THE STATE OF NEW HAMPSHIRE

BEFORE THE NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION

PRE-FILED TESTIMONY OF CHARLES R. GOODWIN

Light Emitting Diode (LED) Option - Energy Efficient Outdoor Lighting Rate EOL

Docket No. DE 13-XXX

August 28, 2013

I. Introduction

Q. Please state your name, position and business address.

A. My name is Charles R. Goodwin. I am Director of Rates and Forecasting for Northeast Utilities Service Company, which provides centralized services to the Northeast Utilities operating subsidiaries, including Public Service Company of New Hampshire ("PSNH" or "the Company"). My business address is 107 Selden Street, Berlin, Connecticut.

Q. Have you testified previously before the Commission?

A. Yes, I have testified previously.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to propose an additional option under PSNH's tariff for Energy Efficient Outdoor Lighting Delivery Service Rate EOL. That option provides for outdoor lighting service from luminaires containing light emitting diodes ("LEDs") as a lighting source.

II. Background

Q. Please provide a brief description of Rate EOL.

A. Rate EOL is a "delivery and maintenance" rate for unmetered street lighting service. It is available to federal, state, county, municipal or other governmental units, departments or agencies. To qualify for the rate, customers on Rate EOL have agreed to convert all of their roadway and area lighting to either high pressure sodium ("HPS") or metal halide ("MH"). The customer pays PSNH the remaining unexpired life of all existing fixtures and brackets and the installed cost of new HPS or MH fixtures and brackets placed in service. Seven wattages of HPS fixtures and seven wattages of MH fixtures are offered. On each individual light fixture, customers have the option of either "all-night" (4,345 hours of operation per year) or "midnight" (2,005 hours of operation per year) service.

Q. Please describe the Rate EOL rate structure.

A. Currently, the tariff includes a fixed "Monthly Distribution Rate" per fixture for each of the 14 types of fixtures that are offered. The tariff pages show the monthly kWh per luminaire assumed for billing purposes. Transmission, Stranded Cost Recovery, System Benefits, Electricity Consumption Tax and energy service charges are calculated by multiplying the monthly kWh per luminaire by the applicable charge.

Q. Does the Company offer other rates for unmetered street lighting service?

A. Yes, Outdoor Lighting Delivery Service Rate OL is available to both private and governmental accounts. The OL rate structure is similar to that of Rate EOL; however, the fixed monthly distribution charges on Rate OL are higher since they include the full cost of the street lighting installation. In addition to the HPS and MH options available on Rate EOL, Rate OL includes

pricing for existing installations of older, less-efficient incandescent, mercury and fluorescent luminaires.

Q. Why is PSNH proposing an LED option under Rate EOL?

A. The Company's municipal outdoor lighting service customers have expressed interest in LED lighting service for a variety of reasons. Municipalities receiving service under Rate OL may want to reduce their street lighting bills and kilowatt-hour consumption by converting to Rate EOL, but prefer the newer LED technology to the currently-available HPS and MH options. Customers who are already on Rate EOL are facing increasing costs of replacing old, failing equipment, and many would prefer to replace that equipment with newer technology. Some want to be "early adopters" of new technology, regardless of the payback. Others want to install LEDs for perceived environmental reasons.

Only a few years ago, the average LED fixture was priced between $1,200 and $1,400. When the price of installation was added, these luminaires were not a cost-effective alternative to HPS or MH fixtures. Since that time, prices have decreased by 50% or more. Payback periods for converting inefficient, higher wattage fixtures to LED are now more reasonable. The payback for replacing a low wattage, energy efficient HPS or MH fixture may still be extremely long. However, as prices continue to drop, this may change.

In the "Settlement on Permanent Distribution Service Rates" approved by the Commission in Docket No. DE 09-035, PSNH agreed to monitor developments in the technology and the applicable rating standards for LED lighting. As a result of our review, PSNH has determined that offering an LED option under Rate EOL may provide customers with opportunities for energy savings while improving overall lighting quality. Offering an LED lighting service option

is also consistent with PSNH's commitment to assist customers in managing their cost of electricity, to support energy-efficient initiatives, and to support New Hampshire's clean energy goals.

Q. Please describe some of the benefits of LED lighting.

A. Compared to HPS or MH, LEDs offer energy savings, turn on and off instantly (avoiding warm-up and restrike periods), have a white light which is perceived as brighter, and provide more accurate color rendering. LEDs are expected to have longer lifetimes and may cost less to maintain. Also, since LEDs use drivers instead of ballasts, electrical losses are reduced. Replacing existing luminaires with new LED fixtures may reduce or eliminate light pollution and light trespass.

Q. Has PSNH reviewed rating standards for LEDs?

A. Hundreds of roadway and pole-mounted lights are included on the Qualified Products List ("QPL") administered by the DesignLights Consortium ("DLC"). The DLC is a collaboration of utility companies and energy efficiency organizations that promotes quality, performance and energy efficient commercial sector lighting solutions. In 2010, the DLC created the Qualified Products List ("QPL"), a leading resource that distinguishes quality, high efficiency LED products. The products on this list meet rigorous standards for product lifetime, color rendering, lumen output and other factors.

III. Description of LED Service Option

Q. Please describe the LED option PSNH is proposing to implement under Rate EOL.

A. The proposed option would allow customers to receive outdoor lighting service utilizing any combination of LED, HPS or MH luminaires. Customers already receiving service on Rate EOL who wish to take service under the LED option will be responsible for the cost of removing any existing luminaires as well as the installed cost of the LED luminaires placed into service under the LED service option. In addition to the costs described above, customers who are converting from Rate OL to Rate EOL must pay PSNH the remaining unexpired life of all existing fixtures and brackets in service. These costs will be specified in individual agreements with each customer. PSNH will then provide delivery and maintenance service for the LED luminaires, as it does for all other luminaires served under Rate EOL. The customer may elect either all-night service or midnight service on each individual LED fixture.

Q. What are the customer's responsibilities under the LED service option?

A. Customers are responsible for satisfying all town ordinances. The customer is responsible for selecting the fixtures to be installed, subject to Company review and acceptance. The customer will determine the size and type of fixtures, review product specifications for Color Rendering Index, light output, product lifetime, etc. The customer will conduct the bidding process with a vendor, negotiate the warranty, purchase the fixtures, and have them shipped to a customer-owned facility. Additionally, customers assume the responsibility for providing replacement fixtures when needed to replace fixtures that fail or are damaged. The Company recommends that the customer either maintain a stock of replacement fixtures or reach agreement with their vendor for prompt delivery of replacements. Despite the fact that the customer will furnish the

fixtures, PSNH will be solely responsible for installation and maintenance, and PSNH will hold title to the fixtures during the time they are installed.

Q. How will PSNH evaluate the LEDs selected by the customer?

A. PSNH needs to ensure that the fixtures are safe and compatible with existing equipment. The Company also needs to minimize costs of training and ongoing maintenance. Once the customer has narrowed its selection to a small number of products, PSNH Engineering Standards will either examine sample fixtures or the technical drawings. The Company will contact the manufacturer for further information, if necessary. PSNH will only allow fixtures that are compatible with current voltages, fit existing brackets, require no special tools or training to install and maintain, are compatible with existing photocells, and which appear on the DLC's Qualified Products List.

Q. What type of maintenance will the Company provide for LEDs?

A. Most LED fixtures are "integrated," with the light cluster sealed on a panel with a heat sink. As a result, maintenance will be limited to replacement of the photoelectric control. When PSNH receives a report of a luminaire not working, the Company will test the voltage feeding the luminaire as well as the photoelectric control. If necessary, PSNH will correct voltage problems and replace photocells, at no additional cost. If the photoelectric control is working properly and the voltage is correct, the Company will remove the luminaire, return it to the customer, and replace it with a new luminaire provided by the customer. Labor, associated overheads and any material needed to remove the old and install the new luminaire will be billed to the customer. If an entire luminaire must be replaced as a result of vandalism, accident or any other reason, the customer will pay the

cost of removing the existing luminaire and the cost of installing (labor, materials and overheads) the new luminaire.

Q. Will PSNH allow lighting technologies other than LEDs under this option?

A. Possibly. PSNH is proposing tariff language that says "LED or other energy efficient lighting technology accepted by the Company." This language will provide flexibility as new technologies emerge or as customers demonstrate an interest in other lighting sources such as induction lighting.

Q. Will the LED service option be available to customers taking service under PSNH's standard outdoor lighting Rate OL?

A. No. The LED service option will only be available to customers taking service under Rate EOL. LED technology is still developing, and while the amount of energy consumed by LED luminaires is dramatically lower than HPS or MH luminaires with equivalent light output, the cost of the luminaires is still significantly higher. Moreover, we do not yet know whether there will be significant demand for the LED service option, thus making it difficult to determine an appropriate inventory level. Finally, there are currently no standard sizes for LED luminaires. For these reasons, the Company does not want to maintain an inventory of LED fixtures. Therefore, PSNH will require customers to furnish the LED fixtures and will offer this service option only under Rate EOL. Currently, 93% of municipal lights are billed on Rate EOL.

IV. Pricing of LED Service Option

Q. Please describe the pricing under the LED service option.

A. Unlike HPS or MH luminaires which are manufactured in a manageable number of standard sizes, LED wattages are not standardized. It would be impractical to develop a price for each possible wattage, due to the number of prices that would be required. To resolve this problem, PSNH has calculated a distribution rate which includes both a fixed monthly charge per luminaire and a rate per watt. This rate design will allow customers to choose any wattage that fits their lighting needs.

Q. How did you calculate the distribution charges?

A. PSNH ran a regression analysis of the current EOL distribution charges plotted as a function of their wattage. The analysis is shown on Attachment 1. The zero intercept on the y-axis is the fixed monthly charge. The fixed charge recovers costs of providing service regardless of the size of the luminaire and the level of usage. These fixed costs include distribution facilities such as poles, wires and transformers as well as costs of billing, customer service and power restoration. The slope of the line created by the regression analysis is the rate per watt for the luminaire. These rates are consistent with current pricing and will produce distribution revenue which is roughly the same as current rates, for fixtures of equal wattages. During the remaining term of the "Settlement on Permanent Distribution Service Rates" in Docket No. DE 09-035, the Company will adjust these rates by the same percentage that other distribution rates may be adjusted.

Q. Why are you proposing a fixed monthly charge?

A. With technology rapidly changing and wattages decreasing, PSNH is concerned that there could be a deficiency in revenue in the coming years if the pricing is solely based on wattage. Absent a fixed monthly charge, bills for very low wattage luminaires would not recover the cost of providing service. By charging a fixed monthly charge in addition to a per watt charge, PSNH will recover a portion of the fixed cost of serving the load.

Q. What are the proposed distribution charges for the LED option under Rate EOL?

A. PSNH is proposing a fixed monthly distribution charge of $8.50 per fixture, the y-intercept from the regression analysis shown on Attachment 1. The proposed distribution rate per watt is $0.0139, the slope of the line.

Q. How will monthly kilowatt-hour usage be calculated for the purpose of billing per kilowatt-hour rates?

A. Monthly kilowatt-hour usage will be calculated based on the wattage of the luminaire and the number of hours of operation in each month (wattage/1,000 x monthly hours of operation). The monthly hours of operation are the same as those used to calculate monthly kWh per luminaire for current options, for both the all night and midnight service options. For the same light output, kilowatt-hour usage under the LED service option will be lower than usage for existing options, reflecting the lower wattage of LEDs. Therefore, for comparable light output, municipalities will receive lower monthly charges for Transmission, Stranded Cost Recovery, System Benefits, Electricity Consumption Tax and energy service.

Q. Please provide some examples of bill savings under the LED option.

A. Attachment 2 shows four examples. The first two examples are based on conversions of Mercury Vapor fixtures on Rate OL to LED fixtures on Rate EOL. The second two examples show conversions of HPS fixtures already on Rate EOL to LED fixtures. The savings shown here range from 8% for a low wattage HPS fixture already billed on Rate EOL to 69% for a higher wattage mercury fixture currently billed on Rate OL. The savings will vary widely depending on the customer's current rate (OL or EOL), the size and type of current fixtures and the wattage of the LED fixtures selected by the customer. Savings will also be affected by any future rate changes.

Q. Has PSNH prepared revised tariff pages?

A. Black-lined tariff pages showing the proposed revisions are included in Attachment 3.

V. Implementation

Q. How long will it take to implement the new LED service option?

A. PSNH is already preparing for the new option and will require several more months. Since the LED rate design is unlike the current rates, changes are required in the Company's billing system. The wattages must be captured on the billing system, bill calculations must be revised to include a charge per watt, monthly kWh per luminaire must be calculated and changes will be required in the bill print modules. Revenue reporting will be impacted. PSNH is also revising internal accounting and operational procedures and documents to accommodate the new rate. Commission approval of the rate by December 1, 2013 would allow the Company to implement the rate on January 1, 2014.

Q. What is PSNH requesting of the Commission?

A. PSNH requests that the Commission approve its proposed LED service option under Rate EOL by December 1, 2013 for effect on January 1, 2014. If approval is received after December 1, PSNH requests an effective date 30 days after the date of the Commission's order.

Q. Does this conclude your testimony?

A. Yes, it does.