

i) Climate Control

Almost fifty percent of a buildings electricity usage is attributed to heating and cooling, and every cooling degree below 78°F can add between 8-12% to power costs⁹. The City of Naples endorses a facility wide guidance limit on indoor temperature control to no less than 76°F for cooling purposes and 68°F for heating. This will be remotely controlled by Facility Managers where technology permits. Additional remote operations will be added as available. Night-time or unoccupied setbacks should be no less than 80°F.

Conservatively assuming that 40% of electric costs for City buildings for 2006 are for cooling, this equates to \$196,240.73 for 1,806,572 kWh. It is also assumed that previously in summer months, temperature settings of 73 or 74°F were common; indeed settings in these ranges were frequently observed. Based on the 10% cost per degree Fahrenheit guideline, we can see that a 2 degree upwards adjustment should realize a 20% savings on cooling costs. Even if we restrict estimations to the warm summer months we see that for 5 months, or \$81,766.97 (752,738.3 kWh) the City should save 20%: \$16,353.40 and 150,547.66 kWh which prevents the emission of 81 metric tons CO₂e. Recent savings at City Hall (see page 6) illustrate the potential scale of savings in this area, these estimations are considered on the low end.

Estimated savings: \$16,353.40, 81 metric tons CO₂e.

Action item: policy guidance on climate control.

ii) Office Shutdown

Inadvertently leaving on lights, computers, peripheral electronics and monitors, is an easily avoided waste of power. There are approximately 350 desktop and notebook computers in use by City employees¹⁰. Additionally, over 80 LaserJet printers and numerous personal Inkjet type printers. While most PCs, monitors and printers are capable of “sleeping” or going into a power savings mode after a set period of time, it is more desirable to completely shut down the PC, monitor and even printers when they won’t be used, even for short time periods. A typical 35-watt LCD computer monitor can use around 5 watts per hour even while idle. A computer even in sleep or standby mode will also pull around 3 watts¹¹. With 350 systems, all drawing 8 watts per hour between 5pm and 8am, that’s $15 \text{ hrs} * (350 * 8) / 1000 = 42 \text{ kWh}$ or nearly 5 unnecessary dollars every night. Even if it just happened Monday-Thursday, that equates to \$1000/year.

City employees are encouraged to fully switch off all electronic equipment in their offices and common areas (where applicable) whenever the systems are not in use. Technology Services staff have enacted an over-ride program to automatically send idle PC’s into sleep mode. To estimate the potential savings of this action, the following four hypothetical scenarios and calculations are described. As it is not possible to determine exactly how many systems are currently left on, in sleep mode or are completely turned off, these are presented for illustrative purposes and we can assume a savings potential somewhere mid-way between the extremes described.

Scenario A: ALL ON ALL THE TIME

While most computers switch to screen saver after a few minutes inactivity, there is no difference in electricity usage. So a system that's left on 24/7 will draw an average of 150 watts for the PC and 35 watts for the monitor. To illustrate the worst case scenario for computing power, let's suppose that City staff never turn off the computer or monitor:

With 350 systems this, thankfully unlikely scenario, would cost the City \$59,843 and create 286 MT CO₂e.

Per a memo from the City Manager (January, 29th, 2009), Technology Services began sending out scripts to selectively force systems that are left on to go into the sleep or power savings mode if they happen to be left on. Staff estimate that prior to the enforced shutdown, about 70% of staff were ordinarily closing down all electronics at night, although no detailed information is available¹².

Scenario B: MIDDLE GROUND - the most likely existing scenario is that 70% of staff (per Technology Services estimates) are either going to sleep mode or shutting down at the end of the day, while 30% are leaving all power on. This equates to a more realistic \$30,484.45 and 146 MT CO₂e. (This assumes that the remaining 30% never turn off their computer, which is probably unfair.)

Scenario C: WITH OVER RIDE - Commencement of the override capability revises the estimate to \$17,902 and 86 MT CO₂e. This scenario assumes that all staff send computers to sleep, where the reality may be that some actually do turn the systems completely off.

Scenario D: ALL OFF – if all staff were to completely shut down the PC and monitor every night, costs are estimated at \$16,016 and 77 MT CO₂e.



These days, with the staggering number of office electronic devices we use, 'plug load', is a major component of electricity use. The good news is, the solution is simple, and free: turn it off!

| SCENARIO | WATTS | HRS/WK | kWh PER YEAR (watts x hrs/wk x 50/1000) | | COST | | CO ₂ e | |
|--|-------|--------|--|-----------|-----------|-------------|-------------------|----------------|
| | | | per unit | City-wide | per unit | City-wide | Per unit (lbs) | City-wide (MT) |
| A All systems on all the time | 185 | 168 | 1,554 | 543,900 | \$ 170.94 | \$59,843.00 | 1,803 | 286 |
| B 30% (105) on all the time 70% (245) sleep mode days end | 185 | 168 | 1,554 | 163,170 | \$ 170.94 | \$17,948.70 | 1803 | 86 |
| | 185 | 45 | 416 | 101,920 | \$ 45.76 | \$11,211.20 | | |
| | 8 | 123 | 49 | 12,005 | \$ 5.39 | \$ 1,320.55 | | |
| | | | 465 | 113,925 | \$ 51.15 | \$12,531.75 | 540 | 60 |
| TOTAL | | | | 277,095 | | \$30,480.45 | | 146 |
| C All sleep mode days end | 185 | 45 | 416 | 145,600 | \$ 45.76 | \$16,016.00 | | |
| | 8 | 123 | 49 | 17,150 | \$ 5.39 | \$ 1,886.50 | | |
| | | | 465 | 162,750 | \$ 51.15 | \$17,902.50 | 540 | 86 |
| D All off days end | 185 | 45 | 416 | 145,600 | \$ 45.76 | \$16,016.00 | 483 | 77 |

Table 2: Computer shutdown scenarios, kWh, costs and GHG savings

Table 2 shows the full calculations. These calculations are based on an 11 cent per kWh electricity cost and use CACP (2003) software at 2009 (Region 8) coefficients for estimation of CO₂e. Work hour assumptions are as follows: 9 hours in a work day, using 50 weeks/yr, ON = 150 watts for PC, 35 watts for monitor, SLEEP = 3 watts for PC, 5 watts for monitor.

Without detailed knowledge of precise staff behavior and numbers and practice in system shut down, it is not possible to provide an exact quantification of energy savings. What the exercise does illustrate is the positive effect the shut-down is likely having on energy use, and the importance of closing down all systems as fully as possible to reach scenario D and minimize unnecessary wasted costs. While not to negate the importance of shutting down fully wherever possible, (note the significant difference of 209 MT CO₂e between scenarios A (all on all the time) and D (all off except for work hours), and \$43,827 in electricity costs, we can see that the savings become much smaller as we compare scenarios C and D.

Estimated savings: Scenarios B-C; \$12,577.95, 60 metric tons CO₂e

Action item: policy guidance on office electronics.

iii) Space Consolidation

Staff reductions for fiscal year 2007-2008 totaled 33 positions¹³, and with current budget constraints additional job losses are inevitable¹⁴. Consequently, there exists a small number of vacant offices and space which could be utilized for storage, in some cases negating the need for offsite storage. As part of the task force effort, a basic survey of all departments showed a total of 5 vacant and 3 potential empty offices and almost 500 square feet in storage area, utilizable with some minor infrastructure modifications. Also at City Hall, approximately 25% of the first floor has been rented to Collier County Clerk of Courts. City Managers have recently coordinated with the County to give up this space, freeing the area for use by the City.

Creation of a records center at City Hall (in the space previously utilized by Collier County) would (per Tara Norman, City Clerk¹⁵) would cost approximately \$30,000 for the required renovations and equipment. Details of the offsite storage areas that could be closed and move on-site need to be confirmed, but it is conservatively estimated that at least \$5,000 per year in rental costs could be saved. Offsite electricity related emissions would also be reduced, although per inventory protocols these are not part of the City's direct footprint.

This report recommends that the City further explore the closure of smaller office facilities and reconsolidation of departments and personnel to reduce operating costs and save jobs. For example (and precise logistics remain to be determined) moving Community Services to the Community Development building could conservatively save 50% of the electric costs (\$4,209.98) of that smaller building. It is assumed that unused buildings will still need to be dehumidified to prevent mildew and mold, and staff in a new location will add to the electric use of that new building. Similarly, Purchasing and the Natural Resources Division could be moved to City Hall entailing a potential savings of \$5,629.66.

Estimated savings: minimum \$5,000 rental costs.

Action items: 1) Close off-site storage locations, 2) Create Records Center at City Hall, 3) Explore office consolidation



The City's main complex is located on the Gordon River at Riverside Drive.



Large buildings include Utilities....



...Police and Emergency Services....



....and Community Development. Other facilities at Riverside Drive include the waste water treatment plant, Solid Waste, Purchasing, Equipment Services, Community Services and Natural Resources.

iv) City Hall

Figure 3 shows that City Hall continues to be a focus of energy efficiency concerns with increasing usage and costs. The problem may (and not based on a structural evaluation but rather comments expressed by staff during the course of this report) be rooted in the short design and construction window back in the late 1970's. The building was erected on the existing City Hall site with the aid of federal stimulus money, which at that time was available only to entities with 'shovel-ready' projects¹⁵. Consequently, as an older building there are issues with inefficient HVAC ductwork and weatherization (leakiness). It is neither practical nor financially feasible to consider a re-build at this time. The City must work within the parameters available and explore all options to run the building as cost-effectively as possible.

Facilities Managers have made considerable progress with lighting improvements (see #5). Other options include installing window film on south facing windows. This could have the dual benefit of providing hurricane-proofing. Information from FPL on the potential for rebates to assist with this work, is pending. Climate control should be controlled and on-going, recent evaluations of utility bills (post-distribution of policy guidance on temperature settings) suggest that costs are already coming down. Motion sensors have been installed in the City Manager's small conference room. After hours lighting needs to be re-evaluated and aesthetic and/or safety concerns weighed in light of costs.

v) Energy Efficiency Retrofits

Facilities Managers began the task of changing incandescent and magnetic ballast (T12) lighting to energy efficient compact fluorescents and electronic ballast T8's several years ago¹⁶. Work has extended to cover approximately 80% of City facilities, although for reasons of cost, switch outs were implemented on an as-fail basis. As this work is on-going and not a direct result of this energy savings plan, no attempt is made to calculate GHG and dollar savings. We note that CFL's average 75% more efficient than traditional bulbs, this is one of the most cost effective ways to lower energy bills. Efforts to complete all replacements are recommended.

In hallways, bathrooms and conference rooms, overhead lights can be inadvertently left on. To address this problem, Facilities Managers have begun installing motion sensors on a trial basis throughout City facilities. Two have been installed at public restrooms at the Naples pier, three in the City Manager's office, two more are planned for City Hall restrooms and four in the Community Services building (in bathrooms, the copy room and lunchroom). The basic fixtures cost \$74 (those planned for the City Hall bathrooms are more expensive as they need to be ceiling mounted) at \$174. Without detailed analysis of before and after lighting it is difficult to precisely estimate the electricity savings entailed. Staff report no issues with operation¹⁶. Manufacturer's specifications¹⁷ describe potential savings of 30-90% prior lighting costs. The greatest savings potential is from restroom applications.

Focusing only on these locations then, at Naples Pier and City Hall bathrooms, we can assume that prior to installation lights were on all the time, but that lights were CFLs, and assume each room contained five, 35W bulbs. Without the sensors:

$5(35 \times 24 / 1000) = 4.2$ kWh per bathroom per day. 1,533 kWh in a year or \$168 and 1,779 lbs CO₂e.

Assuming that the motion sensors are able to at least half that amount of operating time, savings for the 4 rest room locations alone are in the region of \$336 and 1.6 metric tons CO₂e.

Estimated savings: \$336, 1.6 metric tons CO₂e

Action items: continue and expand use of motion sensors throughout City facilities.

v) HVAC upgrades

The need for air conditioning system upgrades for facilities on Riverside Drive has been recognized for several years. The existing system utilizes a traditional split system with individual compressors and air handlers. Reclaimed water for cooling purposes is purchased from City of Naples Utilities and its use has resulted in considerable corrosion and weakening of piping. In addition to these problems, the system at the Police and Emergency Services Building is undersized for the load required. Carrying out needed upgrades and at the same time allowing for increased energy efficiency is a recommended work item under this plan.

HVAC contractors (B&I) have provided proposals for the Police and Emergency Services, Community Development and Utilities Buildings. The scope of work incorporates an option for geothermal technology which utilizes the constant groundwater temperatures found at short distances underground. While precise estimates on the power savings from using a geothermal system are difficult to predict given that existing equipment is not brand new and varies in condition, contractors are confident that efficiencies will improve. Groundwater below about 12 feet is a constant 5°F lower than surface water. Running any electrical equipment on a cooler source improves efficiency and lengthens operational life. The difference is estimated to be equivalent to an increase in EER rating of 1 unit (i.e. from a 12 to 13 EER). In addition to savings in electricity, substantial reductions in re-use water are entailed. Constructing cooling towers instead of the geothermal system requires some additional potable water use, still only a small percentage of the existing high demand. Based on information provided by B&I, utilities reductions for the two scenarios are estimated as follows:

Utility building

- Cooling Tower: Eliminates use of re-use water (113,280,000 G/yr) adds potable water and conveyance (1,548,000 G/yr potable water plus 25,000 G/yr for sewage conveyance) net savings: \$45,200 in water costs. Adds 24,545 kWh /yr for pump and fan energy.

- Geothermal: Eliminates use of re-use water (113,280,000 G/yr, \$48,000) improved efficiency reduces power needs by 12,923 kWh (\$1,422 and 7 metric tons CO₂e).

Police and Emergency Services Building

- Cooling Tower: Eliminates use of re-use water (83,570,400 G/yr) add potable water and conveyance (1,848,000 G/yr for Cooling Tower, 126,000 G/yr for sewage conveyance) net savings \$36,800. System upgrades will improve efficiency from an 8.9 EER to 12.6 EER giving a projected savings of \$9,200.00, approximately 83,636 kWh for 45 metric tons CO₂e.
- Geothermal: Eliminates use of re-use water (83,570,400 G/yr, \$41,000). Improved efficiencies related to geothermal technology will add a further \$6,306 savings (57,326 kWh for 31 metric tons CO₂e) over that noted above.

Community Development Building

- Cooling tower: Eliminates use of re-use water (126,144,000 G/yr), adds 1,848,000 G/yr potable water plus 93,500 G/yr for sewage conveyance, net savings \$43,900. Adds 18,181 kWh /yr for pump and fan energy.
- Geothermal: Eliminates use of re-use water (126,144,000 G/yr, \$48,200), improved efficiency reduces power needs by 25,846 (\$2,843 and 14 metric tons CO₂e).

No attempt has been made to estimate the per gallon water related GHG emissions, although it is noted that the water-sewer sector was the greatest proportion of government emissions in the 2006 inventory. For this reason, from a combined utility and GHG reduction standpoint the geothermal system is the recommended scope of work. Additional costs are estimated at \$15,000 Utilities building, \$3,200 for the Community Development building and \$7,600 for the Police and Emergency Services building, totaling \$25,800. Annual estimated savings with the geothermal is \$156,971 (payback is less than two months for this component). The entire project, including this element, is budgeted at \$1.1 million approximating a 7 year payback overall. Given additional reasons to overhaul the HVAC system a good portion of this is unavoidable cost (for employee health reasons in addition to operational concerns).

HVAC contractors stress that management of indoor temperature (employing night-time or unoccupied setbacks to 82°F and automatic power controls) are crucial to realizing the optimal energy savings. Their work confirmed that cooling related electric use in the buildings studied is about 48-50% of total bills. Please see page 7 for projected City-wide savings from climate control efforts.

Estimated savings: \$156,971, 52 metric tons CO₂e

Action items: add geothermal technology with planned HVAC retrofits.

b. Commute

The City of Naples employs approximately 500 full time staff together adding 2,230 metric tons of CO₂e (10.2% of the government total) from the drive to work and back each day⁵. Finding ways to reduce commuter miles driven can reduce emissions and save employees money. Two options are addressed in this plan:

i) Commuter Services

With funding provided by the Florida Department of Transportation, the Commuter Services program¹⁸ assists large employers in establishing car pools and ride share programs. The City has commenced this free program. Commuter Services will be working in conjunction with Human Resources to survey staff on driving habits, promote an on-line registration and carpool matching service and provide incentives and promotional efforts along the way.

The employee commute survey conducted as part of the greenhouse gas inventory showed that several carpools have already been established. It is hoped that the program will assist participants and add to the efforts underway.

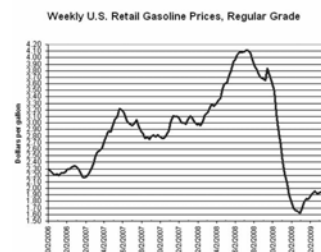
The average round trip driving distance was found to be 29.7 miles, resulting in about 37 lbs of carbon emissions (based on an average efficiency per CACP 'passenger vehicle' category). In general terms then, each employee creates about 4.46 metric tons CO₂e per year from driving to work. Eliminating one trip per week would save $37 \times 50 = 1850$ lbs or 0.84 metric tons CO₂e per person. As we estimate that about 130 staff are already working shifts and 6 staff already carpool, at a minimum the total savings would be 305 metric tons. (Note that this assumes whoever picks the non-driving employee up does not drive any additional miles to do so).

ii) Four day weeks

Many cities across the country have started or are considering implementing a four day work week to save not only on fuel used in commuting to work, but on building energy costs, by closing down certain facilities one extra day a week. As part of the task force effort, departments were surveyed to ascertain where, driven by scheduling needs (not energy constraints) 4 day weeks were already in place. Based on returned questionnaires, approximately 130 employees (87 in Police and Emergency Services and 40 in Utilities) are already working a 4-day week.



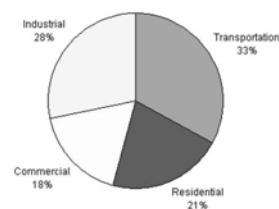
By helping employees reduce their own gas costs, we help fuel our local economy.



Similar price spikes to that of mid 2008 may become a more common occurrence.



The average daily commute for City staff results in about 37lbs of GHG emissions. Not driving just one day a week would shave over 4 metric tons in a year.



The transportation sector accounts for over a third of total U.S greenhouse gas emissions. For the City of Naples, the proportion is even higher.

As the City of Naples provides customer service at a number of facilities on a 5-day basis, this measure must be carefully considered. However for working residents, longer days may in reality prove a better service than the traditional hours. Proposed as part of this energy savings plan is a trial run of four-day weeks for the entire City commencing in the slower summer months. This measure is introduced in certain part for the benefit it provides to employees, gaining an extra personal day each week.

If a four day week PLUS one carpool per week were implemented per person, 611 metric tons CO₂e could be saved, 27% of the baseline commute, and 2.6% of the City's overall carbon footprint.

Estimated fuel savings:

Exact numbers will vary based on actual driving distances and vehicle efficiency but, as a guideline; with gasoline at an average of \$2.00/gallon (March, 2009) and with reported fuel efficiencies averaging 20 miles per gallon⁵ and daily round-trip commute at 29.7 miles, we can see that the average daily commute costs $20/29.7 * 2.00 = \$2.90$ in fuel. Employees could save \$145.00 per year just on fuel from either a carpool day or a 4-day week, \$290.00 per year if both were implemented. Cumulatively, the savings (and cash that could flow back into the local economy or stay in staff savings plans) from 500 employees, is substantial, upwards of \$70,000 per year.

These simple calculations do not include vehicle costs for maintenance, insurance, license, registration, depreciation, finance charges and taxes. With these costs factored in at \$0.54 per mile, for 29.7 miles, a daily commute totals \$18.90¹⁹.

| | | |
|---|-------------|--|
| Average RT distance | 29.7 | based on employee commute questionnaire 2008 |
| GHG's (lbs) | 37 | based on a mid-sized gasoline vehicle per CACP |
| Number of participants | 364 | 130 work shifts, 6 already carpool |
| lbs saved | 673,400 | CACP software |
| metric tons saved | 305.5 | |
| Annual fuel saved (gallons) | 12,256 | 20 mpg / 29.7 miles* 364* 50 |
| Annual cost savings (all employees) | \$24,511.80 | at \$2.00/gallon |
| 2006 Fleet Emissions (MT CO ₂ e) | 2,230 | |
| 2006 City Emissions (MT CO ₂ e) | 23,277 | |
| Commute savings (1 pp/wk) | 14% | of commute emissions |
| | 1.30% | of City emissions |

Table 3: Summary of Commute Savings

Electricity savings:

As the logistics of a facility-wide shut down have not been fully evaluated and discussed, we cannot estimate savings on a whole building basis. The full four-day week program would likely entail closing all facilities (except essential public works services) for one day a week and imposing an across the board switch to four ten hour work days, for example, Monday to Thursday. The impact this would have on public service needs to be fully and carefully considered so that any change is made in a manner in which cost savings can be maximized.

Switching to a four day week entails some significant savings in transportation emissions, but smaller savings in employee power use. While staff are absent for a day they make up the hours elsewhere and it's only when an entire building can be placed in 'standby' mode: with lights out, powered down and important AC set at 'away' settings. As the additional hours are worked in the early morning and late afternoon/evening, AC systems do not have to work as hard as in the heat of the day to keep buildings at ambient temperature. Additionally, many staff already come to work early or leave late for a number of reasons. Hence facility lighting loads may not be increased significantly if all staff worked longer days and for an extra day each week there would be no load whatsoever.

To meaningfully estimate what the cost savings might be for building shut-down, we need to know how electricity load varies between work-days and weekends. FPL do not currently have the ability to track daily or hourly variations, daily averages they provide are for the whole month²⁰. In light of budget constraints, it is recommended that the City carry out this additional analysis. Measurement of key buildings would entail meter readings over some weekend periods to be able to estimate the percent reduction.

For estimation purposes, we see that total City electric charges for buildings in 2008 were \$506,460.36. Dividing by 365 days in the year gives \$1387.56 per day. If we were able to halve that daily cost by closing for 52 extra days per year, we would save \$36,076.62 (327,969 kWh and 177 metric tons CO₂e). This is a very general approximation and subject to further discussion and research.

Estimated savings: Eliminating one commute: \$145 per staff member per year and 305.5 metric tons CO₂e. A City-wide, four-day week, adds building savings of +/- \$36,076.62, 177 metric tons CO₂e.

Action items: 1) Continue to work with Commuter Services, 2) explore feasibility of 4-day weeks