

THOMAS P. DiNAPOLI
COMPTROLLER

STATE OF NEW YORK
OFFICE OF THE STATE COMPTROLLER
110 STATE STREET
ALBANY, NEW YORK 12236

STEVEN J. HANCOX
DEPUTY COMPTROLLER
DIVISION OF LOCAL GOVERNMENT
AND SCHOOL ACCOUNTABILITY
Tel: (518) 474-4037 Fax: (518) 486-6479

June 30, 2009

Mayor Tom Gallagher
Common Council Members
City of Cortland
25 Court Street
Cortland, NY 13045

Report Number: P4-9-29

Dear Mayor Gallagher and Common Council Members:

A top priority of the Office of the State Comptroller is to help local government officials manage government resources efficiently and effectively and, by so doing, provide accountability for tax dollars spent to support government operations. The Comptroller oversees the fiscal affairs of local governments statewide, as well as compliance with relevant statutes and observance of good business practices. This fiscal oversight is accomplished, in part, through our audits, which identify opportunities for improving operations and City governance. Audits also can identify strategies to reduce costs and to strengthen controls intended to safeguard local government.

In accordance with these goals, we are conducting an audit of four municipalities to determine if local municipalities can have a positive impact on the environment and public safety, and realize cost savings by using light emitting diode¹ (LED) bulbs for traffic signals. We included the City of Cortland (City) in our audit. Within the scope of this audit, we examined the City's electricity bills and conducted interviews with employees to gain an understanding of traffic signal use and maintenance. Our audit period was January 1, 2006 to July 31, 2008.

This report of examination letter contains our findings and recommendations specific to the City. We discussed the findings and recommendation with City officials and considered their comments in preparing this report. The City's response is attached to this report in Appendix A. City officials generally agreed with our recommendation and indicated they planned to initiate corrective action. At the completion of our audit of the four municipalities, we prepared a global report that summarizes the significant issues we identified at all of the municipalities audited.

¹ Light emitting diode, or LED, traffic signals are an energy-efficient alternative to commonly used incandescent bulbs. Where incandescent bulbs use one large bulb, LED traffic signal lights are composed of hundreds of LEDs that from a distance appear as a single continuous light source.

Summary of Findings

If the City replaced all of its incandescent traffic signals² with LED bulbs, our analysis shows that your City could save more than \$131,000 over a five-year period, an average of more than \$26,000 annually, on its traffic signal electricity and maintenance costs.

Background and Methodology

Incandescent bulbs have long been used to illuminate traffic signals. Traffic signals are an integral part of smooth day-to-day operations within all municipalities. Signals operate 24 hours a day, 7 days a week and amount to an annual operating cycle of 8,760 hours. Opportunity exists for substantial cost savings if these devices could operate more efficiently. Recently, municipalities started to move from the traditional incandescent bulbs to LEDs.

Recent technological advances have catapulted LEDs into the forefront of efficient traffic signal devices. LED technology gained popularity in many municipalities' traffic signals because of their energy efficiency. This type of bulb has quickly become an area for reduced electric use and cost savings. Approximately 52 percent of the traffic signal market has already moved to LEDs, with red and green signals having the deepest market penetration at 65 percent and 59 percent, respectively.³ Yellow traffic signals have yet to experience the same adoption because they remain illuminated for only a fraction of the time.

In 2008, the U. S. Department of Energy commissioned a study⁴ to determine the effects of using LEDs in traffic signal applications. The study disclosed that municipalities who replaced their existing incandescent traffic signals with LED bulbs achieved immense savings. Another study done by the New York State Energy and Research Development Authority (NYSERDA) concluded that replacing incandescent bulbs with LEDs could result in estimated energy savings of 90 percent on average for traffic signals.⁵

The City has 33 traffic intersections; 20 of these intersections have New York State Department of Transportation (NYS DOT) owned traffic signals. City officials are also responsible for the electricity and maintenance costs of the NYS DOT traffic signals. City officials spent an average of \$41,066 for electricity and maintenance for their incandescent traffic signals annually.

As part of our audit procedures, we examined the City's traffic signal expenditures for a six month period of the 2008 fiscal year to determine the amount and cost of electricity required to run the City's traffic signals. We interviewed City officials to determine whether or not the equipment and technical skills necessary to replace and maintain LED traffic signals were available. We also contacted appropriate third parties including staff

² The City has 29 traffic intersections that operate traffic signals with incandescent bulbs.

³ U.S. Department of Energy savings estimates.

⁴ Navigant Consulting Inc. prepared a report for the U. S. Department of Energy.

⁵ NYSERDA Energy Smart Pamphlet available at:

<http://www.lrc.rpi.edu/programs/transportation/LED/pdf/NYSLEDBrochure.pdf>

of other New York State agencies⁶ and officials from municipalities that have recently replaced their incandescent traffic signals with LEDs within their municipal jurisdictions. We estimated the replacement price for the red and green traffic signals, as well as their maintenance and repair costs, based on data obtained from State contracts and City estimates. We then compared those cost estimates to current traffic signal expenditures to identify any savings.

We conducted our audit in accordance with generally accepted government auditing standards (GAGAS). Such standards require that we plan and conduct our audit to adequately assess those City operations within our audit scope. Further, those standards require that we understand the City's management controls and those laws, rules and regulations that are relevant to City operations included in our scope. An audit includes examining, on a test basis, evidence supporting transactions recorded in the accounting and operating records and applying such other auditing procedures, as we consider necessary in the circumstances. We believe that our audit provides a reasonable basis for our findings, conclusions and recommendations contained in this report.

Audit Results

Cost Savings

The City could realize significant cost savings if they replaced their current incandescent traffic signals with energy efficient and longer lasting LEDs.

According to our analysis, the City's 29 intersections with red and green traffic signals still use 374 incandescent bulbs.⁷ We developed cost estimates⁸ for the purchase and installation of LED bulbs to replace these incandescent bulbs. Our analysis indicated that the City's total costs to replace their existing incandescent bulbs would be slightly more than \$21,000, or an average of about \$56 per bulb.⁹

Our calculation of potential cost savings¹⁰ projected that City officials could save approximately \$131,000 over a five-year period, an average of over \$26,000 annually, by replacing existing incandescent bulbs with more efficient LEDs.

City officials have already replaced four existing incandescent traffic signal intersections¹¹ with LEDs. Savings were immediate and electric consumption went from 4,894 kilowatt-hours (kWh) per month to only 1,701 kWh. The replacement for these

⁶ Third parties and agencies we contacted included New York State Electric & Gas (NYSEG), NYSERDA, NYS DOT and NYS Department of Public Service.

⁷ These signals use either 116-watt or 69-watt long-life incandescent bulbs. Typically, an incandescent bulb can last for 8,000 hours, while an LED bulb can last for 50,000 hours. Our review of City electric bills disclosed that the City's average electricity cost was approximately \$0.19 per kilowatt-hour (kW h)

⁸ The total costs of replacing to LED bulbs included the purchase and installation of the LED bulbs by City staff.

⁹ \$21,000/374 bulbs = \$56

¹⁰ The potential cost savings were reduced by the initial cost to replace the City's existing incandescent traffic signals to LEDs of \$21,433.

¹¹ These four intersections were not part of the 29 intersections that still use incandescent bulbs.

four intersections¹² resulted in an average total electricity cost savings of \$597 per month. City officials told us they have not continued with the replacement because of budgetary constraints.

Environmental Impact

Electricity usage in the United States has increased by 24 percent and emissions from the production of electricity have increased by 22 percent between 1994 and 2005.¹³ A large percentage of electricity is generated from oil, natural gas, and coal, while the remainder is produced from nuclear, hydroelectric, and refuse. All of these sources, except for nuclear and hydroelectric (which some consider clean alternatives) produce certain pollutants that have a negative impact on the environment. Fossil fuels represent the majority of fuel used to produce power, emit pollutants into the atmosphere, and accounted for 85 percent of the nation's greenhouse emissions in 2006.¹⁴

A study released by the National Academy of Sciences¹⁵ confirmed that greenhouse gases are accumulating in the Earth's atmosphere as a result of human activities contributing to global warming. Key pollutants that contribute to smog and acid rain include carbon dioxide (CO₂) nitrous oxide (N₂O) and sulfur dioxide (SO₂). Information about these gases follows.

- Carbon dioxide is a colorless, odorless gas that allows light from the sun's rays to transmit to the Earth's surface but blocks heat radiating from the Earth's surface from escaping into the atmosphere, thus contributing to global climate change or warming due to the "greenhouse" effect.
- Nitrogen oxide is a compound of nitrogen and oxygen that once in the air may undergo a chemical transformation into nitrates and nitric acid, contributing to acid rain and ground-level ozone (photochemical smog).
- Sulfur dioxide is a heavy, colorless gas that once in the air may undergo a chemical transformation into sulfates and sulfuric acid, contributing to acid rain. Electric generation facilities are the largest source of SO₂ emissions. Federal and State environmental regulatory programs control and monitor SO₂ emissions.¹⁶

City officials could potentially save approximately 130,897 kilowatt-hours of electricity each year if they replaced the remainder of their existing incandescent traffic signals with LEDs. In addition to lowering the City's electricity costs, officials could also reduce the amount of greenhouse gas emissions by reducing the City's demand for electricity. Depending on fuel source, size, and location, electricity generation may also cause other

¹² Because these four intersections were part of a larger capital project, individual intersection capital cost amounts were unavailable.

¹³ Energy Information Administration's Annual Energy Review, 2006

¹⁴ Environmental Protection Agency report entitled "Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2006"

¹⁵ Entitled "Climate Change Science Report", issued 2001

¹⁶ Environmental Disclosure, Consumer Guide, New York State Public Service Commission, 8/03

public health, environmental and socioeconomic impacts not disclosed above. Each kWh of traditional electricity consumed produces harmful emissions or byproducts.

The following table illustrates the amount of pollution emissions (in pounds) that the City could avoid producing by replacing the City’s incandescent bulbs with LEDs.

	Pollution Emissions Equivalents (lbs)		
Potential kWh Savings	CO₂	N₂O	SO₂
130,897	107,336	130	549

Recommendation

1. City officials should replace their existing incandescent traffic signals with LEDs to achieve energy and maintenance cost savings. Officials should also consider the environmental impact of their operations (electricity usage) and pursue methods to operate efficiently and in an environmentally sensitive manner.

The Common Council has the responsibility to initiate corrective action. A written corrective action plan (CAP) that addresses the findings and recommendations in this report should be prepared and forwarded to our office within 90 days, pursuant to Section 35 of the General Municipal Law. For more information on preparing and filing your CAP, please refer to our brochure, *Responding to an OSC Audit Report*, which you received with the draft audit report. We encourage the Common Council to make this plan available for public review in the City Clerk’s office.

Our office is available to assist you upon request. If you have any further questions, please contact Patrick Carbone at (607) 721-8306

Sincerely,

Steven J. Hancox
Deputy Comptroller
Office of the State Comptroller
Division of Local Government
and School Accountability

APPENDIX A

RESPONSE FROM CITY OFFICIALS

The City officials' response to this audit can be found on the following pages.



CITY OF CORTLAND
OFFICE OF MAYOR TOM GALLAGHER

25 Court Street, Cortland, New York 13045 Ph. 607.753.0872 Fx. 607.753.0385
www.cortland.org / mayor@cortland.org

March 18, 2009

State of New York
Office of the State Comptroller
44 Hawley Street
Binghamton, New York 13901

Attn: Patrick A. Carbone, Chief Examiner

Re: Report No. P4-9-29

Dear Mr. Carbone:

The City of Cortland wishes to thank the State Comptroller's Office for conducting your study of the use of light emitting diode (LED) bulbs for traffic signals to assist us in identifying potential savings for our community. Based upon our telephone discussion during the exit interview, we gained a keen understanding of the detail, which supported the summarized report and the rationale used in establishing the basis for your assumptions.

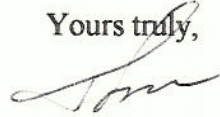
As we explained during the audit process and exit interview, the City of Cortland has been proactive in recent years in an attempt to upgrade the City Owned Traffic Signals to LED bulbs. The last three intersections that have been upgraded by the City of Cortland have been converted from incandescent traffic bulbs to LED traffic bulbs. The city has scheduled one additional traffic signal for upgrade in 2009 with new poles and traffic equipment utilizing LED heads.

The audit identifies 29 traffic signals that are currently utilizing incandescent traffic bulbs. These traffic signals are made up of 18 City of Cortland owned signals and 11 New York State Department of Transportation owned signals.

The City of Cortland will continue to convert from incandescent traffic bulbs to LED traffic bulbs at its City Owned Traffic Signals, that are not in need of a complete rebuild. The City of Cortland would also encourage the New York State Department of Transportation convert from incandescent traffic bulbs to LED traffic bulbs at the State controlled intersections.

Once again, please accept our sincere thanks for the work your office has done on the study. We are always receptive to innovative ways in which we can reduce the financial burden carried by our real property taxpayers. If we encounter any difficulties, we will certainly contact your staff for guidance, and keep you abreast of our progress.

Yours truly,



Tom Gallagher
Mayor



Michael Preston, Superintendent
Public Safety Department