

LED Streetlight Cost-Benefit Analysis Report

for

The Village of Fayetteville

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Central New York Regional Planning & Development Board

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Executive Summary

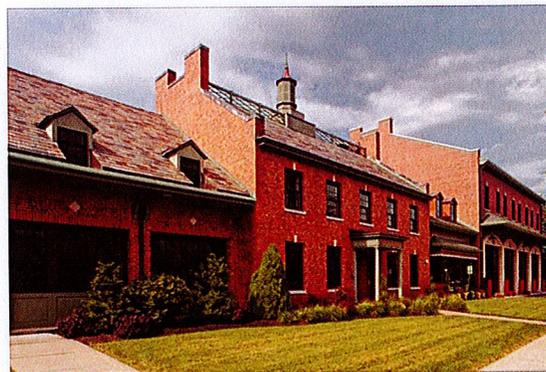
The purpose of this report is to provide a detailed cost-benefit analysis for the opportunity of converting streetlights to light emitting diode (LED) technology in the village of Fayetteville via the new National Grid utility-owned LED streetlight tariff. The information contained in this report will allow municipal officials to make an informed decision about the future of the village's streetlights. This analysis was made possible through the CNY Bright Lights program, an initiative of the Central New York Regional Planning and Development Board (CNY RPDB), funded through the NYSERDA Clean Energy Communities program.

Project Summary

Based on information provided by National Grid, our team identified two scenarios for converting 100% of National Grid-owned cobra head style streetlights in Fayetteville to LED, Scenarios 1 and 2, explained in detail below. Both scenarios would require the Village of Fayetteville to pay a fee to National Grid in the amount of \$85,278.96 which covers the *average net book value* of luminaires to be replaced. Our analysis for Scenario 1 estimates annual cost savings of \$6,435.88, or a 13.3 year simple payback, and emissions reductions of 23.8 metric tons of carbon dioxide equivalent (MTCO_{2e}).¹ Our analysis for Scenario 2 estimates annual cost savings of \$5,514.93, or a 15.5 year simple payback, and emissions reductions of 22.5 MTCO_{2e}. Assuming a useful life of 25 years, converting to LEDs could save the Village up to \$160,897.

This report includes information regarding one-to-one streetlight conversion related to National Grid's utility-owned LED streetlight tariff only. If desired, the Village may pursue reconfiguration or decommissioning of streetlights during the conversion process for an additional cost to be negotiated with National Grid. The Village may also choose to pursue municipal ownership of all streetlight facilities with the intention of converting to LED, an option expected to become available in the fall of 2016.

Detailed information concerning next steps, as well as CNY RPDB's methodology, findings, and recommendations, are contained in the following sections of this report.



¹ Greenhouse gas emissions reductions are measured in metric tons of carbon dioxide equivalent (MTCO_{2e}), a standard unit for measuring emissions from methane, nitrous oxide, and carbon emissions. 1 MTCO_{2e} is about the same amount of emissions that are sequestered by 1 acre of US forests in 1 year.

Introduction

In its December 2014 report entitled *Street Lighting in New York State: Opportunities and Challenges*, the New York State Energy Research and Development Authority (NYSERDA) acknowledged street lighting as a significant cost to municipalities in New York and a major source of greenhouse gas emissions. As its title suggests, the report explains opportunities to reduce costs, energy use, and emissions associated with street lighting, primarily through the conversion to LEDs. The report also addresses the barriers to conversion, including the fact that approximately 75% of streetlights across the state are utility-owned. Until recently, this meant that streetlight facilities must be purchased from the utility before conversion.

Fortunately, on May 23, 2016, the New York State Public Service Commission (NYS PSC) accepted National Grid's proposed utility-owned LED streetlight tariff. Effective June 1, 2016, this tariff allows New York municipalities in National Grid's service territory to convert their cobra head roadway streetlights to LED while maintaining ownership by National Grid. The new tariff requires municipalities to pay for the average net book value of the lights being replaced, which will vary from municipality to municipality depending on the age of the lights. National Grid will provide these cost figures to interested municipalities upon request.

Numerous municipalities throughout New York State are interested in converting to LED streetlights due to a variety of benefits. LED streetlights use 45-70% less energy and last longer than traditional streetlights. Converting to LED streetlights will reduce both operating costs and greenhouse gas emissions for municipalities. LEDs produce a whiter, brighter light that provides enhanced visibility and safety. Light produced by LEDs is also directional, which means light pollution and wasted light energy will be reduced. Thanks to National Grid's new utility-owned LED streetlight tariff, municipalities like the Village of Fayetteville can now realize these benefits. Through its CNY Bright Lights initiative, the CNY RPDB is pleased to provide this report which assesses the costs and benefits of pursuing National Grid's utility-owned LED streetlight tariff opportunity in the village of Fayetteville.

This report is organized in five main sections. The first section presents findings from Fayetteville's streetlight inventory. The second section offers two main scenarios for converting to LED streetlights using National Grid's new tariff, along with the cost for conversion, annual cost savings, and simple payback. The third section explains possible greenhouse gas emissions reductions attributed to LED streetlight conversion in Fayetteville. The fourth section explains financing options for the Village if they decide to pursue conversion to LED streetlights. The final section explains recommendations and next steps. CNY RPDB's methodology and assumptions are explained throughout the various sections of the report.

Streetlight Inventory

CNY RPDB Methodology

In order to assess the costs and benefits of converting utility-owned streetlights to LED, the CNY RPDB first requested an inventory of lighting assets in the village of Fayetteville from National Grid. The inventory National Grid provided included information such as the pole numbers, street names, lamp types and wattages of all fixture components in Fayetteville. The CNY RPDB then used the inventory provided to compile a list of all the roadway luminaires which are eligible for conversion to LED via the National Grid utility-owned streetlight tariff. The provided inventory was used for the cost benefit analysis.

If the Village officially decides to move forward with conversion to LED streetlights, National Grid will perform an on the ground inventory to verify that its records are correct and up to date for all streetlights in the Village before conversion. National Grid will then notify the Village of any updates, which the Village can take into consideration before conversion. The CNY RPDB can provide assistance through this process.

Findings

According to National Grid's inventory, there are 351 cobra head roadway luminaires in the village of Fayetteville, including 30 70W high-pressure sodium (HPS) luminaires, 277 100W HPS luminaires, and 44 150W HPS luminaires. Inventory findings are explained in the table in Appendix A.

The Village of Fayetteville also owns 24 100W HPS, 9 250W HPS, and 1 400W HPS ornamental luminaries which were not included in the CNY RPDB's analysis. The Village may choose to pursue options for converting these streetlights to LED for additional cost and energy savings.

Conversion Scenarios

CNY RPDB Methodology

In order to calculate the financial costs and benefits of converting Fayetteville's streetlights to LED, the CNY RPDB first submitted a request to National Grid for the average net book value of streetlight facilities associated with LED conversion in the village of Fayetteville. This figure is determined by National Grid based on the age of the facilities in the municipality and any prior failures of the facilities. Fayetteville's average net book value per luminaire was quoted at \$242.96, which was multiplied by the total number of luminaires in the village (351) to estimate a conversion cost for Fayetteville of \$85,278.96.

The CNY RPDB then identified two scenarios for converting cobra head streetlights in Fayetteville to LED. Scenario 1 involves converting all 70W and 100W HPS bulbs to the 30W LED replacement option and 150W HPS bulbs to the 60W LED option. Scenario 2 involves converting 20% of 100W HPS bulbs to the 60W LED replacement option with the rest of the conversions the same as in Scenario 1. Scenario 2 provides estimates if the Village decides to increase wattage from the 30W LED replacement to the 60W LED replacement for 100W HPS bulbs in intersections or other busy areas, such as North Burdick Street.²

Total current charges for streetlights in Fayetteville were calculated by multiplying the number of luminaires at each wattage by the current charges³ per luminaire as provided by National Grid in slide 47 of their June 15, 2016 webinar explaining the new LED streetlight tariff.⁴

Total LED replacement charges were calculated by multiplying the number of luminaires at each wattage by the LED replacement charges per luminaire also provided by National Grid in slide 47 of their June 15, 2016 webinar.⁵

Total annual cost savings were calculated by subtracting total LED replacement charges from total current charges. Simple payback period was calculated by dividing conversion costs by total annual cost savings. Financing costs have not been included in the simple payback calculation.

Findings

Our analysis for Scenario 1 estimates a conversion cost of \$85,278.96 and annual cost savings of \$6,435.88, or a 13.3 year simple payback. This option could save the Village \$160,897 over the lifetime of the LED streetlights, assuming a useful life of 25 years. Our analysis for Scenario 2 estimates a conversion cost of \$85,278.96 and annual cost savings of \$5,514.93, or a 15.5 year simple payback. This option could save the Village \$137,873.25 over the lifetime of the LED streetlights, assuming a useful life of 25 years. The Village could choose to pursue either

² The CNY RPDB conducted field investigations in the Village of Minoa and Village of Manlius, where approximately 20% of utility-owned streetlights with 100W HPS bulbs were located at intersections. Please note that the physical distribution of streetlights may be different in Fayetteville, which may result in a slight change to the financial payback for Scenario 2.

³ Current commodity charges are low right now, at about \$0.02-0.03 per kWh, but have historically been closer to \$0.07-0.08 per kWh. The higher the commodity charge, the greater the savings and the shorter the payback period.

⁴ Webinar available at <https://www.youtube.com/watch?v=zGfiaciFfw8&feature=youtu.be>

⁵ Webinar available at <https://www.youtube.com/watch?v=zGfiaciFfw8&feature=youtu.be>

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scenario, or they could pursue an option in between. The Village may wish to pursue a formal lighting layout with the assistance of a lighting professional to determine ultimate LED replacement wattages.

Scenario 1

Number of luminaires	Current wattage	Current charges ⁶	LED replacement wattage	LED replacement charges ⁷	Cost Savings	% Savings
30	70	\$3,069.00	30	\$2,953.20	\$115.80	3.77%
277	100	\$32,508.72	30	\$27,267.88	\$5,240.84	16.12%
44	150	\$6,355.80	60	\$5,160.76	\$1,195.04	18.80%

Conversion costs: \$85,278.96⁸
 Annual cost savings: \$6,435.88
 Simple payback: 13.3 years
 Lifetime savings⁹: \$160,897

Scenario 2

Number of luminaires	Current wattage	Current charges	LED replacement wattage	LED replacement charges	Cost Savings	% Savings
30	70	\$3,069.00	30	\$2,953.20	\$115.80	3.77%
222	100	\$26,053.92	30	\$21,853.68	\$4,200.24	16.12%
55	100	\$6,454.80	60	\$6,450.95	\$3.85	0.06%
44	150	\$6,355.80	60	\$5,160.76	\$1,195.04	18.80%

Conversion costs: \$85,278.96
 Annual cost savings: \$5,514.93
 Simple payback: 15.5 years
 Lifetime savings: \$137,873.25

⁶ Current charges per luminaire were provided by National Grid in their June 15, 2016 webinar in slide 47, available at <https://www.youtube.com/watch?v=zGfiaciFfw8&feature=youtu.be>

⁷ LED replacement charges per luminaire were provided by National Grid in their June 15, 2016 webinar in slide 47, available at <https://www.youtube.com/watch?v=zGfiaciFfw8&feature=youtu.be>

⁸ Conversion costs were determined by multiplying the average net book value by the number of lights to be converted. The average net book value price was determined by National Grid based on the age of the facilities in the municipality and any prior failures of the facilities. Fayetteville's average net book value per luminaire = \$242.96.

⁹ Lifetime savings estimates an average useful life of 25 years per luminaire.

Greenhouse Gas Reductions

CNY RPDB Methodology

To calculate greenhouse gas reductions attributed to converting streetlights to LED, annual energy savings were first calculated by multiplying total number of luminaires by annual kWh used per luminaire type as provided by National Grid on slide 47 of their June 15, 2016 webinar.¹⁰ Energy savings were calculated by subtracting LED streetlight annual energy use from current annual energy use.

Energy savings were then converted to greenhouse gas reductions via ICLEI-Local Governments for Sustainability's ClearPath tool and using the EPA's Emissions & Generation Resource Integrated Database (eGRID) 2012 emissions factors.¹¹

Findings

Our analysis for Scenario 1 estimates an annual energy savings of 127,999 kWh, reducing annual emissions by 23.8 metric tons of carbon dioxide equivalent (MTCO_{2e}). Assuming a useful life of 25 years, converting to LED streetlights via Scenario 1 could reduce emissions by 595.6 MTCO_{2e}. Our analysis for Scenario 2 estimates an annual energy savings of 121,124 kWh, reducing emissions by 22.5 MTCO_{2e}.¹² Assuming a useful life of 25 years, converting to LED streetlights via Scenario 2 could reduce emissions by 563.6 MTCO_{2e}.

The Village of Fayetteville's Climate Action Plan sets a goal of reducing municipal emissions by 20% from the 2009 baseline by the year 2030, or 134.4 MTCO_{2e} reduced per year. Converting to LED streetlights according to Scenario 1 would make the Village 17.7% closer to that emissions reduction goal, while Scenario 2 would make the Village 16.7% closer to their goal.

Scenario 1

Number of luminaires	Current wattage	Current annual energy use	LED replacement wattage	LED annual energy use	Annual energy savings	% Savings
30	70	10,770	30	3,870	6,900	64.1%
277	100	136,284	30	35,733	100,551	73.8%
44	150	31,724	60	11,176	20,548	64.8%

Energy savings: 127,999 kWh

Emissions reductions: 23.8 MTCO_{2e}

Lifetime savings¹³: 595.6 MTCO_{2e}

¹⁰ Webinar available at <https://www.youtube.com/watch?v=zGfiaciFfw8&feature=youtu.be>

¹¹ 2012 emissions factors are the most recent available, released 10/08/2015

¹² Greenhouse gas emissions reductions are measured in metric tons of carbon dioxide equivalent (MTCO_{2e}), a standard unit for measuring emissions from methane, nitrous oxide, and carbon emissions. 1 MTCO_{2e} is about the same amount of emissions that are sequestered by 1 acre of US forests in 1 year.

¹³ Lifetime savings estimates an average useful life of 25 years per luminaire.

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Scenario 2

Number of luminaires	Current wattage	Current annual energy use	LED replacement wattage	LED annual energy use	Annual energy savings	% Savings
30	70	10,770	30	3,870	6,900	64.1%
222	100	109,224	30	28,638	80,586	73.8%
55	100	27,060	60	13,970	13,090	48.4%
44	150	31,724	60	11,176	20,548	64.8%

Energy savings: 121,124 kWh

Emissions reductions: 22.5 MTCO₂e

Lifetime savings: 563.6 MTCO₂e

Financing Options

As noted above, if the Village of Fayetteville decides to pursue this opportunity to convert all cobra-head roadway luminaires to LED streetlights via the National Grid utility-owned streetlight tariff, the Village will be responsible for paying \$85,278.96 in conversion costs to cover the average net book value of luminaires converted. The Village can choose to pay this amount upfront with funds from the Village's general fund, or, if funds are not currently available, the Village can choose to finance project costs using one of three options: independent financing, NY Green Bank financing, or National Grid financing. Each option is explained in more detail below.

Independent Financing

If the Village chooses independent financing, they can borrow money from a lending institution and pay interest according to that institution's current interest rates.

NY Green Bank Financing

National Grid has discussed their LED streetlights opportunity with the NY Green Bank, which is willing to provide financing to municipal customers to convert to LED streetlights. The interest rate is to be determined, but will almost certainly be lower than the rate provided by National Grid.

National Grid Financing

The Village may choose to borrow from National Grid, agreeing on a monthly payment plan, not to exceed ten years, with the project financed at the Company's pre-tax weighted average cost of capital, which is currently 9.79%.

Financing Cost Estimate for Scenario 1

Assuming the Village secures financing for Scenario 1 at a 4% interest rate over 7 years, total project costs would increase from \$85,278.96 to \$97,015.57 over the 7 year period, with a monthly payment of \$1,165.66 and a payback period of 15.2 years. Estimated lifetime savings are estimated to be \$148,260.39.

Once financing costs are known, the CNY RPDB can provide revised payback estimates for the Village.

Recommendations and Next Steps

Recommendations

Because of the cost savings, greenhouse gas reductions, and other benefits of converting to LED streetlights noted in the report, it is recommended that the Village of Fayetteville convert 100% of National Grid-owned cobra head style roadway luminaires to LEDs following Scenario 1, or a following Scenario 1 but converting 100W HPS luminaires on North Burdick Street to the 60W LED option. These options are recommended based on the location of 100W HPS streetlights in primarily residential areas and the additional cost and emissions reductions that are possible compared to Scenario 2.

It is recommended that the Village of Fayetteville choose to pay for the project up front if possible, or pursue independent financing or financing via the NY Green Bank.

It is also recommended that the Village consider converting Village-owned ornamental streetlights to LED through discussions with a contractor and/or LED streetlight company.

Next Steps

Upon internal stakeholder review and approval, the recommended next steps are as follows:

Within 90 days,¹⁴

1. Provide to National Grid the location inventory of lights to be converted and selected LED luminaire to be installed at each location (provided in this document for both scenarios).
2. Determine your financing preference for the project (conversion costs = \$85,278.96)
3. Submission of a purchase order, promissory note, or a formal letter on letterhead from an authorized individual to your National Grid account representative indicating the following:
 - a. Total number of roadway street lights to be converted,
 - b. Reference to the location inventory and the desired LED luminaires per location, and
 - c. Payment and selected financing option.

All conversions will be done on a first-come, first-served basis. If the Village completes the steps above within the next few weeks, it is expected that National Grid could convert streetlights in the early fall of 2016.

National Grid appreciates notification of the Village's decision in this matter regardless of whether or not they decide to move forward. The CNY RPDB is available to provide additional assistance through these steps of the process.

¹⁴ The average net book value figures provided by National Grid that are used in this cost-benefit analysis are good for 90 days, after which a revised net book value can be requested. To lock in the initial net book value, the customer must submit a commitment letter stating they will make payment on an approved quantity of lights within an additional 90 days. The Village's 90 day period began August 24, 2016 when National Grid provided the CNY PRDB and the Village with the average net book value figures.

About CNY RPDB

The Central New York Regional Planning and Development Board is a public agency that was established in 1966 by Cayuga, Cortland, Madison, Onondaga and Oswego counties under the provisions of Article 12B of the New York State General Municipal Law. The CNY RPDB is governed by a board of directors appointed by its five member counties. The agency provides a comprehensive range of services associated with the growth and development of communities in CNY with a focus on five key program areas including economic development, energy management, land use and transportation, environmental management, and regional information services.

For more information, visit <http://www.cnyrpdb.org>.

About Clean Energy Communities

NYSERDA's Clean Energy Communities program is a \$16 million initiative to help local governments across the state reduce energy consumption and drive clean energy use in their communities. Local governments that complete four (4) out of ten (10) identified High Impact Actions will earn the Clean Energy Community designation and access to grant funding, up to \$250,000 per municipality (\$100,000 for smaller municipalities) with no local cost share, to implement additional clean energy projects. Dedicated and knowledgeable local Clean Energy Coordinators, including the CNY RPDB, are available to provide on-demand technical assistance, step-by-step guidance, case studies, model ordinances, project development support and other tools and resources. Converting a minimum of 50% of all municipal and utility-owned cobra-head-style streetlights to LED is one of the Clean Energy Community High Impact Actions.

Learn more at <https://www.nyserra.ny.gov/cec>.

About CNY Bright Lights

CNY Bright Lights is an initiative of the Central New York Regional Planning and Development Board (CNY RPDB) created to assist municipalities in converting streetlights to LED technology. Through this initiative, the CNY RPDB provides technical assistance to municipalities in Cayuga, Cortland, Madison, Onondaga, and Oswego Counties in working with utility companies to purchase lighting assets to convert to LED and/or to convert utility-owned lighting assets to LED. The CNY RPDB will also help municipalities identify and apply for funding for LED streetlight conversion projects. CNY Bright Lights is made possible thanks to funding from NYSERDA's Clean Energy Communities program.

Learn more at <http://www.cnyenergychallenge.org/cny-bright-lights>.