentation is consistent and contains data sources, methodology, formulas, and results.

[2] Eastern Research Group, Inc, Jan. 1997. "Introduction: The Value of QA/QC'. Quality Assurance Committee Emission Inventory Improvement Program, U.S. Environmental Protection Agency. p. 1.2-2. Available online: http://www.epa.gov/ttn/chief/eiip/techreport/volume06/vi01.pdf. Accessed 06/04/2012.

Emission Reduction Results

Table 1-1, shown below, summarizes the emission benefits of each control strategy. The most successful control measures, in terms of quantities of emission reductions, are CPS Energy's STEP program and large solar plants. COSA's Mission Verde Sustainability Plan and traffic re-signalization projects are also effective in reducing local ozone precursor emissions.

Table 1-1: Emission Reductions for Adopted Control Strategies in San Antonio, 2014

Programs and Strategies	Control Strategy Implementation Years	Emission Reduction tons/year		Emission Reduction Tons/day	
		NO_X	VOC	NO_X	VOC
Mission Verde Sustainability Plan	2009 - 2020	34.18	1.42	0.094	0.004
STEP program	2009 - 2020	257.64	10.79	0.706	0.030
Traffic Re-signalization	2004 - 2010	16.14	3.53	0.063	0.014
Solar Energy Projects	2012	41.65	1.73	0.114	0.005
Commuter Rail	After 2012	8.28	2.82	0.011	0.032

AACOG will continue to analyze local air quality control strategies according to the standards developed by TCEQ's Air Quality Planning Section. Some control strategies listed in Table 1-1 are in the early stages of implementation and will need to be re-evaluated as further emission reductions are achieved. For example, CPS Energy's STEP program is expected to provide emission benefits through 2020, yet this report only provides emission reductions in 2014. Future reductions in ozone precursor emissions will be documented in subsequent reports as the programs are fully implemented. In addition, new control strategies will be analyzed for SIP credit if a SIP revision is required for San Antonio.

Finalized control strategy analyses contains sufficient information so TCEQ and AACOG modeling staff can modify emissions inventory input files and TCEQ's Air Quality Planning Section may properly document the strategies in any SIP revision. Future local control strategies must meet the four criteria for SIP credit (quantifiable, enforceable, surplus, and permanent).

2. San Antonio Mission Verde Sustainability Plan

Background

Originally discussed by the City of San Antonio (COSA) Council in January 2009 and formally adopted on February 4, 2010, the Mission Verde Sustainability plan is an economic approach to sustainability with a focus on energy conservation. The plan calls for diversification of energy sources, updates to the transportation system, creation of green jobs, and reuse and revitalization of San Antonio's resources.[3] "Like many sustainability plans across the country, the Mission Verde plan in San Antonio, TX is built to deliver the triple-bottom line of economic, environmental, and equitable outcomes. Mission Verde is unusual, however, in that it focuses primarily on economic growth and development to drive the other two outcomes, rather than using environmental goals to drive economic growth. While the distinction may seem minor on paper, in practice it has generated nearly universal buy-in from a diverse group of community leaders, including the business community. The Mission Verde plan and its related initiatives have San Antonio poised to become a regional and national leader in the green economy, particularly in the areas of clean technology and renewable energy".[4]

The Mission Verde plan "is based on a simple principle: in meeting our needs today we cannot compromise the ability of future generations of San Antonio to meet their needs. This is sustainability. It is more than an environmental policy; it is an economic one. Saving energy saves money. Renewable energy creates economic self-reliance. Fewer cars on the road mean less pollution, which carries its own economic costs. A green infrastructure, powered by green technology, creates jobs."[5] The intent of the plan "was to invest in energy saving initiatives that would save the consumer and the community money, and serve as a catalyst for job creation and innovation"[6] By engaging key stakeholders in the region, a list of primary initiatives was compiled to achieve the plan's goals.[7]

Initiatives

Mission Verde plan was crafted after careful study of the economic conditions in San Antonio and the plan is intended to provide a sustainable economy. Investment in renewable sources of energy is the core of the plan along with creation of green jobs, expansion of green spaces, and water conservation.[8] To achieve these goals, the following initiatives were identified and included in the plan:

1. "Build a 21st Century urban energy infrastructure in San Antonio with distributed energy
2. Create a multi-tech venture capital fund in San Antonio
3. Create a Green Jobs Program in San Antonio
4. Use the City's economic development strategies to foster development of a 21st Century sustainable economy

[3] City of San Antonio, Feb. 4, 2010. "Mission Verde Sustainability Plan", Office of Environmental Policy. Available online: http://www.sanantonio.gov/oep/SustainabilityPlan.asp. Accessed 02/06/2012.

[4] Institute for Sustainable Communities. "Case Study: San Antonio, TX, San Antonio's Mission Verde, An Economic Development Plan Drives Triple Bottom Line Sustainability". Available online: http://sustainablecommunitiesleadershipacademy.org/resource_files/documents/San%20Antonio,%20TX.pdf. Accessed 06/21/2012.

[5] City of San Antonio. "Mission Verde: Building a 21st Century Economy". p. 1. Available online: http://www.sanantonio.gov/oep/SustainabilityPlan/Mission%20Verde.pdf. Accessed 06/21/2012.

[6] *Ibid*. pp 1-2.

[7] City of San Antonio. "Mission Verde Sustainability Plan". Available online: http://www.sanantonio.gov/oep/SustainabilityPlan.asp. Accessed 06/21/2012.

[8] City of San Antonio. "Mission Verde: Building a 21st Century Economy". p. 4. Available online: http://www.sanantonio.gov/oep/SustainabilityPlan/Mission%20Verde.pdf. Accessed 06/21/2012.

5. Adopt a green, high-performance building code for new residential and commercial construction
6. Build a Green Retrofit Program for existing homes and buildings
7. Create an integrated, efficient multi-modal transportation system for San Antonio
8. Create new sustainable real estate development that is mixed-use, mixed income, walkable, and transit-oriented
9. Create a Green One-Stop Center to coordinate sustainability efforts and to provide information to residents and businesses
10. Address sustainability and resource efficiency across City's facilities and departments
11. Maximize the Energy Efficiency of all City Facilities"[9]

The initiatives will be partially or totally funded by federal, state, and local grants. The federal grants that have been used for funding of these initiatives are: US Department of Energy's Energy Efficiency and Conservation Block Grant (EECBG), Weatherization Assistance Program (WAP), Solar America Cities, and Better Building.[10] In addition, funding sources from Texas State Energy Conservation Office (SECO) and the US Centers for Disease Control will be utilized to support applicable programs in Mission Verde sustainability plan.[11] The programs in Mission Verde's plan include weatherization (Casa Verde SA), energy efficiency (EECBG), and better building program.

Weatherization (Casa Verde SA)
"The Casa Verde SA weatherization program was a partnership between the COSA and CPS Energy and supported with grants from state and federal sources. It was designed to help families in need to reduce their monthly utility bills. Eligible participants, whether they are homeowners or renters, may receive FREE weatherization upgrades designed to increase the energy efficiency of their homes. Introduced in 2009, Casa Verde weatherized more than 3,320 local homes."[12]

The originally funding for this grant ceased in February 2012.[13] However, the program will start fresh as a component of CPS Energy's Save for Tomorrow Energy Plan (STEP) program through 2020 and it is expected to have a reduction of 10,581 MWh of energy annually.[14] "Casa Verde SA is administered at no cost to participants by CPS Energy and uses local contractors and energy auditors to complete the work. In addition to accepting applications via mail, Casa Verde SA hosts numerous community events throughout our service area where residents can find out about the program, ask questions, and apply in person."[15]

---

[9] City of San Antonio. "Mission Verde Sustainability Plan". Available online: http://www.sanantonio.gov/oep/SustainabilityPlan.asp?res=1280&ver=true. Accessed 07/06/2012.
[10] City of San Antonio. "Mission Verde Sustainability Plan". p. 7. Available online: http://www.sanantonio.gov/oep/SustainabilityPlan.asp. Accessed 06/21/2012.
[11] *Ibid.*
[12] CPS Energy. "Casa Verde SA Weatherization Program". San Antonio, Texas. Available online: http://www.cpsenergy.com/Casaverde/. Accessed 06/21/2012.
[13] *Ibid.*
[14] City of San Antonio, Aug. 4, 2010. "Mission Verde Update Presentation". Office of Environmental Policy. San Antonio, Texas. p. 34. Available online: http://www.sanantonio.gov/oep/pdf/OEP-MV-BSession-2010.pdf. Accessed 02/06/2012.
[15] CPS Energy. "Casa Verde SA Weatherization Program". San Antonio, Texas. Available online: http://www.cpsenergy.com/Casaverde/. Accessed 06/21/2012.

City Lights

The energy efficiency and conservation block grant (EECBG) is intended “to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to: reduce fossil fuel emissions; reduce the total energy use of the eligible entities; improve energy efficiency in the transportation, building, and other appropriate sectors; and create and retain jobs.”[16] “As part of the EECBG, the City’s Small Business Lighting Efficiency Program, City Lights, will leverage the already existing CPS Energy rebate program to assist commercial customers in reducing their energy costs.”[17]

“This program was launched in July 2010 and will provide zero-interest loans for lighting upgrades to 1,500 CPS Energy commercial costumers over the two years. The program will remain in effect as original loans are paid back”.[18] The energy savings of 17,209 MWh/year from City Lights are not included in CPS Energy’s STEP program analysis in the following section.

Better Building Program

The Department of Energy selected San Antonio to receive a $10 million grant as part of the American Recovery and Reinvestment Act to fund building retrofit projects and initiatives that will lead to energy saving for residential, commercial, and industrial buildings.[19] “Referred to as the Better Building Program, this initiative will provide finance for building energy-efficiency improvements through revolving loans, regular commercial loans, and performance contracting. The City will increase conservation awareness and marketing efforts to gain participation in the program by conducting door-to-door outreach campaigns. Based on this initiative and under the name CPS Energy Saver, the City’s Office of Environmental Policy and CPS Energy have partnered to assist residential and commercial customers with low cost energy audits, financing options, and rebates for the installation of energy efficiency measures.”[20] This program is expected to save 42,000 MWh of electricity annual.[21]

Data Collection

Mission Verde Sustainability Plan initiatives from the City’s Office of Environmental Policy included information on funding sources, type of project, energy savings, and the value of grant

---

[16] U.S. Department of Energy, Sept. 29, 2010. “Energy Efficiency and Conservation Block Grant Program”. Available online: http://www1.eere.energy.gov/wip/eecbg.html. Accessed 06/21/2012.

[17] City of San Antonio, Aug. 4, 2010. “Small Business Lighting Efficiency Program”, Office of Environmental Policy. San Antonio, Texas. Available online: http://www.sanantonio.gov/oep/citylights.asp?res=1440&ver=true.Accessed 02/06/2012.

[18] City of San Antonio, Aug. 4, 2010. “Mission Verde Update Presentation”, Office of Environmental Policy. San Antonio, Texas. p. 11. Available online: http://www.sanantonio.gov/oep/pdf/OEP-MV-BSession-2010.pdf. Accessed 02/06/2012.

[19] City of San Antonio, May 1, 2010. “Noticias Verdes”, Office of Environmental Policy, San Antonio, Texas. Available online: http://www.sanantonio.gov/oep/Newsletter/May2010Eblast.html . Accessed 02/06/2012.

[20] City of San Antonio, “Better Buildings”. Available online: http://www.sanantonio.gov/oep/betterbuildings.asp?res=1280&ver=true. Accessed 06/21/2012.

[21] City of San Antonio, Aug. 4, 2010. “Mission Verde Update Presentation”, Office of Environmental Policy. Available online: http://www.sanantonio.gov/oep/pdf/OEP-MV-BSession-2010.pdf. Accessed 02/06/2012.

funding from various sources for each project. Combined, the projects are expected to save $6,712,433 dollars per year and have an energy reduction of 69,790 MWh/year (Table 2-1).[22]

Table 2-1: Impacts of Grants on Mission Verde Cost and Energy Savings

Grant	Jobs Created	Cost Saving ($/year)	Energy Saving (MWh/year)
Weatherization (Casa Verde SA)	135	$910,000	10,581
Energy Efficiency (EECBG)	141	$1,686,433	17,209
Better Building Program	500	$4,116,000	42,000
Total	776	$6,712,433	69,790

Methodology

Ozone precursor emissions reductions for the programs listed above were calculated using 2013 emission factors from the CPS Energy. Based on data provided by CPS Energy, one megawatt hour (MWh) of electricity creates, on average, 0.041 pounds of VOCs and 0.979 pounds of NO_X system-wide. Emissions benefits for projects under Mission Verde Plan were calculated using the following formula.

Equation 2-1: Mission Verde Program Annual Emission Reductions

$$E_{Mission.Verde.A} = MWh_A \times EF / 2000 \text{ lbs/short ton}$$

Where,

$E_{Mission.Verde.A}$ = Annual emissions saving for project A (VOC or NO_X)
MWh_A = Annual megawatt hours saved for project A (from COSA in Table 2-1)
EF = Emission factor, 0.041 lbs of VOCs and 0.979 lbs of NO_X per MWh (calculated from data provided by CPS Energy)

Sample calculation: Annual VOC emissions reduction from the Weatherization (Casa Verde SA) program

$$E_{Mission.Verde.A} = 10{,}581 \text{ MWh} \times 0.041 \text{ lbs of VOC per MWh} / 2000 \text{ lbs/short ton}$$
$$= 0.22 \text{ tons of VOC per year}$$

The following table lists emission reductions from Mission Verde programs. The better building program had the highest reductions at 20.57 tons of NO_X per year and 0.85 tons of VOC per year. The energy efficiency program reduces emissions by 8.43 tons of NO_X and 0.35 tons of VOC per year, while the weatherization program reduces emissions by 5.18 tons of NO_X per year and 0.22 tons of VOC per year.

[22] City of San Antonio, Aug. 4, 2010. "Mission Verde Update Presentation", Office of Environmental Policy. p. 34. Available online: http://www.sanantonio.gov/oep/pdf/OEP-MV-BSession-2010.pdf. Accessed 02/06/2012.

Table 2-2: Projected Mission Verde Program Emission Reductions, 2014

Grant	NO_X Saving (tons/year)	VOC Saving (tons/year)	NO_X Saving (lbs/day)	VOC Saving (lbs/day)
Weatherization (Casa Verde SA)	5.18	0.22	2.84	1.18
Energy Efficiency (EECBG)	8.43	0.35	4.62	1.92
Better Building Program	20.57	0.85	11.27	4.68
Total	34.18	1.42	18.73	7.78

3. Save for Tomorrow Energy Plan (STEP)

Background

The STEP program is sponsored by CPS Energy with the goal of saving 771 MW of electricity between 2009 and 2020. The energy conservation efforts of the program are promoted by providing financial incentives to residential and commercial customers to improve heating, ventilation, insulation, and air conditioning systems as well as to increase the use of compact fluorescent lamps and programmable thermostats, expand lighting retrofits, replacement of existing household appliances with energy efficient appliances, and other commercial programs.[23] The results of this program will create an efficient energy market leading to significant environmental benefits from emission reductions. COSA has established a set of accountability procedures for STEP, which requires CPS Energy to provide "quarterly and annual reports to the COSA indicating year to date STEP activity and emissions (NO_X and VOC) reductions per rebate program area."[24]

To ensure the goals of the program are achieved and the reductions are documented, the City of San Antonio developed a set of funding accountability procedures that must be followed by CPS Energy. For this purpose, the established procedures are listed below:

- "All funds collected for STEP programs, either from base rates or through the fuel adjustment, must be accounted for separately.
- CPS Energy shall provide an annual report, prepared by an independent third party consultant, to the City which quantifies the kilowatt savings from STEP expenditures by customer class and other measures deemed necessary by the City.
- Based on the report provided and the amount of STEP expenditures determined to be eligible for recovery through the fuel adjustment, CPS Energy will calculate the annual kilowatt per hour charge. It will be reviewed and approved by City staff before implementation of the kilowatt per hour charge.
- City staff will monitor the recovery through the fuel adjustment on a monthly basis. Annually, the amount of under or over recovery, if any, will be determined and the fuel adjustment will be adjusted accordingly to ensure that only the amount of eligible STEP expenditures are recovered.
- CPS Energy must maintain documentation of all STEP expenditures, by customer class and other measures deemed necessary by the City.
- CPS Energy shall provide quarterly reports to the City staff which show year to date STEP expenditures by program and customer class, funds accumulated and estimated kilowatt savings and other measures deemed necessary by the City.
- Examples of detailed quarterly report information include but are not limited to the following: number of kilowatt saved by customer class and program type; the number of participants and contractors; geographic area and council district program activity; and, total costs/expenditures by program type.
- CPS Energy shall provide an annual report to the City which shows the incentive payments made as a result of the Commercial Demand Response program for the prior twelve months and other measures deemed necessary by the City.

[23] City of San Antonio, 2010. "Save for Tomorrow Energy Plan (STEP); Reporting and Accountability". Fiscal Year 2011, Q4. Office of Environmental Policy. San Antonio, Texas. Available online: http://www.sanantonio.gov/oep/step.asp?res=1440&ver=true. Accessed 01/06/2012.
[24] *Ibid*.

- A quarterly report detailing information shall be made available to the public with sufficient protection regarding confidential information as deemed necessary by the City."[25]

Residential and commercial initiatives that reduce energy consumption and emissions include:

Residential Programs

"HVAC Program –offers incentives for the purchase of eligible high efficiency central air conditioners, heat pumps and room air conditioners.

Home Efficiency Program – targets a wide range of energy efficiency measures that save cooling and heating energy in existing homes.

Air Flow Program – offers incentives for repair and/or replacement of duct work to improve the overall efficiency of heating and cooling system.

Peak Saver Program – a residential air-conditioner demand response control program.

CPS Energy will install a free Honeywell programmable thermostat in participating customers' homes when they enroll in the program. The thermostat is used by CPS to cycle off the compressor of participating air conditioners during periods of peak demand throughout the summer (May – September).

Solar Photovoltaic & Water Heaters – offers incentives for the installation of both solar photovoltaic systems and solar water heaters.

New Residential Construction – offers incentives to developers to build at least 15% more energy efficient than current CoSA building codes.

Refrigerator Recycling – offers incentives to homeowners to recycle old/extra refrigerators and freezers to remove inefficient appliances from use.

Compact Fluorescent Lamps (CFL) Program – The CFL program has been phased out; however CPS Energy continues to distribute 10,000 to 15,000 CFL bulbs annually through various customer events like National Night Out and Earth Day Celebrations.

Additionally, upon request CPS Energy will donate a small number of CFL bulbs to organizations that will utilize them to promote energy efficiency within our customer service area.

Commercial Programs

Lighting – offers incentives to customers who install efficient lighting in their facilities. Incentives are offered for both retrofit and new construction projects.

HVAC Program – offers incentives for the installation of high efficiency unitary AC equipment, heat pump and chillers.

Roof Coating Programs – offers incentives for the installation of reflective roofing.

Lean Clean Energy – offers incentives for industrial customers to evaluate their energy use and make efficiency upgrades.

New Commercial Construction – offers incentives to developers to build at least 15% more energy efficient than current CoSA building codes.

Commercial Kitchen Equipment – offers incentives for upgrades to more efficient cooling equipment including ice makers.

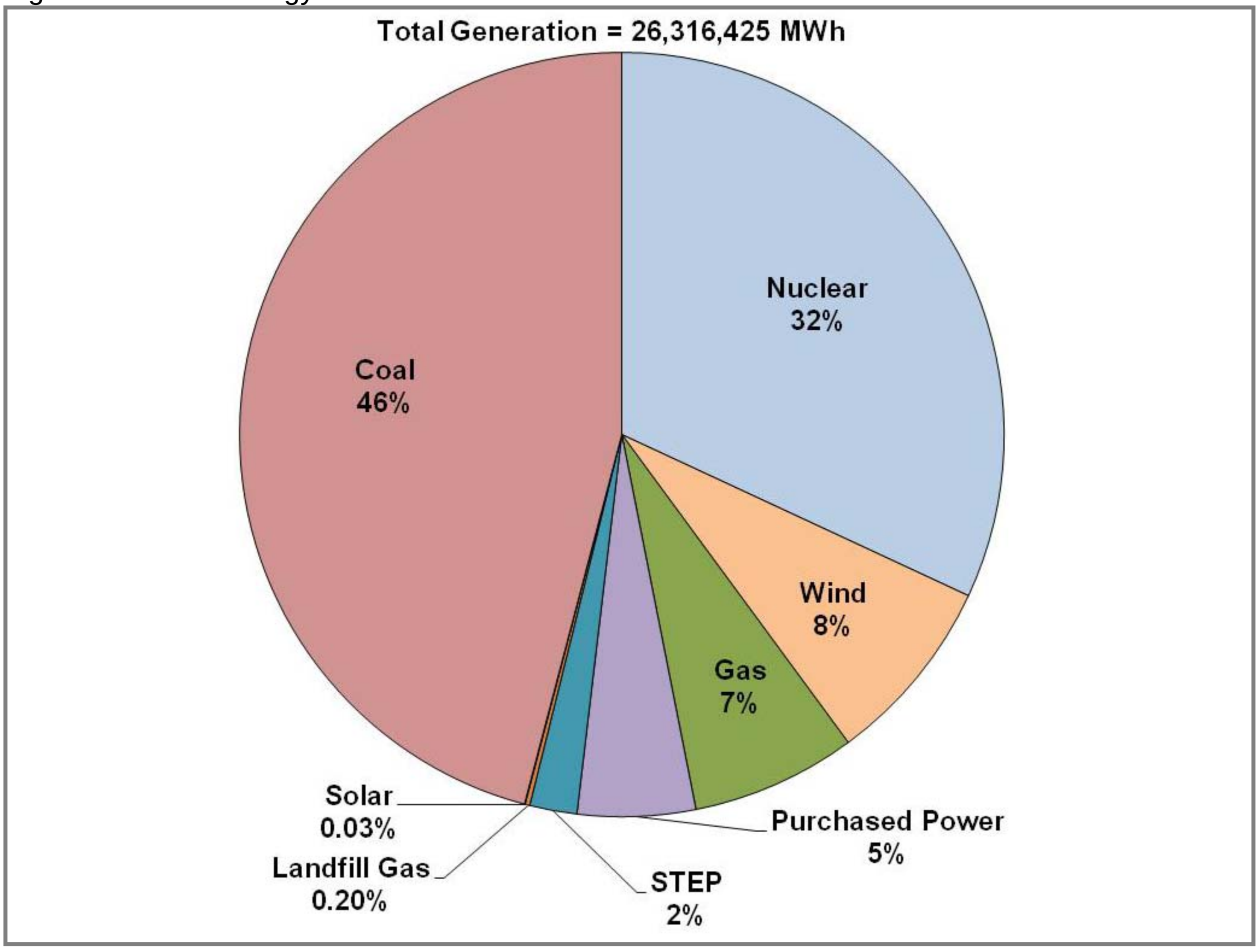
Other Commercial Programs – includes incentives for the installation of custom projects."

[25] February 2012. "CPS Energy Quarterly STEP Report to the City of San Antonio 4th Quarter for CPS Energy Fiscal Year 2012". pp. 4-5. Available online: http://www.sanantonio.gov/oep/pdf/STEP/FY2012%20Qtr%204%20STEP.pdf. Accessed 06/21/2012.

Data Collection
A list of initiatives included in the STEP program can be found in quarterly reports produced by the City's Office of Environmental Policy. These quarterly reports include information on costs, type of project, energy savings, and allocation of rebates by council district.[26]

Total 2010 energy efficiency savings and cumulative kilowatt reductions from the STEP program can be found in the CPS Energy's Chief Executive Officer's report to the board members. As illustrated in Figure 3-1, the accumulated demand reduction of 526,329 MWh due to STEP program in 2010 was 2% of the total CPS MWh energy generation (26,316,425 MWh).[27]

Figure 3-1: CPS Energy 2010 Generation Profile



[26] Office of Environmental Policy; Save for Tomorrow Energy Plan (STEP); Reporting and Accountability. Available online: http://www.sanantonio.gov/oep/step.asp. Accessed 06/21/2012.
[27] CPS Energy, Review of CPS Energy Generation Strategy, Doyle N. Beneby, August, 29, 2011. p. 5. Available online: http://www.cpsenergy.com/files/Board_Notices/082911_President_Report.pdf. Accessed 01/09/2012.

Methodology
Ozone precursor emissions were calculated using emission factors based on CPS Energy's 2013 projections. VOC and NO_X emission factors, 0.041 and 0.979 lbs, are based on the system-wide generation of one megawatt hour (MWh) of energy. The net emissions benefits were calculated based on the formula provided below:

Equation 3-1: Emission Reductions from CPS Energy's STEP Program

$$AE_{STEP} = AMWh \times EF / 2000 \text{ lbs/short ton}$$

Where,

AE_{STEP} = Annual emissions saving for STEP program A (VOC or NO_X)
AMWh = Annual megawatt hours saved due to STEP program, 526,329 MWh (from Chief Executive Officer's report)
EF = Emission factor, 0.041 lbs of VOCs and 0.979 lbs of NO_X per MWh (calculated from data provided by CPS Energy)

Sample calculation: Annual VOC emissions saving for the STEP program

$$AE_{STEP} = 526{,}329 \text{ MWh} \times 0.041 \text{ lbs of VOC per MWh} / 2000 \text{ lbs/short ton}$$
$$= 10.79 \text{ tons of VOC per year}$$

Annual and daily emission reductions due to the STEP program are 0.71 tons of NO_X per day and 0.03 tons of VOC per day (Table 3-1).

Table 3-1: STEP Energy Program and Emission reductions, 2014

Energy Program	Net Energy Saving (MWh)	NO_X Reduction Tons/year	VOC Reduction Tons/Year	NO_X Reduction Tons/day	VOC Reduction Tons/day
STEP Rebate Program	526,329	257.64	10.79	0.71	0.03

4. Traffic Signalization

Background

San Antonio - Bexar County Metropolitan Planning Organization (MPO) sponsored three traffic signal re-timing projects starting in 2006 to optimize traffic signal timing along specific corridors in San Antonio. Optimized signal timing plans derived from modeling were implemented for each respective phase of the study, resulting in decreases in travel time and vehicular delay, with increases in average vehicle speeds along the study corridors. The San Antonio-Bexar County MPO, the Texas Department of Transportation (TxDOT), and the Federal Highway Administration (FHWA) funded the traffic re-signalization projects.

The first traffic re-timing study, Phase II conducted in 2007, included 83 signalized intersections operated by the City of San Antonio. An analysis of 197,000 vehicles per day travelling along six different system routes, Alamo, Bandera/Callaghan, Blanco, Broadway, Fredericksburg, and St. Cloud, was conducted "to reduce congestion and improve travel times on city streets".[28] However, re-timing of traffic signals on Bandera/Callaghan and Blanco subsystems were not implements because of roadway construction.[29] In 2009, phase 3 re-timing project was published for the Blanco/West, Lockhill-Selma, Marbach/Military, and Culebra/Grissom subsystems. Approximately 100,000 vehicles traveled per day through the 52 intersections in the 4 subsystems.[30] Phase 4 re-timing was conducted on 89 intersections: Flores/Pleasanton, Near West Side, Eisenhauer, and Rittiman subsystems. Estimated daily arterial volume on the 4 subsystems was 201,210.[31]

Data Collection

Baseline traffic data, consisting of arterial traffic counts, travel time runs, and intersection turning movement counts, were collected. The data was used to determine the traffic flow characteristics of the individual arterials and intersections in the study and later served as input to develop signal optimization models. Turning movement counts for each intersection were gathered for AM peak, off-peak, and PM peak time periods. "Additional 24-hour arterial tube counts were also gathered in each case in order to evaluate directional traffic flows throughout the day and develop an appropriate time-of-day schedule for implementing multiple timing plans" (i.e. peak and off peak). Travel time data was gathered after implementation of the timing plans to assist in the analysis and evaluation of arterial operations. [32]

"Travel time data was gathered with the before data to provide an additional benchmark for comparing traffic flow along the major arterials and for calibrating the before traffic models with field conditions. Traffic signal settings were provided by the City of San Antonio in the form of BiTrans traffic signal timing data. The traffic signal data was converted from the existing signal programming to cycle lengths, phase times, and offsets for input into the various signal-timing models. Additional field conditions, such as intersection spacing, lane configurations, and overall intersection operations, were obtained by field investigations."[33] Once the final

---

[28] Gilmer D. Gaston, September 2007. "Traffic Signal Re-Timing Project II: Final Report". Pape-Dawson Engineers, Inc. p. ii. San Antonio, Texas
[29] *Ibid*. pp. 13, 19.
[30] John Friebele, March 23, 2009. "The Bexar County Metropolitan Planning Organization (MPO) Traffic Signal Re-Timing Project III: Draft Report". Wilbur Smith Associates. San Antonio, Texas
[31] John Friebele, June, 2010. "Traffic Signal Re-Timing Project IV: Final Report". Wilbur Smith Associates. San Antonio, Texas
[32] Gilmer D. Gaston, September 2007. "Traffic Signal Re-Timing Project II: Final Report". pp. ii-iii. Pape-Dawson Engineers, Inc. San Antonio, Texas.
[33] *Ibid*. p. iii.

Synchro[34] signal timing model development and field installation were implemented, the results were analyzed to estimate changes in effectiveness of each subsystem. "Two initial models were developed for each system: a Base Model of existing conditions and an Optimized Model for future timing plan implementation".[35]

For the Base Model, the roadway/signal system was constructed and all existing geometry and signal timing parameters were inputted into the model. The differences between the "before" and "after" travel time runs indicates the amount of improvement in the time that traffic is able to travel from one end of the system to the other end. Effectiveness of the re-timing was measured based on change in delay (vehicle-hours), fuel consumption, travel time (seconds), and speed (mph). As shown in Table 4-1, phase 2 reduction was 762.8 hours per day[36], while the reduction for phase 3 was 916 hours per day.[37] The combined reduction in delay for the 4 subsystems in phase 4 was 3,198 hours per day.[38]

Methodology

To calculate emission reductions from each subsystem, change in hours delayed from the *Synchro* modeling runs was multiplied by MOVES[39] 2014 hourly emission factors (Equation 4-1). MOVES model was run for the weekdays and 24 daily hours to calculate emission factors for light-duty passenger vehicles traveling on unrestricted urban roads. When the MOVES results were aggregated, exhaust and crankcase running emission factors were 11.55 grams of NO_X and 2.53 grams of VOC per "Source Hours Operating" period. Emission factors do not include emissions from the extended idling and parking periods.

Equation 4-1: Emission Reduction due to Re-timing of Traffic Signals

$$AE_{Signals.A} = AHR_A \times AEF / 907{,}184.74 \text{ g/short ton}$$

Where,

$AE_{Signals.A}$ = Annual VOC or NO_X emissions reduction for intersection system A

AHR_A = Annual hours saved for intersection system A (from Traffic Signal Re-Timing Project; Table 4-1)

AEF = Weighted average hourly exhaust emission factors for VOC or NO_X light duty vehicles; 11.55 g/hour of NO_X and 2.53 g/hour of VOC in 2014 (from MOVES model)

Sample calculation: Annual NO_X emission reduction for the Eisenhauer traffic light system

$AE_{Signals.A}$ = 82,654 hours saved x 11.55 grams of NO_X per hour / 907,184.74 g/short ton
= 1.05 ton of NO_X per year

---

[34] Trafficware Ltd. "Synchro 8". Available online: http://www.trafficwareinc.com/transportation/product/synchro-8-0. Accessed 01/12/2012.

[35] John Friebele, June, 2010. "Traffic Signal Re-Timing Project IV: Final Report". Wilbur Smith Associates. San Antonio, Texas. p. 5.

[36] Gilmer D. Gaston, September 2007. "Traffic Signal Re-Timing Project II: Final Report". Pape-Dawson Engineers, Inc. p. ii. San Antonio, Texas. pp. 8, 25, 30, 35, 37.

[37] John Friebele, March 23, 2009. "The Bexar County Metropolitan Planning Organization (MPO) Traffic Signal Re-Timing Project III: Draft Report". Wilbur Smith Associates. San Antonio, Texas. pp. 5-6, 10, 13, 17.

[38] John Friebele, June, 2010. "Traffic Signal Re-Timing Project IV: Final Report". Wilbur Smith Associates. San Antonio, Texas. p. 22.

[39] U.S. EPA, December 2009. Office of Transportation and Air Quality Washington, DC. Motor Vehicle Emission Simulator. Available online: http://www.epa.gov/otaq/models/moves/index.htm. Accessed 01/13/2012.

Table 4-1: Delay Improvements after Re-timing of Traffic Signals, 2007-2010

Study Phase	Subsystem		Number of Intersections	Weekday Arterial Traffic Volume (vpd)	Change in Total Delay (hours/day)	Change in Total Delay (hours/year)
2	Alamo		6	30,000	-98.6	-25,636
	Bandera/Callaghan		21	34,000	-	-
	Blanco		23	55,000	-	-
	Broadway		16	35,000	-169.7	-44,122
	Fredericksburg		11	30,000	-458.3	-119,158
	St. Cloud		6	13,000	-36.2	-9,412
	Total		83	197,000	-762.8	-198,328
3	Blanco/West	Blanco North	19	29,000	-165.9	-116,376
		Blanco South			14.5	
		West Avenue			-296.2	
	Lockhill-Selma		10	17,200	-115.7	-30,082
	Marbach/Military	Marbach	9	25,800	-80.3	-10,270
		Military			40.8	
	Culebra/Grissom	Culebra	13	28,000	-304.8	-81,016
		Grissom			-6.8	
	Total		52	100,000	-914.4	-237,744
4	Flores/Pleasanton		19	33,313	-42.8	-11,128
	Near West Side		56	124,335	-2,579.7	-670,722
	Eisenhauer		9	16,340	-317.9	-82,654
	Rittiman		5	27,222	-257.7	-67,002
	Total		89	201,210	-3,198.1	-831,506

Estimated emission reductions for each subsystem are shown in Table 4-2. There was a 16.14 tons/year reduction in NO_X emissions and a 3.52 tons reduction in VOC emissions per year.

Table 4-2: Reductions in Ozone Precursor Emissions from Re-timing of Traffic Signals, 2014

Study Phase	Traffic System	NO_X (tons/year)	VOC (tons/year)	NO_X (tons/weekday)	VOC (tons/weekday)
2	Alamo	0.33	0.07	0.0013	0.0003
	Broadway	0.56	0.12	0.0022	0.0005
	Fredericksburg	1.52	0.33	0.0059	0.0013
	St. Cloud	0.12	0.03	0.0005	0.0001
3	Blanco/West	1.48	0.32	0.0058	0.0013
	Lockhill-Selma	0.38	0.08	0.0015	0.0003
	Marbach/Military	0.13	0.03	0.0005	0.0001
	Culebra/Grissom	1.03	0.23	0.0040	0.0009
4	Flores/Pleasanton	0.14	0.03	0.0006	0.0001
	Near West Side	8.54	1.87	0.0335	0.0073
	Eisenhauer	1.05	0.23	0.0041	0.0009
	Rittiman	0.85	0.19	0.0033	0.0007
Total		16.14	3.53	0.0633	0.0138

5. Solar Energy Projects

Background
State mandates such as Senate Bill 5 (SB5) and Senate Bill 12 (SB 12)[40], energy conservation policies, and local air quality planners have promoted the use of solar energy in San Antonio. CPS Energy, San Antonio's utility company, is committed to generate up to 400 megawatts of electricity from solar power by 2020.[41] Large and small scale projects are funded or implemented by CPS Energy to achieve the goals of San Antonio's energy policies. Of these projects, the Blue Wing Solar Farm[42], Tessman Road Landfill, and the Pearl Brewery solar projects are in their operating phase now, while the SunEdison projects are expected to go online in 2012[43]. Other political entities and jurisdictions in San Antonio have implemented solar projects to reduce fossil fuel usage and emissions.

Blue Wing Solar Farm
Blue Wing Solar Farm is a "14-megawatt facility is located in southeast San Antonio on 113 acres near the intersection of IH-37 and U.S. 181. Blue Wing Solar Project is planned to generate more than 26,570 megawatt-hours of electricity per year to power 1,800 households. The renewable energy generated by the farm is equivalent to taking 3,800 cars off the road."[44] "Juwi solar, with U.S. operations based out of Boulder, Colorado, developed, designed and built Blue Wing. The project is owned by Duke Energy and the power is purchased by CPS Energy under a 30-year power purchase agreement."[45] An aerial photography of Blue Wing extensive solar array is provided in figure 5-1.[46]

Tessman Road Landfill
CPS Energy and Republic Services, Inc., the owner of Tessman Road Landfill, have agreed to cover the closed sections of the active landfill with flexible photovoltaic solar collection strips to generate electricity (Figure 3-2).[47] "Instead of a traditional clay cap, the design places flexible solar panels on the surface of closed sections of the landfill. The flexible solar strips can be configured to maximize the hours of sunlight exposure throughout the year, depending upon a landfill's design and site contours. It is estimated that the energy produced by the two fully-

---

[40] State Energy Conservation Office, Aug. 2010. "Energy Efficiency: Texas' Newest Energy Resource." Available online: http://www.seco.cpa.state.tx.us/sb5compliance.php. Accessed 01/10/2012.
[41] CPS Energy, Aug. 2010. "Capturing South Texas Sun for San Antonio Power". Available online: http://www.cpsenergy.com/Services/Generate_Deliver_Energy/Solar_Power/index.asp. Accessed 01/10/2012.
[42] CPS Energy, Energy Generation and Delivery, Solar Power. Available online: http://www.cpsenergy.com//Services/Generate_Deliver_Energy/Solar_Power/Blue_Wing_Solar_Farm/index.asp . Accessed 01/11/2012.
[43] SunEdision. "Impact of CPS Energy agreement". Available online: http://www.cpsenergy.com/files/ne_sunedison.pdf. Accessed 06/25/2012.
[44] CPS Energy. 2011. "Blue Wing Solar Farm". Available online: http://www.cps-satx.com/Services/Generate_Deliver_Energy/Solar_Power/Blue_Wing_Solar_Farm/. Accessed 06/25/2012.
[45] Eric Wesoff, Greentechmedia, Nov. 16, 2010. "The Blue Wing Solar Project: 'Truly Utility Scale'". Available online: http://www.greentechmedia.com/articles/read/the-blue-wing-solar-project1/. Accessed 06/27/2012.
[46] *Ibid*.
[47] Republic Service Inc. March 2010. "Tessman Road Landfill Solar energy Cover". SWANA, Silver Spring, MD. p. 11. Available online: http://swana.org/Portals/0/pdfs/2010Noms/LFR-Gold.pdf. Accessed 01/11/2012.

operational systems, will continuously generate 9 megawatts of power."[48] The new solar cover is complementing the landfill's existing biogas-to-energy system, which has operated since 2002. The benefits of the solar project can be expanded by increasing the number of the solar strips as other sections of the landfill are closed.[49]

Figure 5-1: Blue Wing Solar Farm in Southern San Antonio

Pearl Beer Brewery

Pearl Brewery's 200-kilowatt solar project, designed by Meridian Solar, is a partnership between CPS Energy and the Pearl Brewery.[50] "The solar panels are installed on the roof of the Full Goods Warehouse and provide power for the building occupants or feed back onto the CPS Energy distribution grid when production exceeds consumption."[51] The array, pictured in figure 5-3, provides about 25 percent of the building's energy needs.[52]

[48] Geosynthetics, Aug. 2009. "Landfill cover promotes new energy source". Available online: http://geosyntheticsmagazine.com/articles/0809_f1_cover.html. Accessed 06/25/2012.
[49] 2012. "Tessman Road Landfill Solar Energy Cover". Available online: http://www.hdrinc.com/portfolio/tessman-road-landfill-solar-energy-cover. Accessed 06/25/2012.
[50] CPS Energy, Pear Brewery Kiosk View; 3 years life time energy generation from Jan. 2009 to Jan. 2012. Available online: http://pearl.kiosk-view.com/ . Accessed 01/01/2012.
[51] Meridian Solar, 2012. "Pearl Brewery". Available online: http://www.meridiansolar.com/portfolio/projectdetail.php?projectid=58&catid=3. Accessed 06/25/2012.
[52] Kimberly Serrano Aug. 10, 2011. "Discover Sustainability at the Pearl". Available online: http://www.examiner.com/article/discover-sustainability-at-the-pearl. Accessed 06/27/2012.

Figure 5-2: Tessman Road Landfill Solar Energy Project

Figure 5-3: Pearl Brewery Solar Insulation

SunEdison projects
SunEdison and the CPS Energy have signed an agreement to generate 30 MW of solar power from three separate projects within the CPS Energy service area. Two of the sites, on almost 270 acres of land, are next to the Dos Rios Water Recycling Center owned by the San Antonio Water System (SAWS). The "two sites feature a total of 83,034 photovoltaic solar panels that track the sun from east to west"[53] (figure 5-4).

"CPS Energy will purchase all of the electric generation produced at Centennial through a 25-year power purchase agreement (PPA). Utilizing ground-mounted photovoltaic systems on single-axis trackers, Centennial will generate more than 893 million kilowatt hours of electricity over the span of the partnership. The completion of this project reiterates CPS Energy's ongoing commitment to a diversified energy portfolio in meeting the future energy needs of Greater San Antonio. Sustainable energy resources that include wind, solar and landfill gas are contributing to the utility's Vision 2020 goal of having 1500 MW of its generation capacity come from renewable resources by 2020."[54]

Figure 5-4: Solar Farm at Dos Rios Water Recycling Center[55]

The third site is under construction in Somerset, Texas. "Each site will produce approximately 10MW of power that will flow into the CPS Energy electric distribution system."[56] Construction

[53] CPS Energy, June 18, 2012. "Nearly 20 MW Solar Project Brings Water and Electricity Together". Available online: http://www.cpsenergy.com/About_CPS_Energy/News_Features/News/PF-06182012_Sinkin_Solar_Farms_NR.asp. Accessed 06/27/2012.
[54] *Ibid*.
[55] Earth Techling, June 19, 2012. "Utilities Bowtie Together Water And Electricity". Available online: http://www.earthtechling.com/2012/06/utilities-bowtie-together-water-and-electricity/. Accessed 06/27/2012.

of the 2 projects at Dos Rios Water Recycling Center began in November 2011 and was completed in April 2012. These solar farms are expected to produce more than 35.7 million kilowatt hours (kWh) of clean solar energy in the first year of operation. The facility located in Somerset, with 10.6 MW of solar power, is expected to be activated in June 2012.[57]

Data Collection
CPS Energy, reports published by the Solid Waste Association of North America (SAWANA)[58], and the Texas A&M Energy System Laboratory[59] provided information on current solar projects in San Antonio. Current active and planned solar projects are included in table 5-1. Emission reductions from these projects are not included in the emission reductions for CPS Energy's STEP program; rather they are independently calculated in this section.

Methodology
Ozone precursor emissions were calculated using emission factors from CPS Energy's 2013 projections. According to this projection, the VOC and NO_X emission factors, 0.041 and 0.979 lbs, are based on the system-wide generation of one megawatt hour (MWh) of energy. The net emissions benefits were calculated based on the formula provided below:

Equation 5-1: Emission Reductions from Solar Energy Projects

$$AE_{Solar.A} = MWh_A \text{ X } EF / 2000 \text{ lbs/short ton}$$

Where,

$AE_{Solar.A}$ = Annual emissions saving for project A (VOC or NO_X)

MWh_A = Annual megawatt hours saved for project A (from CPS Energy, SAWANA, or Texas A&M laboratory report)

EF = Emission factor, 0.041 lbs of VOCs and 0.979 lbs of NO_X per MWh (calculated from data provided by CPS Energy)

Sample calculation: Annual NO_X emissions saving for "Tessman Road Landfill" solar energy program:

$$AE_{Solar.A} = 182.3 \text{ MWh x } 0.979 \text{ lbs of } NO_X \text{ per MWh} / 2000 \text{ lbs/short ton}$$
$$= 0.09 \text{ tons of } NO_X \text{ per year reduction}$$

The following table (5-1) provides emission reductions for each solar project.

---

[56] SunEdision. "Impact of CPS Energy agreement". Available online: http://www.cpsenergy.com/files/ne_sunedison.pdf. Accessed 06/25/2012.

[57] William R. Sinkin Centennial Solar Farms 1&2; FAQ. Available online: http://www.cpsenergy.com/files/FAQ_Centennial_Solar_Farm.pdf. Accessed 06/25/2012.

[58] *Ibid*.

[59] TCEQ, July 2007. "Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan". Energy Systems Laboratory, Texas A&M University System. College Station, TX. Available online: http://repository.tamu.edu/bitstream/handle/1969.1/6354/ESL-TR-06-12-02.pdf?sequence=1. Accessed 01/24/2012.

Table 5-1: Energy and Emissions Reductions from Solar Energy Projects, 2014

Solar Energy Grant	Energy Reduction (MWh)	NO_X Reduction (tons/year)	VOC Reduction (tons/year)	NO_X Reduction (lbs/day)	VOC Reduction (lbs/day)
Eagle Pass High School	1.2	0.00	0.00	0.00	0.00
East Central ISD	1.4	0.00	0.00	0.00	0.00
James Madison High School	1.2	0.00	0.00	0.00	0.00
John Jay High School	1.0	0.00	0.00	0.00	0.00
Roosevelt High School	1.7	0.00	0.00	0.00	0.00
Utopia ISD	1.8	0.00	0.00	0.00	0.00
City Public Services, Northside	24.9	0.01	0.00	0.07	0.00
Del Rio High School	6.2	0.00	0.00	0.02	0.00
Kendall Elementary School	1.2	0.00	0.00	0.00	0.00
Uvalde Junior High School	6.2	0.00	0.00	0.02	0.00
CPS Primary Control Center	24.9	0.01	0.00	0.07	0.00
Tessman Road Landfill	182.3	0.09	0.00	0.49	0.02
Pearl Beer Brewery	252.1	0.12	0.01	0.68	0.03
St. Philip's College	544.2	0.27	0.01	1.46	0.06
Mission Verde Center	63.8	0.03	0.00	0.17	0.01
UTSA Main Campus	427.0	0.21	0.01	1.15	0.05
SunEdison projects	56,936.0	27.88	1.16	152.77	6.35
Blue Wing Solar Farm	26,570.0	13.01	0.54	71.29	2.96
Total	85,046.7	41.65	1.73	228.20	9.49

6. Commuter Rail between San Antonio and Austin

<u>Background</u>

"In the late 1990s, TxDOT and the Austin and San Antonio metropolitan planning organizations (CAMPO and SA-BC MPO), and the Austin and San Antonio transit authorities (Capital Metro and VIA) formed a regional partnership to fund and manage a feasibility study of passenger rail service on the existing Union Pacific freight line that parallels I-35 between Georgetown and San Antonio. The study concluded that a commuter rail system between Georgetown and San Antonio is technically and financially feasible."[60] In 2003, the Lone Star Rail District, with representatives from the cities, counties, transit authorities and metropolitan planning organizations from both metro areas, was officially created to oversee the rail project.[61] Since its creation, the Lone Star Rail District has engaged local communities and stakeholders along the proposed route to discuss best alignment for the commuter rail.

The primary purpose of the commuter rail is to create a transportation alternative within the congested I-35 N corridor. While it is anticipated that travel by private automobile will remain the dominant mode of passenger transport, the railroad project will act as a supplement to the existing highways that connect the 2 metropolitan areas. Existing railroads through the corridor, presently carrying freight and Amtrak passenger service, are considered for commuter rail. The Lone Star Rail District has an agreement with Union Pacific to study freight rail relocation options.[62]

The commuter rail is expected to extend south from Georgetown, Austin, and pass through smaller cities on its way to southern parts of San Antonio. Planned stations are located near the city centers of Georgetown, Round Rock, Austin, Buda/Kyle, San Marcos, New Braunfels, and San Antonio. Additional stations, such as the Texas A&M campus, may later be added to these planned stations.[63] The proposed alignment is illustrated in the Figure 6-1.

<u>Limits of Study</u>

Although the rail project covers nine counties of Williamson, Travis, Bastrop, Hays, Caldwell, Comal, Guadalupe, Bexar, and Wilson, this report only includes the ridership in the three counties of Comal, Guadalupe, and Bexar.

---

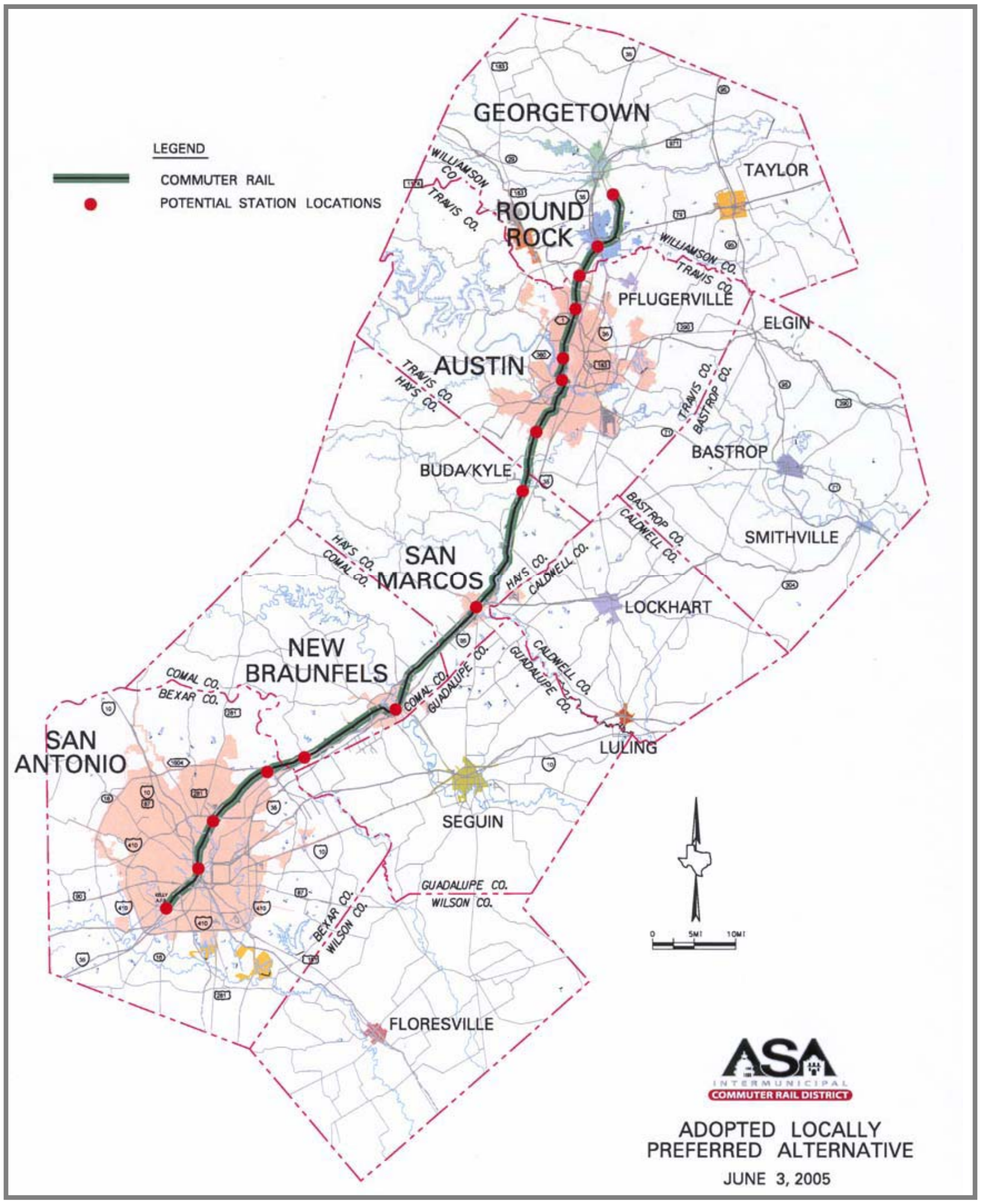
[60] Lone Star Rail District, 2009. "Planning Studies". Available online: http://lonestarrail.com/index.php/lstar/about-planning/. Accessed 12/09/2011.

[61] Lone Star Rail District, 2009. "Project Milestones". Available online: http://lonestarrail.com/index.php/lstar/about-project-timeline/. Accessed 12/09/2011.

[62] Lone Star Rail District Webpage, 2009. "FAQS". Available online: http://lonestarrail.com/index.php/lstar/faq/. Accessed 12/09/2011.

[63] Lone Star Rail District Webpage, 2009. "Planning Studies". Available online: http://lonestarrail.com/images/uploads/ASA_Seaholm_Station_Report-20061222.pdf. Accessed 06/28/2012.

Figure 6-1: Map of Proposed Commuter Rail Alignment



Ridership

Ridership data was gathered from the Feasibility Report for the Austin-San Antonio Commuter Rail study.[64] The study built on 1995 socio-economic data to forecast 2020 ridership for the proposed commuter rail project.[65] For the current analysis, forecasting is performed for the year 2014 by interpolating volumes between the base year (2000) and the horizon year (2020) in table 6-1.

[64] TxDOT, March 1999. "Austin - San Antonio Commuter Rail Feasibility Study". Section 7-6. Available online: http://www.dot.state.tx.us/mis/aus-sat/asrstudy.htm. Accessed 12/09/2011.
[65] *Ibid*.

Table 6-1: Average Weekday Ridership for Austin-San Antonio Commuter Rail

Station	Year 2000 Average Weekday Person Trips			Year 2014 Average Weekday Person Trips			Year 2020 Average Weekday Person Trips		
	Peak	Off-Peak	Total	Peak	Off-Peak	Total	Peak	Off-Peak	Total
New Braunfels	220	50	270	346	78	424	400	90	490
Selma	130	90	220	186	118	304	210	130	340
San Antonio Airport	590	70	660	576	63	639	570	60	630
San Antonio CBD	870	240	1,110	1066	317	1383	1,150	350	1,500
Kelly	250	60	310	341	88	429	380	100	480
Total	2,060	510	2,570	2,515	664	3,179	2,710	730	3,440

Using forecasted results shown in the table 6-1, calculated total number of person trips will reach 3,179 trips in 2014. The formula for this forecast is shown below:

Equation 6-1: 2014 Weekday Commuter Rail Ridership in AACOG Region

PT_i = (HYPT – BYPT) / (HY – BY) * (Y_i – BY) + BYPT

Where,

PT_i = Person trips made via commuter rail for year i
HYPT = Horizon year person trips, 3,440 trips (from TxDOT)
BYPT = Base year person trips, 2,570 trips (from TxDOT)
HY = Horizon year (2020)
BY = Base year (2000)
Y_i = Year i (2014)

Sample calculation: Year 2014 weekday AACOG commuter rail ridership

PT_{2014} = (3,440 – 2,570) / (2020 – 2000) * (2014 – 2000) + 2,570
= 3,179 person trips in 2014

Trip Length

Average commuter trip length is calculated based on data in the update to the commuter rail feasibility report. According to this update, the average trip lengths for home base work (HBW), home base other (HBO), and non-home base (NHB) trips are 17.95, 14.51, and 11.90 miles.[66] The average of above trip lengths is 14.79 miles (Equation 6-2), which is used to calculate emission reductions from commuter rail.

Equation 6-2: Average Trip Length

AT_{Length} = (HBW_{Length} x 33.3%) + (NW_{Length} x 33.3%) + (SCH_{Length} x 33.3%)

Where,

ATL = Average trip length, 14.79 miles (from the 2004 Feasibility Report Update)
HBW_{Length} = Average trip length for home-based-work trips, 17.95 mile (from Lone Star Rail District)
NBO_{Length} = Average trip length for non-work trips, 14.51 miles (from Lone Star Rail District)
NHB_{Length} = Average trip length for school trips, 11.90 miles (from Lone Star Rail District)

[66] Lone Star Rail District, 2004. "Austin-San Antonio Commuter Rail Project, 2004 Feasibility Report". Appendix D, p. 13. Available online: http://lonestarrail.com/pdf/ASA_Rail_2004_Feasibility_Study.pdf, Accessed 12/09/2011.

Sample Calculation: Average Trip Length for commuter rail

AT_{Length} = (17.95 miles x 33.3%) + (14.51 miles x 33.3%) + (11.90 miles x 33.3%)
= 14.79 average trip length miles

Methodology

To calculate emission reductions from commuter rail, total number of person trips was converted to vehicle trips; then the results were multiplied by the average trip length for all trip purposes and average emission factors for LDV. Conversion rates for person trips to vehicle trips were adopted from the MPO's 2008 travel demand model (1.1030 for HBW trips, 1.4877 for non-work trips, and 1.9065 for school trips).[67] As calculated in equation 6-2, the average conversion rate for all trip purposes is 1.4991 persons per vehicle

Equation 6-3: Average Conversion Rates

PTV_{Rate} = (HBW_{Rate} x 33.3%) + (NW_{Rate} x 33.3%) + (SCH_{Rate} x 33.3%)

Where,

PTV_{Rate} = Average person trip to vehicle trip conversion rate for all trip
HBW_{Rate} = Conversion rate for home-based-work trips
NW_{Rate} = Conversion rate for non-work trips
SCH_{Rate} = Conversion rate for school trips

Sample Calculation: Average Conversion Rates for commuter rail

PTV_{Rate} = (1.1030 x 33.3%) + (1.4877 x 33.3%) + (1.9065 x 33.3%)
= 1.4991 persons per vehicle

The MOVES model was run for 2014 and weighted average VOC and NO_X emissions factors for LDVs were calculated. The air quality benefits for the commuter rail were calculated using the following formula.

Equation 6-4: Commuter Rail Project Daily Emission Reduction

DE_{Rail} = PT_i x AT_{Length} x 2 x / PTV_{Rate} EF / 907,184.74 grams/ton

Where,

DE_{Rail} = Daily VOC or NO_X emissions reduction
PT_i = Average daily ridership, 3,179 (from equation 6-1, Table 6-1)
AT_{Length} = Average trip length, 14.79 miles (from the 2004 Feasibility Report Update)
PTV_{Rate} = Average person trip to vehicle trip conversion rate for all trip purposes, 1.4991 persons per vehicle (from equation 6-2)
EF = Average VOC or NO_X emission factors for light duty vehicles in 2014, 0.47 grams of NO_X per mile and 0.16 grams of VOC per mile (from MOVES model)

Sample Calculation: Daily VOC emissions reduction for the commuter rail

DE_{Rail} = 3,179 riders x 14.79 miles x 2 for round trip / 1.4991 person per vehicle x 0.16 grams of VOC per mile / 907,184.74 grams/ton
= 0.011 ton of VOC per day

[67] San Antonio-Bexar County Metropolitan Planning Organization, 2008 Bexar County Travel Demand Model, Person Miles of Travel by Mode, 1/4/2011, emailed to AACOG on 2/25/2011 by Zack Graham, Travel Demand Modeler.

If the Austin-San Antonio Commuter Rail is built, it could reduce VOC and NO_X emissions by 0.011 tons/day and 0.032 tons/day in 2014. This analysis does not include potential emissions from locomotives operating on the commuter rail.