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**Zachary Brown Discussion Group** ([permalink](#))

**Efficient Lighting Retrofits** ([permalink](#))

last edited by [redacted] on Wednesday, 10/01/2008 11:23 PM

**Retrofits for buildings**

-The local government building sector was responsible for approximately 42,740 tons of GHG or 27% of total local government emissions in 2005. There is plenty of room for improvement.

- Durham county operates 37 buildings, with a total area of 1,212,000sq ft. This current project only calls for 1/3 of that, or 400,000sq ft. to be retrofitted. (Durham Action Plan)

- Energy efficiency will be gained through retrofitting of current county buildings to LEED standards, as well as future developments.

- Energy savings comes in the form of replacing old T-12 fluorescent tubes with more efficient T-8 sized tubes.

- The City of Durham has done very little thus far to reduce emissions and increase efficiency from their buildings. (Durham Action Plan)

- With only a payback of .4 years, this project will reduce Durham's annual CO2e emissions by 557 tons, and save 822,000 kwh of electricity per year.

After Building Retrofits using T-8 Sized tubes that use 30% less energy:

**Government Operations**

400,000	Square Feet Retrofitted with Efficient Lighting
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**Government Operations**

\$ 0.0746	Price of Electricity (\$ per kWh)
6.85	Annual Lighting Energy Use per Square Foot (kWh)
30	Percent Savings with Retrofit
\$0.06	Cost of retrofit (\$ per square foot)
822,000	Total Annual Electricity Savings (kWh)
\$61,321	Annual Cost Savings
0.4	Simple Payback (years)

**Government Operations**

CO2e (metric tons)	NOx (lbs)	SOx (lbs)	CO (lbs)	VOCs (lbs)	PM10 (lbs)
557	1,783	6,947	154	17	136

**Things to note/Other Considerations**

- All reductions calculate assume that all 400,000 sq ft will be retrofitted at the same time. In reality, the lights might be replaced with T-8's as the old ones die out. Replacing existing, but currently functioning old bulbs would be somewhat inefficient and bump up costs slightly.

- The lifespan of T-12's is poor: 10,000hrs. This is a lifespan of a little over a year (light-

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- Worst case scenario. all lights are replaced in one year's time.
- Energy savings may overlap with the "energy efficiency retrofits" and "lighting Occupancy Sensors" sectors. Some savings may be counted twice, but due to the limitations of CAPPED it is not possible to see to what extent. For example, the effectiveness of the occupancy sensors will also depend on the amount of old T-12 lights retrofitted with T-8's.

Disregard the information below, it wasn't a top priority and it never got brought up.

**2) Replacing old Traffic Signals with LED signals**

- Currently, only 2,395 of 10,739 traffic signal bulbs are LEDs, out of the 350 intersections that the City of Durham operates. These new signals use 90% less energy.
- Retrofitting the remaining signals (8344) will save the City of Durham \$975,250 annually!
- Each replaced signal saves 1,183 kwh of energy per year.
- Full replacement of signals will pay for itself after 1.4 years.

Before:

**Government Operations**

200	Traffic Signals Replaced with LED Signals
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**Government Operations**

\$ 0.0753	Price of Electricity (\$ per kWh)
1,183	Annual Energy Savings of one LED Traffic Signal (kWh)
\$165	Cost to Install an LED Traffic Signal
236,600	Total Annual Energy Savings (kWh)
\$17,816	Annual Cost Savings
1.9	Simple Payback (years)

After:

**Government Operations**

8,344	Traffic Signals Replaced with LED Signals
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**Government Operations**

\$ 0.0753	Price of Electricity (\$ per kWh)
1,183	Annual Energy Savings of one LED Traffic Signal (kWh)
\$165	Cost to Install an LED Traffic Signal
9,870,952	Total Annual Energy Savings (kWh)
\$743,283	Annual Cost Savings
1.9	Simple Payback (years)

This seems to be a great first step, and I will look into streetlights and indoor building lighting next.

you write. [click here](#).

## Sources

### 1) CAPPA

### 2) Durham's greenhouse gas inventory and Climate Action plan

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Actually, if you look under lighting in CAPPA, one specific choice is efficient lighting retrofits (at the end) which has the specific input given in the assignment. I applaud your work on traffic signals (and perhaps your group can use it!), but you do need to put in the assigned input to the correct strategy page. :>

Tuesday, 09/30/2008 9:56 PM by [redacted] | [Delete](#)

Really interesting stuff. It's amazing what a difference lightbulbs can make. It would be interesting to note how far Durham has already come towards this measure. Also, extra focus could be given to areas that constantly must have lights on or have high intensity lights, such as the detention center and the baseball stadium.

Friday, 10/03/2008 3:14 PM by [redacted] | [Delete](#)

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## Fruits and vegetables [\(permalink\)](#)

**Spinach** [\(permalink\)](#)  
last edited by [redacted] on Thursday, 11/06/2008 7:29 PM

### ENERGY USE:

#### Overview:

Spinach is a fast-growing nutrient dense vegetable. Most varieties grow best in cool, wet climates in soil with a basic pH. Spinach is a native crop to Asia, but the US currently produces the second greatest volume next to China. 96% of the spinach consumed in the US is produced domestically. California, Arizona, and New Jersey produce 73, 13, and 3% of the US's spinach, respectively, although 12 other states dedicate at least 100 acres of land to spinach production as well (7).

#### Production:

- Approximately half of the energy that goes into producing spinach crops comes from nitrogen-based fertilizers. Phosphorous for fertilizers, fuel, machinery, and electricity make up the majority of the rest of the energy requirements (5).
- The seed beds for spinach must be carefully prepared before planting, including treating the soil with lime if the pH is too high. Also, spinach must be well-irrigated (3).
- Spinach is particularly susceptible to pests such as aphids, caterpillars, mites, and wireworms, and diseases like downy mildew and bacterial leaf spot (6). As a result, farmers apply large quantities of potent herbicides and pesticides (5). Although spinach is washed several times (processing), many of these chemicals, such as Permethrin Total and Dimethoate don't get completely removed - making spinach one of the Environmental Working Group's "Dirty Dozen" (13).
- Typically laborers harvest bunched/loose spinach and large machines harvest the spinach to be canned or frozen, but increasingly more machines that are able to harvest the leaves without damaging them are coming on the market and replacing labor (and requiring more energy) (Fig 1) (12).

#### Processing:

Presently, the greatest demand for this food is fresh spinach leaves in prepackaged salad bags. The spinach typically sold in salad bags is washed three times by machine (Fig 2) and then dried, involving equipment like centrifugal dryers, air beds, and flash vacuums (Fig 3 & 4). Once the spinach is put in the salad bags, these bags must be vacuumed by machine, as extra air in the bag can lead to bacterial growth and spoiling (4). Loose-leaf spinach is packed in 7.5 to 8 pound cartons containing 12 10-ounce salad bags or in 20-25 pound bushel crates (3).

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Figure 1: Baby Spinach Harvesting machinery (12)

Figure 2: Spinach washing machine (11)

Figures 3 and 4: Drying machinery

(air drying tunnel (10) (top) & centrifuge (9))

