

Appendix C

Government Greenhouse Gas Emissions Reductions in 2015
Target Year Measures Listing

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Energy Source

Measure Name

Install window film on western exposed glass

Measure Details

Initial Energy Source		Replacement Energy Source	
Electricity			
Use Before	88,000	Use After	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	88,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	47
Implementation Cost	\$0	Savings (\$/year)	\$8,580
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
134	132	69	8	47

Full Description of Measure

Reduces heat gain from afternoon sun. As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Buildings

Measure Name

Insulation Improvements

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	291,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	291,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	156
Implementation Cost	\$0	Savings (\$/year)	\$28,373
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.2%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
442	435	228	25	156

Full Description of Measure

As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Buildings

Measure Name

Leadership in Energy and Environmental Design-New Construction (LEED-NC) Certification Project

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	317,800	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	317,800
Year Implemented	2007	Emission Reduction (tonnes eCO ₂)	170
Implementation Cost	\$0	Savings (\$/year)	\$30,986
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.3%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
482	475	249	27	170

Full Description of Measure

In October, 2007, the South Regional/BCC Library became the first building in Broward County to earn LEED-NC (Leadership in Energy and Environmental Design-New Construction) from the United States Green Building Council. The project's final LEED rating reflects 35 documented and approved points, which corresponds to the Silver certification level under the LEED for New Construction. A total of 5 points were earned under the Energy and Atmosphere category with annual energy savings documented to be 317,800 kWh/year.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Buildings

Measure Name

Plant trees around buildings

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	325,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	325,000
Year Implemented	2004	Emission Reduction (tonnes eCO ₂)	174
Implementation Cost	\$325,900	Savings (\$/year)	\$31,688
		Payback Period (years)	10.3

The emission reduction from this measure as a percentage of total reductions: 0.3%

This emission reduction as a percentage of emission reductions required to meet target: 0.2%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
493	486	254	28	174

Full Description of Measure

Provide shading to buildings and use native plants to reduce irrigation. (Assumptions: 325,000 based on 5% savings in kWh/yr and a total building area of approximately 3,250,000 SF).

43% implementation in 2004, assume 100% implementation by 2015.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Install building/office occupancy sensors

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	150,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	150,000
Year Implemented	1997	Emission Reduction (tonnes eCO2)	80
Implementation Cost	\$0	Savings (\$/year)	\$14,625
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
228	224	117	13	80

Full Description of Measure

Turns lights off when there are no people in the room. As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Install energy efficient electric motors in air handlers and elevators

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	80,250	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	80,250
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	43
Implementation Cost	\$0	Savings (\$/year)	\$7,824
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
122	120	63	7	43

Full Description of Measure

Used mostly on air handlers. As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Install energy efficient exit sign lighting

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	1,240,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	1,240,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	663
Implementation Cost	\$0	Savings (\$/year)	\$120,900
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 1.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.6%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
1,882	1,854	971	107	663

Full Description of Measure

As per AnthonyRosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

 Install variable frequency drives for motors that have part load usage

Measure Details

 Affected Energy Source 1
 Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	762,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	762,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	407
Implementation Cost	\$0	Savings (\$/year)	\$74,295
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.7%

This emission reduction as a percentage of emission reductions required to meet target: 0.4%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
1,157	1,139	596	66	407

Full Description of Measure

Example is when the motor does not need to be running at full blast, it takes the motor and reduces the speed. Similar to air handling. As per AnthonyRosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Optimization of Heating, Ventilation, and Air Conditioning (HVAC) system efficiency by renovating chillers

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	260,695	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	260,695
Year Implemented	2007	Emission Reduction (tonnes eCO ₂)	139
Implementation Cost	\$5,296,285	Savings (\$/year)	\$25,418
		Payback Period (years)	208.4

The emission reduction from this measure as a percentage of total reductions: 0.2%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
396	390	204	22	139

Full Description of Measure

Optimization of Heating, Ventilation, and Air Conditioning (HVAC) system efficiency by renovating chillers. The kWh reduction calculated from Terminal 2/3 and Terminal 4 chiller plant. Calculation is based on cost savings per year of output/efficiency rating of new chillers versus current chillers. This measure was 50% implemented in 2007. It is expected to be 100% implemented by 2015.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Perform energy efficient building lighting retrofits

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	11,355,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	11,355,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	6,070
Implementation Cost	\$0	Savings (\$/year)	\$1,107,113
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 9.7%

This emission reduction as a percentage of emission reductions required to meet target: 5.3%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
17,234	16,978	8,887	977	6,070

Full Description of Measure

As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Perform heating, cooling, and ventilation system retrofits

Measure Details

Affected Energy Source 1

Affected Energy Source 2 (Optional)

Electricity

Energy Reduction	12,764,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	12,764,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	6,823
Implementation Cost	\$0	Savings (\$/year)	\$1,244,490
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 10.9%

This emission reduction as a percentage of emission reductions required to meet target: 6.0%

NO _x Reduction	SO _x Reduction	CO Reduction	VOC Reduction	PM ₁₀ Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
19,372	19,085	9,990	1,098	6,823

Full Description of Measure

Chillers, boilers, fans, pumps, belts, fuel-switching from electric to gas heating. As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Buildings Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Equipment and Lighting

Measure Name

Split Packaged/Direct Expansion (DX) Air Conditioning Systems

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2 (Optional)

Energy Reduction	527,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	527,000
Year Implemented	1997	Emission Reduction (tonnes eCO ₂)	282
Implementation Cost	\$0	Savings (\$/year)	\$51,383
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.5%

This emission reduction as a percentage of emission reductions required to meet target: 0.2%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
800	788	412	45	282

Full Description of Measure

Smaller air conditioning units. As per Anthony Rosa, there are no inputs for implementation dates, locations, and costs. Therefore, the data reflects an average of years implemented from 1997-2007.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Conversion to ultra-low sulfur diesel fuel for buses

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Diesel		Diesel (ULSD)	
Transit Bus		Transit Bus	
Use Before	15,347,323	Use After	15,347,323
Unit	(passenger-miles)	Unit	(passenger-miles)
Price per Unit	\$.06	Price per Unit	\$.06
Ramp-In Factor	100%	Energy Reduction (kWh)	0
Year Implemented	2007	Emission Reduction (tonnes eCO ₂)	0
Implementation Cost	\$0	Savings (\$/year)	\$0
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
0	1,302	0	0	28

Full Description of Measure

In estimation of a level of capacity for Broward County Transit, the following formulas were used: Annual passenger miles/annual revenue miles x no. of seats = % capacity, then multiply by the no. of seats for passengers/vehicle. Used 40 seat bus for Fixed Route, 20 seat bus for Community Bus, eight seat for Paratransit (as per recommended by Cindy Corbett-Eleder)

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Use of B20 Biodiesel instead of normal diesel

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Diesel (ULSD)		Biodiesel (B-20)	
Heavy Truck		Heavy Truck	
Use Before	131,900	Use After	131,900
Unit	(US gal gasoline eq)	Unit	(US gal gasoline eq)
Price per Unit	\$2.35	Price per Unit	\$2.45
Ramp-In Factor	100%	Energy Reduction (kWh)	0
Year Implemented		Emission Reduction (tonnes eCO ₂)	259
Implementation Cost	\$0	Savings (\$/year)	-\$13,190
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.4%

This emission reduction as a percentage of emission reductions required to meet target: 0.2%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
-332	-625	1,726	425	17

Full Description of Measure

Using 2007 values. Assume no additional growth for 2015. Vehicle fleet measures are dependent on technology rather than actual reduction in Vehicle Miles Traveled (VMT), thus it is not possible to predict what will occur in the future. Assume 8 years from now, we will use the same technology as we have now.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Use of Compressed Natural Gas (CNG) vehicles instead of gasoline

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		CNG	
Passenger Vehicle		Passenger Vehicle	
Use Before	412,459	Use After	412,459
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.17	Price per Unit	\$.06
Ramp-In Factor	100%	Energy Reduction (kWh)	139,002
Year Implemented		Emission Reduction (tonnes eCO ₂)	84
Implementation Cost	\$0	Savings (\$/year)	\$44,823
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
901	69	11,238	1,302	15

Full Description of Measure

Using 2007 values. Assume no additional growth for 2015. Vehicle fleet measures are dependent on technology rather than actual reduction in Vehicle Miles Traveled (VMT), thus it is not possible to predict what will occur in the future. Assume 8 years from now, we will use the same technology as we have now.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Use of Electric (EV) vehicles instead of gasoline

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Electricity	
Passenger Vehicle		Passenger Vehicle	
		Grid Average	
Use Before	3,587	Use After	3,587
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.17	Price per Unit	\$.04
Ramp-In Factor	100%	Energy Reduction (kWh)	5,724
Year Implemented		Emission Reduction (tonnes eCO ₂)	1
Implementation Cost	\$0	Savings (\$/year)	\$463
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
6	-2	123	12	-1

Full Description of Measure

Using 2007 values. Assume no additional growth for 2015. Vehicle fleet measures are dependent on technology rather than actual reduction in Vehicle Miles Traveled (VMT), thus it is not possible to predict what will occur in the future. Assume 8 years from now, we will use the same technology as we have now.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Use of hybrid electric vehicles (HEV) instead of gasoline vehicles

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Gasoline	
Passenger Vehicle		Auto - Sub-Compact/Compact	
		SULEV	
Use Before	165,187	Use After	165,187
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.17	Price per Unit	\$.06
Ramp-In Factor	100%	Energy Reduction (kWh)	216,147
Year Implemented		Emission Reduction (tonnes eCO ₂)	57
Implementation Cost	\$0	Savings (\$/year)	\$18,266
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
365	18	4,275	537	1

Full Description of Measure

Using 2007 values. Assume no additional growth for 2015. Vehicle fleet measures are dependent on technology rather than actual reduction in Vehicle Miles Traveled (VMT), thus it is not possible to predict what will occur in the future. Assume 8 years from now, we will use the same technology as we have now. Fuel efficiency increased from 30 mpg to 50 mpg based on our hybrid fleet (recommended by Anthony Rosa). Also classify as a super-ultra low emissions vehicle ("SULEV") based on emissions rating (per Anthony Rosa).

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Change in Fuel Type

Measure Name

Use of Liquid Propane Gas (LPG) vehicles instead of gasoline

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		LPG	
Passenger Vehicle		Passenger Vehicle	
Use Before	161,670	Use After	161,670
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.17	Price per Unit	\$.05
Ramp-In Factor	100%	Energy Reduction (kWh)	69,633
Year Implemented		Emission Reduction (tonnes eCO ₂)	27
Implementation Cost	\$0	Savings (\$/year)	\$19,535
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
353	27	4,405	510	6

Full Description of Measure

Using 2007 values. Assume no additional growth for 2015. Vehicle fleet measures are dependent on technology rather than actual reduction in Vehicle Miles Traveled (VMT), thus it is not possible to predict what will occur in the future. Assume 8 years from now, we will use the same technology as we have now.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Vehicle Fleet Sector

Location of Measure: Broward County, Florida

Type of Measure: Switch to Public Transport

Measure Name

Provide Fixed Bus Route

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Diesel (ULSD)	
Passenger Vehicle		Transit Bus	
Use Before	99,443,362	Use After	13,811,578
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.00	Price per Unit	\$.67
Ramp-In Factor	100%	Energy Reduction (kWh)	58,090,055
Year Implemented	1987	Emission Reduction (tonnes eCO ₂)	14,889
Implementation Cost	\$0	Savings (\$/year)	-\$9,273,488
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 23.8%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
-78,110	16,493	3,153,619	291,041	-643

Full Description of Measure

BC provides fixed bus route. On average, there are 12 people riding on a Broward County bus at any given time of the day during hours of operation (5:30 a.m. to Midnight), the fuel efficiency is 3.5 mpg due to the loading/unloading of passengers (information provided by Cindy Corbett-Elder, BC Office of Transportation). From previous on-board surveys conducted by BC Transit, 80% of riders do not have a vehicle. Therefore assume 20% + 50% of remaining 80% of riders could seek alternate (personal vehicle) transportation for trip taken on BC fixed bus route (information provided by or agreed on by Bob Fossa, Senior Planner, BC Transit). To calculate Vehicle Miles Traveled (VMT) that would have been travelled by individual vehicles had the Fixed Route Bus Service not been provided we used the following formula: VMT(Fixed Bus Route) x (20% of riders with personal vehicles + 50% of remaining 80% of riders that would have found some other passenger vehicle mode to reach their destination) x 12 individual trips (vs. 12 people which is the average occupancy factor on a Broward County bus) = 13,811,578 x 0.60 x 12 = 99,443,362 VMT by personal vehicles.

While Broward County pays for the fuel used in the transit buses, Broward County Transit's 2007 Fare Revenue (including both passes and cash on board) was \$19,728,982. This is more than double the cost of providing fuel for the vehicles (\$9,273,488).

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Employee Commute Sector

Location of Measure: Broward County, Florida

Type of Measure: Car/Van Pooling

Measure Name

Carpool to courthouse

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Gasoline	
Passenger Vehicle		Passenger Vehicle	
Use Before	307,200	Use After	153,600
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.00	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	314,040
Year Implemented	2000	Emission Reduction (tonnes eCO ₂)	83
Implementation Cost	\$0	Savings (\$/year)	\$0
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.1%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
355	26	5,321	507	8

Full Description of Measure

16 carpools to courthouse comprising of 32 employees. Two employees per carpool. Assuming 40 miles RT and 240 workdays a year. No net savings due to the fact that the county does not pay for the fuel, but rather the employee does. Data and assumptions provided by Enrique Zelaya of MPO.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Employee Commute Sector

Location of Measure: Broward County, Florida

Type of Measure: Car/Van Pooling

Measure Name

Carpooling to Governmental Center

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Gasoline	
Passenger Vehicle		Passenger Vehicle	
Use Before	1,190,400	Use After	595,200
Unit	(vehicle-miles)	Unit	(vehicle-miles)
Price per Unit	\$.00	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	1,216,906
Year Implemented	1996	Emission Reduction (tonnes eCO ₂)	322
Implementation Cost	\$0	Savings (\$/year)	\$0
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.5%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
1,376	101	20,618	1,966	31

Full Description of Measure

Carpooling programs are currently in place at the Governmental Center and Annex. There are 62 carpools to courthouse comprising of 124 employees. Two employees per carpool. Assuming 40 miles RT and 240 workdays a year. No net savings due to the fact that the county does not pay for the fuel, but rather the employee does. Data and assumptions provided by Enrique Zelaya of MPO.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Employee Commute Sector

Location of Measure: Broward County, Florida

Type of Measure: Other VMT Reduction

Measure Name

Overnight Vehicle Assignments (OVA) in Pollution Prevention and Remediation Division (PPRD)

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Gasoline	
Passenger Vehicle		Passenger Vehicle	
Use Before	27,600	Use After	0
Unit	(vehicle-miles)	Unit	(US gal gasoline eq)
Price per Unit	\$.00	Price per Unit	\$3.11
Ramp-In Factor	100%	Energy Reduction (kWh)	56,429
Year Implemented	2003	Emission Reduction (tonnes eCO ₂)	15
Implementation Cost	\$0	Savings (\$/year)	\$0
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
64	5	956	91	1

Full Description of Measure

Overnight vehicle assignments (OVA) to start work from home rather than come into the office to pick up a vehicle each day for Pollution Prevention and Remediation Division inspectors.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Employee Commute Sector

Location of Measure: Broward County, Florida

Type of Measure: Switch to Public Transport

Measure Name

Broward County East/West (BEWE) Government Center Connector

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Biodiesel (B-20)	
Passenger Vehicle		Transit Bus	
Use Before	13,845	Use After	3,360
Unit	(US gal gasoline eq)	Unit	(US gal gasoline eq)
Price per Unit	\$.00	Price per Unit	\$2.45
Ramp-In Factor	100%	Energy Reduction (kWh)	385,865
Year Implemented	2006	Emission Reduction (tonnes eCO ₂)	108
Implementation Cost	\$0	Savings (\$/year)	-\$8,232
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.2%

This emission reduction as a percentage of emission reductions required to meet target: 0.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
-188	13	8,002	751	0

Full Description of Measure

Broward County East/West Governmental Center Connector Express Bus Service. Fully funded by Air Quality Federal Grant for two years at a cost of \$500,000 for the project. There are 140 riders per day, 14 miles RT, 140 miles a day, 10 mpg. BEWE uses B20 biodiesel fuel. Data and assumptions provided by Enrique Zelaya of MPO. Fuel cost paid for by employee not shown.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Employee Commute Sector

Location of Measure: Broward County, Florida

Type of Measure: Switch to Public Transport

Measure Name

Employee mass transit riders

Measure Details

Initial Fuel and Vehicle Type		Replacement Fuel and Vehicle Type	
Gasoline		Diesel (ULSD)	
Passenger Vehicle		Rail - Commuter	
Use Before	132,000	Use After	0
Unit	(US gal gasoline eq)	Unit	(US gal gasoline eq)
Price per Unit	\$.00	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	4,857,809
Year Implemented	2007	Emission Reduction (tonnes eCO ₂)	1,284
Implementation Cost	\$0	Savings (\$/year)	\$0
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 2.1%

This emission reduction as a percentage of emission reductions required to meet target: 1.1%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
5,492	405	82,307	7,847	123

Full Description of Measure

There are 275 employees use mass transit (BC buses or Tri-Rail). Broward County government does not pay for Tri-Rail services. Also Fixed Bus Routes already in place regardless of employee commuters (i.e., not dependent on them), therefore no extra funding from BC government for employees to use mass transit for commute. Assuming 40 miles RT, 240 workdays a year, and 20 mpg for passenger vehicle used.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Streetlights Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficiency: Lamp and Ballast

Measure Name

Install Light Emitting Diode (LED) traffic signals

Measure Details

Affected Energy Source

Electricity

Energy Reduction	13,539,000		
Unit	(kWh)		
Price per Unit	\$.10		
Ramp-In Factor	100%	Energy Reduction (kWh)	13,539,000
Year Implemented	2002	Emission Reduction (tonnes eCO ₂)	7,238
Implementation Cost	\$0	Savings (\$/year)	\$1,320,053
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 11.6%

This emission reduction as a percentage of emission reductions required to meet target: 6.4%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
20,548	20,243	10,597	1,165	7,238

Full Description of Measure

Light Emitting Diode (LED) signals to replace less fuel efficient incandescent lights. About 260,000 red and green incandescent signals at 135 Watts each have been replaced with LED traffic signals at 12 Watts each.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Water/Sewage Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficient Treatment Method

Measure Name

Fine bubble diffusers in "C" module

Measure Details

Affected Energy Source 1

Affected Energy Source 2 (Optional)

Electricity

Energy Reduction	2,628,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	2,628,000
Year Implemented	2005	Emission Reduction (tonnes eCO ₂)	1,405
Implementation Cost	\$4,500,000	Savings (\$/year)	\$256,230
		Payback Period (years)	17.6

The emission reduction from this measure as a percentage of total reductions: 2.2%

This emission reduction as a percentage of emission reductions required to meet target: 1.2%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
3,989	3,929	2,057	226	1,405

Full Description of Measure

Fine bubble diffusers in "C" module. The liquids treatment at the North Regional Waste Water Treatment Plant (NRWWTP) consists of four secondary treatment modules (A, B, C & D), each with a design capacity of 20 million gallons per day. Secondary treatment includes aeration and clarification. Initially, the aeration process was accomplished in each module with four 300 HP mechanical aerators. On the average at the NRWWTP, each module would utilize 900 HP for normal aerator operation. This project replaces the mechanical aerators (900HP) with fine bubble diffusers, which operate with 500HP blowers resulting in an energy savings of 400HP or 2.628 million KWH per year. This savings was achieved at a capital cost of about \$4,500,000.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Water/Sewage Sector

Location of Measure: Broward County, Florida

Type of Measure: Energy Efficient Treatment Method

Measure Name

Reclaimed water usage as process waters

Measure Details

Affected Energy Source 1

Affected Energy Source 2 (Optional)

Electricity

Energy Reduction	4,599,000	Energy Reduction	0
Unit	(kWh)	Unit	
Price per Unit	\$.10	Price per Unit	\$.00
Ramp-In Factor	100%	Energy Reduction (kWh)	4,599,000
Year Implemented	1990	Emission Reduction (tonnes eCO ₂)	2,459
Implementation Cost	\$10,000,000	Savings (\$/year)	\$448,403
		Payback Period (years)	22.3

The emission reduction from this measure as a percentage of total reductions: 3.9%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
6,980	6,876	3,600	396	2,459

Full Description of Measure

A 10 million gallon per day reclaimed water plant was added at the Norht Regional Waste Water Treatment Plant (NRWWTP) to further polish the treated effluent to allow its use for landscape irrigation and process water. This reclaimed water plant includes filtration and disinfection at a cost of about \$10,000,000, which replaces potable drinking water from the Broward County District 2A Water Treatment Plant for these uses and results in an average energy savings of 4.599 million kWh per year.

In 1990 12% implemented. Assume 100% implementation by 2015.

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Waste Sector

Location of Measure: Broward County, Florida

Type of Measure: Landfilling to Recycling

Measure Name

Provide recycling service to unincorporated area single and multifamily residences

Measure Details

Waste Type Affected

Mixed Recyclables

Amount of Waste

2,096

Unit

(tons)

Price per Unit

\$155.00

Ramp-In Factor

100%

Year Implemented

1989

Emission Reduction (tonnes eCO₂)

7,411

Implementation Cost

\$0

Savings (\$/year)

\$324,880

Payback Period (years)

0

The emission reduction from this measure as a percentage of total reductions:

11.9%

This emission reduction as a percentage of emission reductions required to meet target:

0.0%

NO_x ReductionSO_x Reduction

CO Reduction

VOC Reduction

PM₁₀ Reduction

(lbs)

(lbs)

(lbs)

(lbs)

(lbs)

0

0

0

0

0

Full Description of Measure

This measure accounted for because BC controls recycling program for unincorporated areas

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Waste Sector

Location of Measure: Broward County, Florida

Type of Measure: Landfilling to Recycling

Measure Name

Provide recycling service to unincorporated area single and multifamily residences

Measure Details

Waste Type Affected

Paper - Household

Amount of Waste

3,703

Unit

(tons)

Price per Unit

\$155.00

Ramp-In Factor

100%

Year Implemented

1989

Emission Reduction (tonnes eCO₂)

11,791

Implementation Cost

\$0

Savings (\$/year)

\$573,965

Payback Period (years)

0

The emission reduction from this measure as a percentage of total reductions:

18.9%

This emission reduction as a percentage of emission reductions required to meet target:

0.0%

NO_x ReductionSO_x Reduction

CO Reduction

VOC Reduction

PM₁₀ Reduction

(lbs)

(lbs)

(lbs)

(lbs)

(lbs)

0

0

0

0

0

Full Description of Measure

This measure accounted for because BC controls recycling program for unincorporated areas

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Waste Sector

Location of Measure: Broward County, Florida

Type of Measure: Landfilling to Reduction

Measure Name

Reduce Paper Usage: Metropolitan Planning Organization (MPO) Community Involvement Roundtable (CIR) packages

Measure Details

Waste Type Affected

Paper - Office Paper

Amount of Waste	56		
Unit	(lbs)		
Price per Unit	\$.65		
Ramp-In Factor	100%		
Year Implemented	2007	Emission Reduction (tonnes eCO2)	0
Implementation Cost	\$0	Savings (\$/year)	\$36
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
0	0	0	0	0

Full Description of Measure

Metropolitan Planning Organization (MPO) Community Involvement Roundtable (CIR) packages reduced from 55 to 35 pages. Weight calculated based on 20 lb bond paper, 8.5" x 11", 75 g/m2.

This cost savings does not include the savings due to not purchasing ink, toner, electrical use due to printer, etc...Based on 20 lb bond paper, 8.5" x 11", 75 g/m2. (Standard paper used by Environmental Protection Department's Air Quality Division). Paper size is 0.0603 m2. (8.5" = 0.2159 m and 11" = 0.2794 m.) Multiply this by the mass/area and you will find that a sheet of 20 lb bond paper weighs 0.00992 lb. (Note: For this calculation used 2000 lbs in 1 Ton (Short, USA) from www.onlineconversion.com.)

AQD pays \$30 for a case (10 reams, 5000 sheets) of paper. Therefore, AQD (likely BC also) pays \$ 0.60/lb for the paper.

The cost to dispose of paper is \$93/ton. This works out to be \$0.047/lb (from P. Foye).
So, savings in purchase + disposal = \$ 0.647/lb

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Waste Sector

Location of Measure: Broward County, Florida

Type of Measure: Landfilling to Reduction

Measure Name

Reduce Paper Usage: Metropolitan Planning Organization (MPO) packages

Measure Details

Waste Type Affected

Paper - Office Paper

Amount of Waste	1,067		
Unit	(lbs)		
Price per Unit	\$.65		
Ramp-In Factor	100%		
Year Implemented	2007	Emission Reduction (tonnes eCO ₂)	4
Implementation Cost	\$0	Savings (\$/year)	\$690
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
0	0	0	0	0

Full Description of Measure

Metropolitan Planning Organization (MPO) packages reduced from 120 to 85 pages in 2004 and then from 85 to 55 pages. Weight calculated based on 20 lb bond paper, 8.5" x 11", 75 g/m².

This cost savings does not include the savings due to not purchasing ink, toner, electrical use due to printer, etc...Based on 20 lb bond paper, 8.5" x 11", 75 g/m². (Standard paper used by Environmental Protection Department's Air Quality Division). Paper size is 0.0603 m². (8.5" = 0.2159 m and 11" = 0.2794 m.) Multiply this by the mass/area and you will find that a sheet of 20 lb bond paper weighs 0.00992 lb. (Note: For this calculation used 2000 lbs in 1 Ton (Short, USA) from www.onlineconversion.com).

AQD pays \$30 for a case (10 reams, 5000 sheets) of paper. Therefore, AQD (likely BC also) pays \$ 0.60/lb for the paper.

The cost to dispose of paper is \$93/ton. This works out to be \$0.047/lb (from P. Foye).
So, savings in purchase + disposal = \$ 0.647/lb

Broward County

Government Greenhouse Gas and Air Pollutant Reductions in 2015 Target Year Measures Listing

Waste Sector

Location of Measure: Broward County, Florida

Type of Measure: Landfilling to Reduction

Measure Name

Reduce Paper Usage: Metropolitan Planning Organization (MPO) Technical Coordinating Committee packages

Measure Details

Waste Type Affected

Paper - Office Paper

Amount of Waste	51		
Unit	(lbs)		
Price per Unit	\$.65		
Ramp-In Factor	100%		
Year Implemented	2007	Emission Reduction (tonnes eCO2)	0
Implementation Cost	\$0	Savings (\$/year)	\$33
		Payback Period (years)	0

The emission reduction from this measure as a percentage of total reductions: 0.0%

This emission reduction as a percentage of emission reductions required to meet target: 0.0%

NOx Reduction	SOx Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
0	0	0	0	0

Full Description of Measure

Metropolitan Planning Organization (MPO) Technical Coordinating Committee (TCC) packages reduced from 95 to 80. Weight calculated based on 20 lb bond paper, 8.5" x 11", 75 g/m2.

This cost savings does not include the savings due to not purchasing ink, toner, electrical use due to printer, etc...Based on 20 lb bond paper, 8.5" x 11", 75 g/m2. (Standard paper used by Environmental Protection Department's Air Quality Division). Paper size is 0.0603 m2. (8.5" = 0.2159 m and 11" = 0.2794 m.) Multiply this by the mass/area and you will find that a sheet of 20 lb bond paper weighs 0.00992 lb. (Note: For this calculation used 2000 lbs in 1 Ton (Short, USA) from www.onlineconversion.com.)

AQD pays \$30 for a case (10 reams, 5000 sheets) of paper. Therefore, we pay \$ 0.60/lb for the paper. The cost to dispose of paper is \$93/ton. This works out to be \$0.047/lb (from P. Foye). So, savings in purchase + disposal = \$ 0.647/lb