



# How to Save over \$1000 a Year with Conservation and Efficiency



Dario Atallah - Ambassador

- Monarch High School Presentation
- Fairview High School Presentation
  - Fairview Parent Organization
  - December, 2009



# Overview

- Introduction
- State of Energy - Big Picture
- Renewable Energies
- Home Initiatives
- Summary
- Discussion

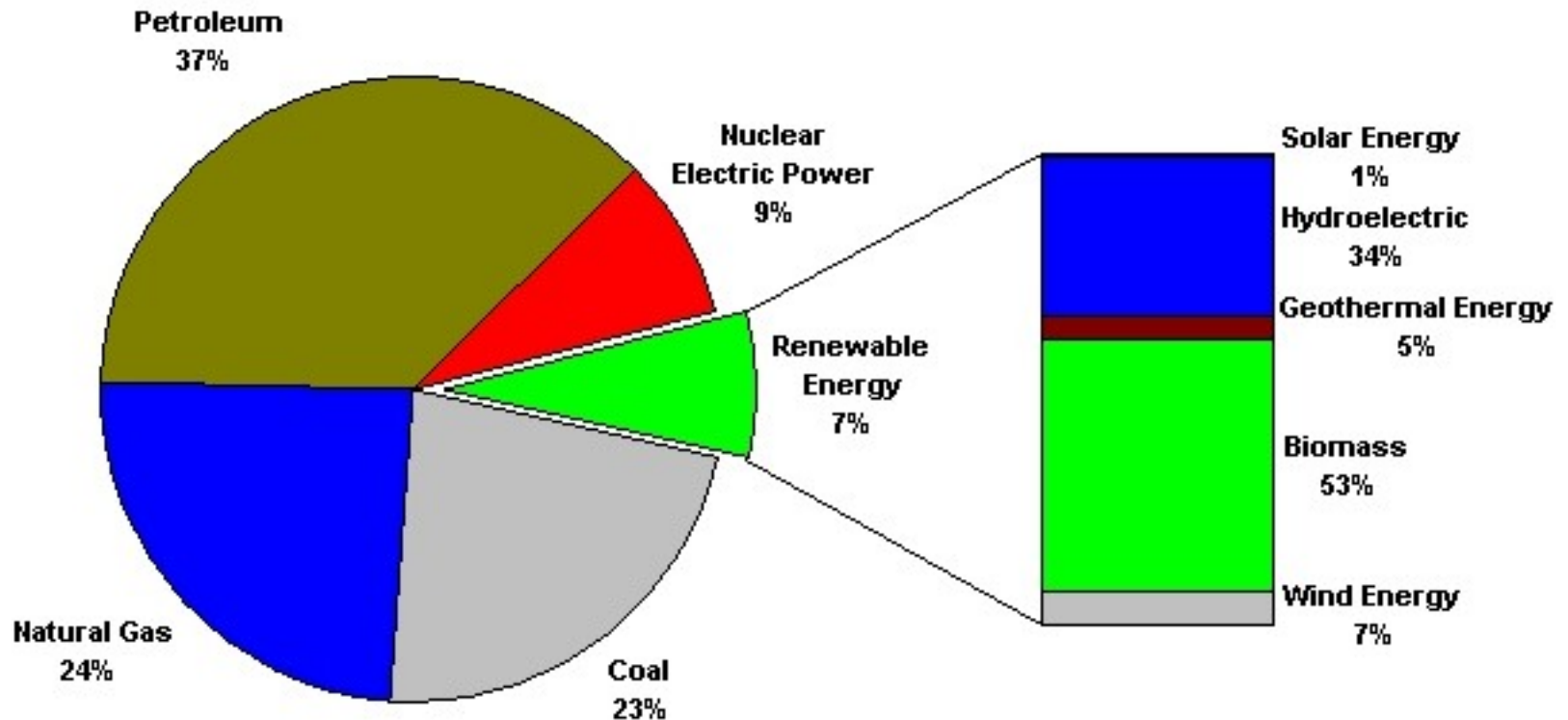


# Energy Landscape

**Renewable Energy Consumption in the Nation's Energy Supply, 2008**

**Total = 99.305 Quadrillion Btu**

**Total = 7.301 Quadrillion Btu**

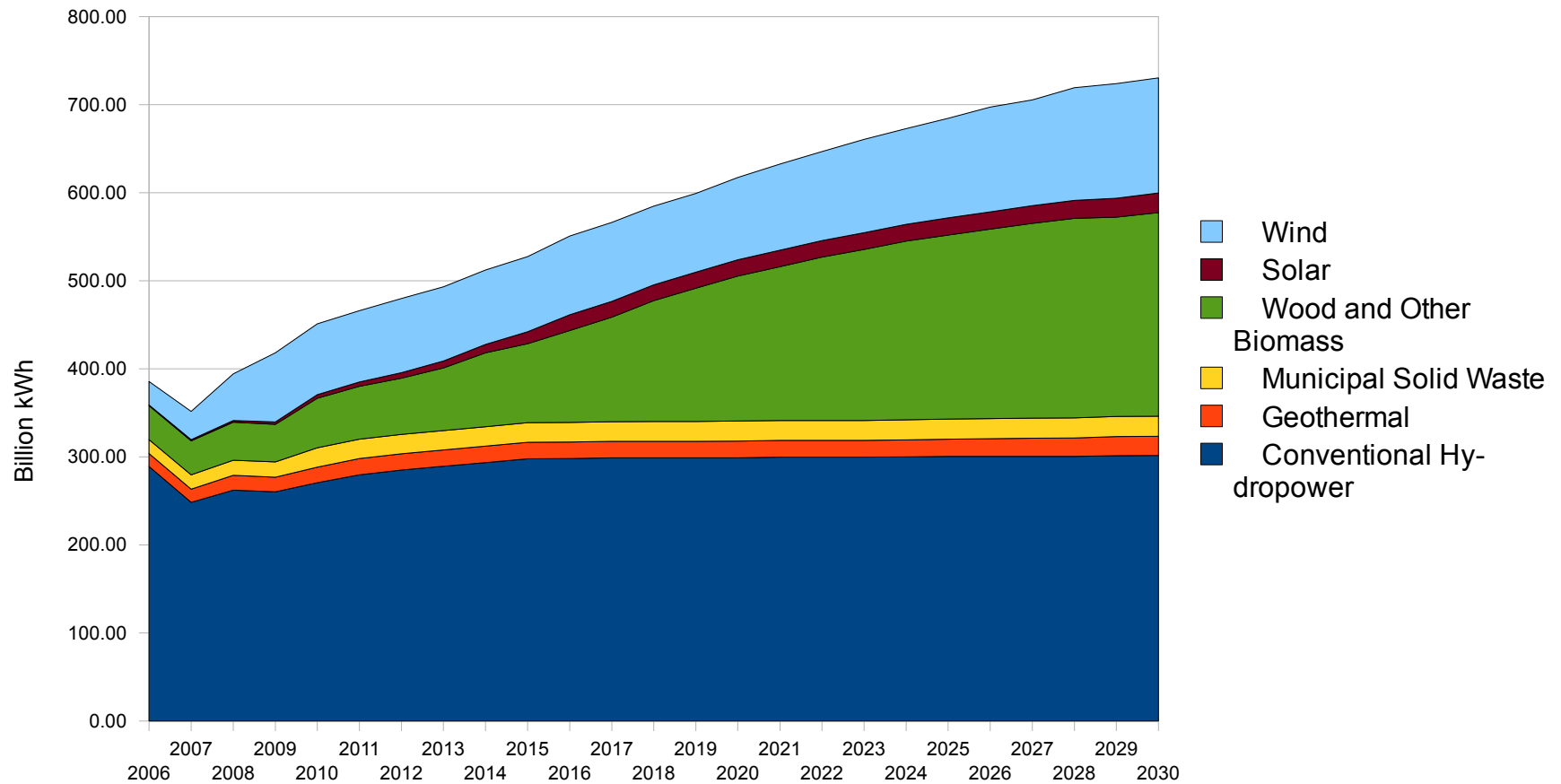


Source: [WWW.EIA.DOE.GOV](http://WWW.EIA.DOE.GOV)



# Renewable Energy Projections

Renewable Energy Generation



Source: Energy Information Administration (EIA)



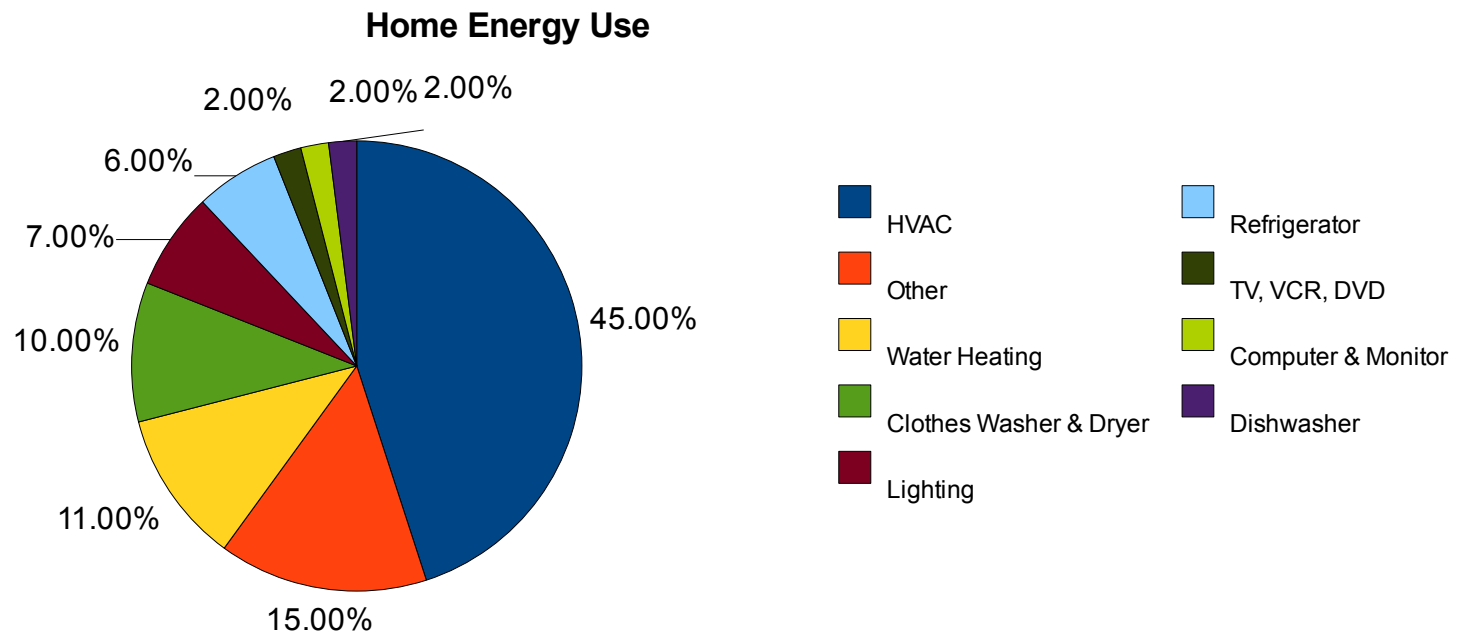
# Residential Energy Use

Residential Energy usage is 22% of total  
Average Colorado home (Source: Xcel Energy)

11,000 kWh per year (\$1,034/yr)

700 therms per year (\$623/yr)

150,000 gallons of water per year (\$755/yr)





# Home Initiatives - Low Hanging Fruit

## Electricity Use (\$200 - \$300/yr savings)



- Change incandescent bulbs to CFL's
- Kill phantom loads, turn off lights, monitors

## Hot water heater (\$22-\$23/yr savings)



- Lower hot water heater temperature to 120 Deg F
- Insulate heater, insulate hot water pipe

## Wash in cold water (\$10/yr savings)

## Heating (\$100 - \$200/yr savings)



- Change furnace filter, turn down thermostat
- Seal leaks, close fireplace flue and turn pilot off (gas)

## Windows (\$100 - \$250/yr savings)



- Seal cracks and close shades/blinds to increase R value

## Carpool, combine errands, use public transportation (\$200 - \$300/yr savings)



# Home Initiatives - Medium Hanging Fruit

## Sealing (\$100 - \$200/yr savings)



- Seal cracks on doors and windows
- Seal duct system leaks
- Seal canned lighting & house fan orifice
- Insulate electrical boxes in outside walls (light switches, power plugs)
- Weather strip and/or adjust doors and windows

## Insulation (over \$130/yr savings)



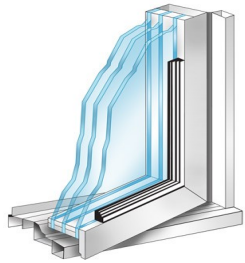
- Insulate the attic (16 - 18 inches)
- Condition crawl space with vapor barrier on ground

## Water Savings (over \$500/yr savings)



- Buy faucet aerators, low flow shower heads
- Replace toilet with dual flush systems

# Home Initiatives - High Hanging Fruit



## Windows (\$100 - \$150/yr savings)

- Replace single pane or defective windows with low-e double pane with lower U-values

## Appliances



- Replace HVAC systems with Energy Star components (don't oversize) (\$200 - \$300/yr)
- Replace old Plasma with Energy Star model (\$60)
- Replace refrigerator with Energy Star rated (\$80)
- Switch to gas dryer & front loader washer

## Add Solar Panels (\$700 - \$800/yr savings)



- Best if facing south
- Best if angled at 40 degrees in Boulder County

Plant trees on east and west sides

Add overhangs on south facing windows



# Home Initiatives - Services

- Zero Cost **T1 Audit** by Energy Core
  - Free House Energy Assessment
- **Energy Audit** from Center for Resource Conservation (\$100)
  - In Depth energy efficiency analysis
- Paid energy **upgrades** by Climate Smart Program
  - Free CFLs and more
- Free Consumer Energy Use **portal** by Symbiotic Engineering
  - Monitor energy usage year over year



# Summary Savings - Low Cost

	Household Potential Yearly Savings (\$)	Household CO2 Lbs/Yr Savings	Boulder County Potential Yearly Savings (\$MM)	Bldr County CO2 Tons/Yr Savings	Colorado Potential Yearly Savings (\$MM)	Colorado CO2 Tons/Yr Savings
<b>Summary</b>						
<b>Zero to low Cost initiatives (\$0 - \$100)</b>						
<b>Electricity</b>						
Turn off CRT monitor	\$16.47	307	\$0.86	7,981	\$14.18	132,176
CFLs	\$216.15	4,029	\$14.05	130,937	\$232.69	2,168,510
Turn off phantom loads	\$62.04	1,156	\$2.42	22,549	\$40.07	373,442
<b>Gas</b>						
Lower Furnace 2 degrees	\$28.00	61	\$1.82	1,984	\$30.14	32,851
Hot water heater	\$22.67	293	\$1.47	9,530	\$24.40	157,828
Seal Cracks/Duct Leaks	\$142.80	311	\$1.86	2,023	\$30.74	33,508
Change Furnace Filter	\$100.80	220	\$6.55	7,141	\$108.51	118,265
<b>Auto</b>						
Driving	\$377.50	2,929	\$4.91	19,041	\$81.28	315,350
<b>Water</b>						
Water use	\$343.69	174	\$22.34	5,641	\$369.98	93,432
Wash in Cold Water	\$10.53	138	\$0.68	4,475	\$11.33	74,113
<b>Total Savings Low Cost Initiatives</b>	<b>\$1,320.65</b>	<b>9,618</b>	<b>\$56.96</b>	<b>211,301</b>	<b>\$943.33</b>	<b>3,499,475</b>



# Summary Savings - Medium Cost

	Household Potential Yearly Savings (\$)	Household CO2 Lbs/Yr Savings	Boulder County Potential Yearly Savings (\$MM)	Bldr County CO2 Tons/Yr Savings	Colorado Potential Yearly Savings (\$MM)	Colorado CO2 Tons/Yr Savings
<b>Summary</b>						
<b>Medium Cost initiatives (\$100 - \$500)</b>						
Monitor	\$49.32	919	\$1.28	11,951	\$21.24	197,933
Insulation	\$136.00		\$5.30		\$87.84	
<b>Total Savings Medium Cost Initiatives</b>	<b>\$185.32</b>	<b>919</b>	<b>\$6.59</b>	<b>11,951</b>	<b>\$109.08</b>	<b>197,933</b>



# Summary Savings - High Cost

	Household Potential Yearly Savings (\$)	Household CO2 Lbs/Yr Savings	Boulder County Potential Yearly Savings (\$MM)	Bldr County CO2 Tons/Yr Savings	Colorado Potential Yearly Savings (\$MM)	Colorado CO2 Tons/Yr Savings
<b>Summary</b>						
<b>High Cost Initiatives (\$500 - \$50,000)</b>						
HDTVs	\$66.52	1,240	\$0.86	8,059	\$14.32	133,468
Refrigerator	\$81.31	1,516	\$1.06	9,851	\$17.51	163,155
Efficient AC	\$168.96	3,149	\$2.20	20,470	\$36.38	339,011
Efficient Washer & Dryer	\$135.00	839	\$1.76	5,452	\$29.07	90,291
Window Shades	\$250.00	3,270	\$16.25	106,264	\$269.13	1,759,896
Efficient Furnace 70% to 90%	\$137.06	1,793	\$1.78	11,652	\$29.51	192,969
Energy Star Windows	\$155.10	2,891	\$2.02	18,791	\$33.39	311,202
Solar PV	\$775.50	14,454	\$5.04	46,977	\$83.48	778,004
Hybrid Car	\$1,444.44	11,209	\$9.39	36,429	\$155.49	603,318
<b>Total Savings High Cost Initiatives</b>	<b>\$5,636.91</b>	<b>55,057</b>	<b>\$138</b>	<b>528,305</b>	<b>\$2,292</b>	<b>8,749,550</b>



# Questions

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# Lightbulb/Monitor Savings

	Qty	Power (W)	Time ea (hrs)/day	Energy Used (kWh)/ day	Cost (\$)/day	Yearly Energy Cost/yr	Yearly Energy (kWh)	Monthly Energy (kWh)	CO2 Lbs/Yr
<b>Light Bulbs Incandescent</b>									
Light Bulb 100W	10	100	3	3.00	\$0.28	\$102.93	1,095	91.25	1,918
Light Bulb 60W	30	60	3	5.40	\$0.51	\$185.27	1,971	164.25	3,453
<b>Total Incandescent</b>	<b>40</b>			<b>8.40</b>	<b>\$0.79</b>	<b>\$288.20</b>	3,066	255.5	5,372
<b>Light Bulbs CFLs</b>									
Light Bulb CFL 100W eq	10	25	3	0.75	\$0.07	\$25.73	274	22.81	480
Light Bulb CFL 60W eq	30	15	3	1.35	\$0.13	\$46.32	493	41.06	863
<b>Total CFLs</b>	<b>40</b>			<b>2.10</b>	<b>\$0.20</b>	<b>\$72.05</b>	767	63.88	<b>1,343</b>
<b>Savings - Light Bulbs</b>						<b>\$216.15</b>	2,300	191.63	<b>4,029</b>
<b>Monitors - CRT</b>									
Monitor CRT active	1	150	8	1.20	\$0.11	\$41.17	438	36.5	767
Monitor CRT asleep	1	30	16	0.48	\$0.05	\$16.47	175	14.6	307
<b>Total Monitors - CRT</b>	<b>1</b>		<b>24</b>	<b>1.68</b>	<b>\$0.16</b>	<b>\$57.64</b>	<b>613</b>	51.1	<b>1,074</b>
<b>Monitor - Flat Panel</b>									
Monitor FP active	1	30	8	0.24	\$0.02	\$8.23	88	7.3	153
Monitor FP asleep	1	0.15	16	0.00	\$0.00	\$0.08	1	0.07	2
<b>Total Monitors Flat Panel</b>	<b>1</b>		<b>24</b>	<b>0.24</b>	<b>\$0.02</b>	<b>\$8.32</b>	<b>88</b>	7.37	155
<b>Savings - Monitors</b>						<b>\$49.32</b>	525	44	<b>919</b>

# Driving & Window Savings

Driving	MPG	Times/Week	Miles/week	Miles/Year	Gals / Year	Cost/Year	CO2 Lbs/Yr
Trips to Market (3 miles)	20	3	18	900	45	\$112.50	873
Trips to School (5 miles)	20	5	50	1,800	90	\$225.00	1,746
Trips to Work (10 miles)	20	5	100	5,000	250	\$625.00	4,850
Combine market trips	20	2	12	600	30	\$75.00	582
Carpool to school	20	3	30	1,080	54	\$135.00	1,048
Carpool to work	20	3	60	3,000	150	\$375.00	2,910

<b>Driving savings</b>			<b>66</b>	<b>3,020</b>	<b>151</b>	<b>\$377.50</b>	<b>2,929</b>
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Replacing Car	MPG	Miles/ Year	Gals/Year	Gas Cost	CO2 Lbs/Yr
Old SUV	15	12,000	800	\$2,000.00	15,520
Super efficient Hybrid	54	12,000	222.22	\$555.56	4,311
<b>Car Replacement Savings</b>			<b>577.78</b>	<b>\$1,444.44</b>	<b>11,209</b>

Windows Replacement	Savings %	Savings \$	Number	#CO2 Saved	Cost ea	Cost	
# Windows	15.00%	<b>\$155.10</b>		6	2,891	350	\$2,100.00



# Heating Savings

Water Usage	Minutes/Times Use each person/day	People in Household	Gals/Min or Gals/Flush	Gallons Used / day	Gallons Used / Year	Cost/yr	CO2 Lbs/Yr
Old shower heads	5.00	4	5.5	110	40,150	\$201.95	
Low flow shower heads	5.00	4	2.2	44	16,060	\$80.78	
<b>Savings Shower Heads</b>				<b>66</b>	<b>24,090</b>	<b>\$121.17</b>	61.2
Old Toilet use	5.00	4	5	100	36,500	\$183.60	
Low flow (dual flush) toilet	5.00	4	1.04	21	7,592	\$38.19	
<b>Savings Toilet</b>				<b>79</b>	<b>28,908</b>	<b>\$145.41</b>	73.44
Faucet w/o aerator	3	4	5	60	21,900	\$110.16	
Faucet w/ aerator	3	4	1.5	18	6,570	\$33.05	
<b>Savings Faucets</b>				<b>42</b>	<b>15,330</b>	<b>\$77.11</b>	38.95
<b>Total Water Savings</b>				<b>187</b>	<b>68,328</b>	<b>\$343.69</b>	<b>174</b>

# Insulation & Water Savings

Insulation	Savings/Yr	Cost	Payback	SF
Attic R11 to R38 (4" - 16")	\$136.00	\$400	2.94	800
Window Shades (R-5)	\$400.00	\$1,200	3	300

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# Assumptions

## Energy Costs and Savings

\$/kWh	\$0.094
\$/1000 Gal of water	\$5.03
\$/Gal Gasoline	\$2.50
\$/Therm	\$0.89
BTU/kWh	3,412

## For CO2 calculations, assume:

1 kWh ->	1.75 Lbs CO2
1 CF Natural Gas -> 1000 BTU	0.12 Lbs CO2
1 Gal Gasoline - >	19.4 Lbs CO2
1 Therm - >	11.64 Lbs CO2
1000 Gals Water ->	1.45 kWh
	2.54 Lbs CO2