414 Nicollet Mall
Minneapolis, MN 55401

December 29, 2015

—Via Electronic Filing—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: REPLY COMMENTS
LIGHT EMITTING DIODE (LED) STREET LIGHTING RATE
DOCKET NO. E002/M-15-920

Dear Mr. Wolf:

Northern States Power Company, doing business as Xcel Energy, submits to the Minnesota Public Utilities Commission this Reply in response to the Comments of the Minnesota Department of Commerce – Division of Energy Resources (Department), the City of Minneapolis, and the Suburban Rate Authority on our petition for approval of a the addition of a Light Emitting Diode (LED) option to our existing Company-owned street lighting rate.

The Department requested further information, which we have provided either in our December 14, 2014 Information Request responses in this Docket or with this Reply. The City of Minneapolis asked a number of clarifying questions and Information Requests, which we have addressed in the attachments to this filing. The Suburban Rate Authority noted that they are pleased with this new offering from the Company, they share interest in several of questions asked by the City of Minneapolis, and will await our response to those comments. They do not intend to inquiry further into LED pricing in this proceeding, in favor of reviewing that data in the rate case.

We thank these parties for their review of our Petition, and in this Reply we provide additional information in response to their requests. The following attachments are also included with this Reply:

- Attachment A: Revised LED Street Lighting System Service Tariff Sheet
- City of Minneapolis Information Request Responses 1-24

A. Department Requests

The Department recommended that, if approved, the proposed LED street lighting rates be implemented 90 days after the Petition's filing date, or within 30 days of the Commission's Order, whichever is later. We agree with this recommendation, as it is consistent with our request in our Petition.

The Department also requested that the Company propose a tariff that takes into consideration the evolution of LED technology by proposing a range of wattages or lumens for each category of lighting service. The Company agrees to make this modification, and notes that it does not change the proposed pricing. The LED equivalent wattage we presented in our Petition is a simple average across vendor fixtures, which was calculated using a range of wattages.

In the attached revised tariff sheet (Attachment A to this filing) and in the table below, we have provided the range of wattages as well as the lumen values for each of the LED fixtures offered through this rate:

Table 1
LED Wattage Ranges and Lumen Values

HPS Equivalent Wattage	LED Wattage Range		Lumen Values for LEDs
	Low	High	
100 W	30 W	40 W	4,000
150 W	50 W	75 W	6,000
250 W	110 W	165 W	14,000
400 W	200 W	250 W	25,000

We believe this addresses the Department's concern related to structuring the tariff by exact wattage levels given the evolving nature of LED technology. In our December 14, 2014 Information Request responses to the Department in this filing, we provided the underlying data supporting Attachment A to our initial petition.

B. City of Minneapolis

We engaged the City of Minneapolis in advance of the filing in a number of discussions related to the rate design for this tariff, with a goal of helping stakeholders to better understand the impact of the proposed LED offering on energy savings and

customer bills. The City noted their appreciation of those efforts, and submitted a number of additional questions seeking greater understanding of the LED fixture details and selection. We are providing our responses in the form of the 24 attached Information Request responses.

We appreciate the parties' review of our filing and the opportunity to provide additional information in these Reply Comments. We respectfully request that the Commission approve the addition of an LED option to our existing Street Lighting System Service. This rate addition responds to increasing customer interest in LED street lighting options.

We have electronically filed this document with the Minnesota Public Utilities Commission, and copies of the Summary of Filing to parties on the attached service list. Please contact Amber Hedlund at amber.r.hedlund@xcelenergy.com or 612-337-2268, or me at amy.a.liberkowski@xcelenergy.com or 612-330-6613 if you have any questions regarding this filing.

Sincerely,

/s/

AMY LIBERKOWSKI
MANAGER, REGULATORY ANALYSIS
RATES AND REGULATORY AFFAIRS

Enclosures
c: Service List

Redline

AVAILABILITY

Available for year-round illumination of public streets, parkways, and highways by High Pressure Sodium (HPS), ~~or~~ Metal Halide or Light Emitting Diode (LED) ~~electric lamps in~~ luminaires supported on poles, where the facilities for this service are furnished by Company. Underground Service under this schedule is limited to areas having a Company owned underground electric distribution system. Standard Service includes a monthly payment for the lighting system cost. Pre-Pay Option requires customer payment for the lighting system cost before establishing service. T TN

DETERMINATION OF CUSTOMER BILLS

Customer bills shall reflect energy charges (if applicable) based on customer's kWh usage, plus a customer charge (if applicable), plus demand charges (if applicable) based on customer's kW billing demand as defined below. Bills may be subject to a minimum charge based on the monthly customer charge and / or certain monthly or annual demand charges. Bills also include applicable riders, adjustments, surcharges, voltage discounts, and energy credits. Details regarding the specific charges applicable to this service are listed below.

RATE

	Monthly Rate Per Luminaire				
	Standard Service			Pre-Pay	
Designation of Lamp (*Lumens*)	Overhead	Underground	Decorative	Option	T
70W High Pressure Sodium	$8.95	$17.67	--	$5.50	
100W High Pressure Sodium	$9.44	$18.16	$28.16	$6.14	
150W High Pressure Sodium	$10.15	$18.87	$29.25	$6.94	~~R~~
200W High Pressure Sodium*	$11.89	--	--	--	
250W High Pressure Sodium	$12.78	$21.29	$31.11	$8.83	~~R~~
400W High Pressure Sodium	$15.50	$23.72	$33.36	$11.38	
					T
175W Metal Halide	$13.86	$25.51	$33.36	$12.47	
30-40W Light Emitting Diode (*4,000*)	$9.59	$18.31	--	$4.38	N
50-75W Light Emitting Diode (*6,000*)	$10.21	$18.92	--	$4.89	N
110-165W Light Emitting Diode (*14,000*)	$13.36	$21.87	--	$6.27	~~D~~N
200-250W Light Emitting Diode (*25,000*)	$16.63	$24.85	--	$7.89	N

*Closed to new customers

PRE-PAY OPTION SURCHARGE

A monthly surcharge per luminaire of 0.2% applies to the amount the purchase price exceeds $1,200.

~~In addition, customer bills under this rate are subject to the following adjustments and/or charges.~~ L

L

~~**FUEL CLAUSE**~~ L

~~Bills are subject to the adjustments provided for in the Fuel Clause Rider.~~ L

(Continued on Sheet No 5-74.1)

In addition, customer bills under this rate are subject to the following adjustments and/or charges.

Fuel Clause
Bills are subject to the adjustments provided for in the Fuel Clause Rider.

RESOURCE ADJUSTMENT
Bills are subject to the adjustments provided for in the Conservation Improvement Program Adjustment Rider, the State Energy Policy Rate Rider, the Renewable Development Fund Rider, the Transmission Cost Recovery Rider, the Renewable Energy Standard Rider and the Mercury Cost Recovery Rider.

ENVIRONMENTAL IMPROVEMENT RIDER
Bills are subject to the adjustments provided for in the Environmental Improvement Rider.

SURCHARGE
In certain communities, bills are subject to surcharges provided for in a Surcharge Rider.

LATE PAYMENT CHARGE
Any unpaid balance over $10.00 is subject to a 1.5% late payment charge or $1.00, whichever is greater, after the date due. The charge may be assessed as provided for in the General Rules and Regulations, Section 3.5.

OTHER PROVISIONS
This schedule is also subject to provisions contained in Rules for Application of Street Lighting Rates.

Clean

STREET LIGHTING SYSTEM SERVICE Section No. 5
RATE CODE A30 22nd Revised Sheet No. 74

AVAILABILITY

Available for year-round illumination of public streets, parkways, and highways by High Pressure Sodium (HPS), Metal Halide or Light Emitting Diode (LED) luminaires supported on poles, where the facilities for this service are furnished by Company. Underground Service under this schedule is limited to areas having a Company owned underground electric distribution system. Standard Service includes a monthly payment for the lighting system cost. Pre-Pay Option requires customer payment for the lighting system cost before establishing service. T TN

DETERMINATION OF CUSTOMER BILLS

Customer bills shall reflect energy charges (if applicable) based on customer's kWh usage, plus a customer charge (if applicable), plus demand charges (if applicable) based on customer's kW billing demand as defined below. Bills may be subject to a minimum charge based on the monthly customer charge and / or certain monthly or annual demand charges. Bills also include applicable riders, adjustments, surcharges, voltage discounts, and energy credits. Details regarding the specific charges applicable to this service are listed below.

RATE

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30-40W Light Emitting Diode (*4,000*)	$9.59	$18.31	--	$4.38	N
50-75W Light Emitting Diode (*6,000*)	$10.21	$18.92	--	$4.89	N
110-165W Light Emitting Diode (*14,000*)	$13.36	$21.87	--	$6.27	N
200-250W Light Emitting Diode (*25,000*)	$16.63	$24.85	--	$7.89	N

*Closed to new customers

PRE-PAY OPTION SURCHARGE

A monthly surcharge per luminaire of 0.2% applies to the amount the purchase price exceeds $1,200. L

(Continued on Sheet No 5-74.1)

In addition, customer bills under this rate are subject to the following adjustments and/or charges. L L L L

Fuel Clause
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Bills are subject to the adjustments provided for in the Conservation Improvement Program Adjustment Rider, the State Energy Policy Rate Rider, the Renewable Development Fund Rider, the Transmission Cost Recovery Rider, the Renewable Energy Standard Rider and the Mercury Cost Recovery Rider.

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SURCHARGE
In certain communities, bills are subject to surcharges provided for in a Surcharge Rider.

LATE PAYMENT CHARGE
Any unpaid balance over $10.00 is subject to a 1.5% late payment charge or $1.00, whichever is greater, after the date due. The charge may be assessed as provided for in the General Rules and Regulations, Section 3.5.

OTHER PROVISIONS
This schedule is also subject to provisions contained in Rules for Application of Street Lighting Rates.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 1
Date Received: December 14, 2015 Comments

Question:

Table 1 provides the LED wattage and HPS equivalent wattage. However because the technology is still evolving, there can be significant differences among LED fixtures. A key criterion is actual light output. Thus, the City requests that the lumen output for all existing and proposed fixtures be provided in addition to the wattage equivalents, so direct light output comparisons can be made.

Response:

The delivered lumens for each of the proposed LED fixtures is shown in the table below:

LED Nominal Wattage (W)	LED Nominal Lumens (lm)	Field Identification Label	HPS Equivalent Wattage (W)	Nominal HPS Lumens (lm)
30	3500	A	70	5800
40	4000	B	100	9500
70	6000	C	150	16000
120	14000	D	250	27500
280	25000	E	400	50000

The LED fixtures provide directional light and therefore do not have to produce as much light to illuminate the target area. The HPS fixtures have a more diffuse light and only a fraction of the light is delivered to the target area, so more light must be produced to achieve the same illumination. This is the primary reason for why the LED streetlights have a lower Lumen value than the HPS lamps.

Preparer: Abbey Sebaggala
Title: Distribution Standards Engineer
Department: Electric Distribution Standards
Telephone: 303-571-3539
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 2
Date Received: December 14, 2015 Comments

Question:

The City became aware of recent news and concerns about Kelvin rating "urban glow". See the attached NY Times article dated October 17, 2015. Also, we understand that some cities across the nation are stating that a 4000K rating is too high, and say LED lighting should be lower. We understand that HPS has an approximate rating of 2200K. The City requests that the Kelvin rating be provided as a key criterion along with wattage and lumens to allow cities and agencies to make better decisions.

Response:

The Company has a standard nominal Correlated Color Temperature (CCT) rating of 4000 Kelvin (K) for LED roadway lighting. A rating of 4000 K is the equivalent color temperature of moonlight, a naturally occurring light source that humans have adapted to for millennia. Beyond the natural moonlight temperaures, the decision to standardize at 4000 K was also driven by our experience with the various color temperatures of existing light fixtures on our system, including LEDs, and the feedback we received from several peer utilities with large scale deployment of the technology. The Company seeks to maximize the benefits of LED lighting without compromising efficacy. We selected 4000 K as the nominal CCT rating for the three LED streetlighting pilot projects we conducted across our service territory. We received only positive feedback from residents and public officials in each of the pilot areas.

Additionally, the specification requirements on the fixtures we will install with this rate option meet or exceed the International Dark Sky Association's (IDA) Fixture Seal of Approval guidelines. All LED fixtures approved by the Company for this offering will meet the full cutoff requirements as defined by the Illumination Engineering Society's Backlight, Uplight and Glare ratings luminaire classification system. The proposed side-mounted roadway applications will have an Uplight rating

of zero. This means that zero percent of the fixture lumens will be directed between the 90 and 180 degrees vertical with zero degrees at the nadir. The result is decreased light trespass and minimal upward light emitted, contributing to darker skies.

Preparer:	Abbey Sebaggala
Title:	Distribution Standards Engineer
Department:	Electric Distribution Standards
Telephone:	303 571 3539
Date:	December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 3
Date Received: December 14, 2015 Comments

Question:

Overall regarding Kelvin rating, how has this been considered as part of this Docket? What research will be accomplished for the Docket proposed LED fixtures? We request that Xcel Energy provide such research and analyses related to Kelvin rating.

Response:

Kelvin rating is one of the key factors that was included in the Company's specification requirements. The Company collected results from three pilot installations and researched other pertinent industry studies to arrive to this rating. The results of the research that the Company performed on LED technology was provided in our pilot project reports. There are no plans to perform any further research as part of the LED retrofit program.

Preparer: Abbey Sebaggala
Title: Distribution Standards Engineer
Department: Electric Distribution Standards
Telephone: 303-571-3539
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 4
Date Received: December 14, 2015 Comments

Question:

We request that Xcel Energy provide the LED Pilot results from the "two other pilot installations across Xcel Energy's service territory" and the stated "technical review".

Response:

The Company conducted three pilot projects across our operating subsidiaries' territories in Minnesota, Colorado and Texas. The results of the West St. Paul, MN pilot project were were described in our LED Streetlight Pilot Project Final Report filed on March 13, 2015 in Docket No. E002/M-12-974. Attachment A to this response is the Public Service Company of Colorado's January 29, 2015 LED Street Light Pilot Project Status Report. The Southwestern Public Service Company's report is not available at this time.

Preparer: Amber Hedlund
Title: Case Specialist
Department: NSPM Regulatory Affairs
Telephone: 612.337.2268
Date: December 29, 2015

LED Street Light Pilot Project Status Report
Denver Highlands Host Site
January 29, 2015

I. OVERVIEW

The confluence of declining LED street light fixture pricing, advancements in their performance and increasing pressure from communities in Xcel Energy service areas led the company to request a LED Street Light Pilot project in mid-2013 to advance the goal of increased energy efficiency on our system. The Pilot gives us the opportunity to test LED street light technology on our system and in our unique climate and to gain first hand installation, operations and maintenance experience with the LED street light fixtures. In addition, the Pilot allows customers a trial run with technology and the opportunity to provide feedback if it does not meet performance or aesthetic requirements.

This status report is specifically for the pilot located in the Denver Highlands neighborhood and included the replacement of 65 high-pressure sodium (HPS) fixtures with LED fixtures, which was completed in mid 2013. The HPS fixtures were a mixture of 100W, 150W and 250W cobra-head fixtures and were replaced with 55W, 80W and 160W Philips (Philips Roadway) Roadview LED fixtures respectively. The Roadview fixtures were selected based on their maintained Lumen performance being similar to the baseline HPS Luminaires installed in the pilot area.

Industry experts indicate that LED Street lights will now last 60,000+ hours, or 12+ years, and reduce energy consumption by 30 to 50% compared to HPS fixtures. We are currently closely monitoring the installed LED street light performance to test these claims. This will ensure that the technology will provide adequate energy savings as well as equal or better visibility for drivers and pedestrians. This status report includes our preliminary findings and observations based on the installation experience, research and analysis completed to date.

II. PUTTING LEDS TO THE TEST

Below is a quick summary of Xcel Energy's team of this pilot project to date.

- The Philips Roadway photopic luminance of LED fixtures is superior to that of HPS fixtures;
  - Decreases light trespass with superior BUG ratings (Back lighting, Up lighting, Glare)
  - Demonstrated improved residential and vehicular visibility: LED street lights have a high color rendering index (CRI) with enhanced visual acuity to better see colors and shapes
  - Higher application efficacies, that is they delivered more lumens to the target areas (roadway or sidewalk) per watt of input power. (per average foot candle values measured by a see table 2)

- To date, there has been no service orders associated with the LED street light fixtures.
- Replacing the HPS luminaries with LED luminares has resulted in reduced energy consumption and consequently carbon dioxide (CO_2) emissions.

Prior to installation, engineering and technical documentation was requested and received from the manufacturer. The manufacturer provided LM-79, LM-80 and TM-21 reports, which are IES approved methods of testing for performance specifically for LED lighting. The reports served as proof that the Luminaires met the minimum photometry requirements set forth by Xcel Energy

The crews that performed the installation reported that installing the LED Luminaires was no different than standard HID fixtures. However they all liked the fact that the LED Luminaires were significantly lighter and

hence more ergonomically friendly. The Company finished the fixture installation in September, 2013, and to date no service orders have been issued to repair the new LED street light fixtures.

A key element of the Pilot, is evaluating the kWh usage of the LED streetlights. We anticipate energy savings from switching to LED technology and, as noted above, we were able to replace 100W, 150W and 250W luminares with 55W, 80W and 160W LED Luminaires based on the high efficacy ratings of the LED fixtures. To verify this energy reduction, we metered three of the LED luminares. Digital read meters were set to zero and tied into the LEDs during installation. Table 1 shows the wattage Roadway readings that we have pulled from the meters thus far. The monthly kWh of the LEDs is significantly lower than the known usage consumption for 100W, 150W, and 250W HPS fixtures for the specific burn hours during the reading periods. These values are similar to the nominal ratings of the LED fixtures.

Table 1
Monthly kWh Consumption: LED vs. HPS

		Monthly kWh Usage		
		55W LED	80W LED	160W LED
2013	Aug	17	25	52
	Sep	17	27	53
	Oct	17	27	53
	Nov	22	31	64
	Dec	23	34	80
2014	Jan	23	34	80
	Feb	23	34	46
	Mar	20	30	60
	Apr	16	25	50
	May	18	28	50
	Jun	16	25	46
	Jul	16	23	49
	Aug	17	25	50
Average Monthly kWH	LED	19	28	56
	HPS*	44	63	105

* calculated values for 100W, 150W and 250W HPS luminaires

While we are finding significant energy savings in this initial analysis, we will need additional readings to establish solid burn time and perform a more thorough analysis.

Measuring the quantity and quality of illumination of the LED fixtures is an ongoing effort. This effort involves taking measurements on a grid pattern of the LED fixtures to obtain average foot candle values using the original HID as a baseline for expected performance. The Light meter used for all light measurements is the Solar Lighting company's PMA2200 calibrated annually. Photos of the test site to evaluate quality of illumination are taken every time these light readings are taken. We test the lighting performance through baseline HPS and LED foot candle readings in selected test areas, 2 light level readings and 1 electric usage test site (100W 150W and 250W LED equivalent).

Photopic luminance measures luminance in well-lit conditions Scotopic luminance on the other hand measures luminance in low lighting conditions. As a baseline, luminance measurements were taken for the existing HPS fixtures.

The results shown in Table 2 indicate a significant increase in the efficacy (lumens per input watt) when the LED fixtures were installed over the baseline HPS luminaires. Key observations from these initial light measurements include:

- Photopic foot candles at all three locations are relatively stable, a key indicator that the LED fixtures were delivering the same amount of light as the baseline HPS Luminaires. This is important since the goal is to have like for like replacements.
- Significant increase in the scotopic foot candles delivered by the LED fixtures. Scotopic performance is an indicator of how the human eye perceives light.

The observations to date affirm the photopic illuminance performance of the LED luminares is superior to that of HPS. Table 2 illustrates the performance.

Table 2
Average Photopic and Scotopic Luminance

	100W HPS	55W LED	150 W HPS	80 W LED	250 W HPS	160 W LED
Average Illuminance (fc)	0.67	0.67	0.91	0.88	1.72	2.14
Max. Illuminance (fc)	2.7	2	2.8	2.7	5.8	6.1
Min. Illuminance (fc)	0.1	0.1	0.15	0.2	0.5	0.3
Ave/Min (Uniformity)	3	6	3	6	3	6
System Power (W)	127	55	183	80	305	160
1000 Ave (fc/W)	5.28	12.18	4.97	11.00	5.64	13.38
1000 Min (fc/W)	0.79	1.82	0.82	2.50	1.64	1.88

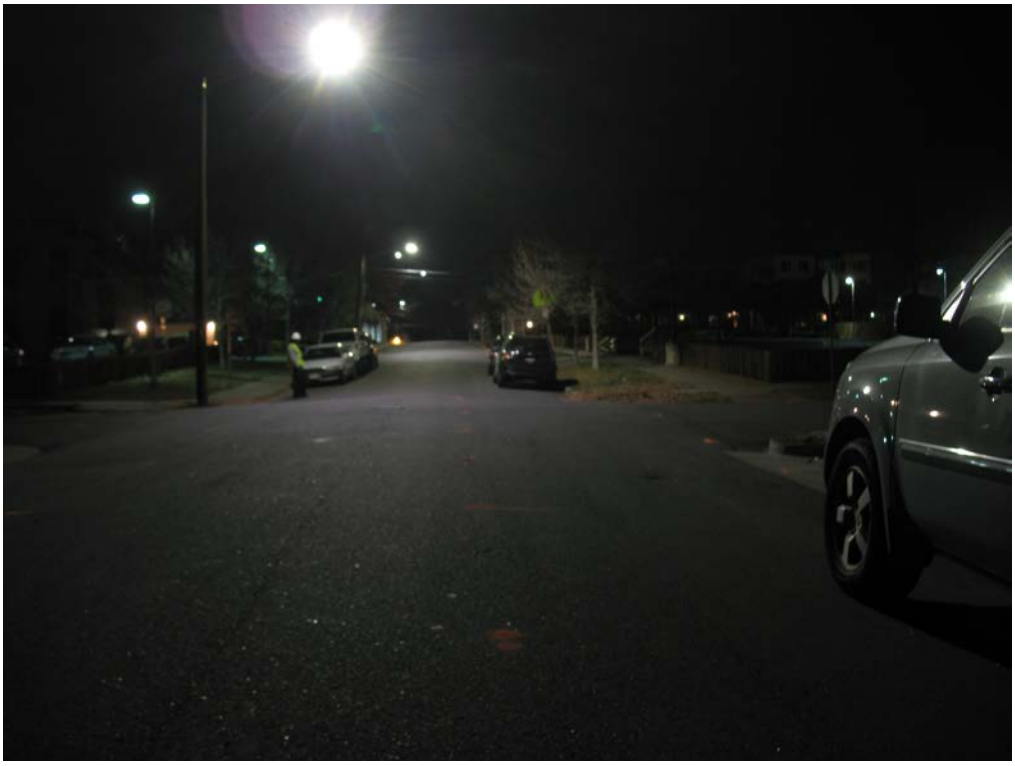
The BUG rating for the LED fixtures is an important part of the pilot process and selection of a LED street light fixture. The goal is to put the LED light in the roadway and the sidewalk but not the yards and windows of residents in close proximity of a street light. Superior sidewalk lighting will also enhance a sense of security by pedestrians

Based on the Xcel Energy minimum requirements, these LED fixtures are expected to last 13 years (rated for 20 years). Coupled with long life photo controls, this should translate into fewer crew visits compared to the HPS fixtures that require lamp replacement every 5 years. Since installation there have been no known service orders. We continue to monitor the service orders. Reduced maintenance translates into obvious cost savings, a key factor in justifying LED technology.

Xcel Energy has received positive feedback from representatives of the city and the police department.

APPENDIX- PHOTOS OF SITE

HPS



LED

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 5
Date Received: December 14, 2015 Comments

Question:

We request that Xcel Energy provide "the Company completed technical specification stipulating performance requirements" and the previously cited "… extensive analysis of vendor conformance to this specification in all areas, including pricing"? Besides issuing an RFP, how was this pricing determined? How did Xcel Energy obtain "competitive LED street lighting fixture pricing"?

Response:

The Company is available to answer questions around our technical requirements. We cannot, however, provide the full technical specification for the following reasons:

- Material specifications are the Intellectual Property of Xcel Energy that must be protected.
- The requirements in our specifications are unique to our service territory and code requirements governing utility companies; providing detailed specifications may lead to misinterpretation.
- We are constantly updating our specifications; it would be impossible to manage versions issued to external parties.

With increasing customer interest in LED street lighting, Xcel Energy issued an enterprise-wide Request for Proposals, leveraging the size of the Company's comprehensive street light fleet across all operating companies to obtain competitive LED street lighting fixture pricing. This initiative generated interest from a number of leading manufacturers and resulted in cost-competitive bids for LED fixtures. The combination of the pricing we are able to obtain by leveraging our bulk purchasing power and the expected impact of increased efficiency of the LED fixtures on Company operations makes LED street lighting a competitive option that can reduce customer bills. In selecting the type of fixtures for this offering, the Company completed a technical specification stipulating performance requirements, and

performed an extensive analysis of vendor conformance to this specification in all areas, including pricing.

Once the Company had developed detailed specifications, a request for proposal was sent to several leading street light manufacturers. The Company also created a detailed scoring matrix which included price, technical specifications, form factor, and ease of installation and maintenance. After each vendor was scored, the Company conducted site visists to ensure that manufacturing capabilities were sufficient and demand could be met. This diligent process ensured that the selected vendors could provide not only competitive pricing, but also could meet the technical specifications and would be prepared to provide the number of fixtures required for the program.

Preparer:	Bob Schommer
Title:	Manager, LED Program
Department:	Distribution Business Operations
Telephone:	651.779.3145
Date:	December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 6
Date Received: December 14, 2015 Comments

Question:

Will a city be allowed to directly purchase the proposed LED fixtures from the vendor bidded contract at the Xcel energy bid price?

Response:

No. These purchases were made for our Company-owned lights, and the pricing received is specific to this work.

Preparer: Bob Schommer
Title: Manager, LED Program
Department: Distribution Business Operations
Telephone: 651.779.3145
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 7
Date Received: December 14, 2015 Comments

Question:

The Docket petition cites a benefit as "improve lighting quality". While there appears to be anecdotal customer survey satisfaction results, what scientific and technical data and testing were actually collected and analyzed by Xcel Energy and their product vendors in reaching this conclusion?

Response:

The Company completed a pilot program in the City of West St. Paul to measure the quantity and quality of illumination from the LED fixtures. The results of that pilot were were described in our LED Streetlight Pilot Project Final Report in Docket No. E002/M-12-974, filed on March 13, 2015. We have attached a copy of that report with this response, which includes data on the photometry performance tests that were performed on the fixtures. These include measurements of the lumaninance, light level ratings, and a rating system for outdoor lighting that measures backlight, uplight, and glare (BUG Rating).

Preparer: Julia Eagles
Title: Regulatory Policy Specialist
Department: NSPM Regulatory Affairs
Telephone: 612-330-6315
Date: December 29, 2015

Light-Emitting Diode (LED) Streetlight Pilot Project Final Report
West St. Paul Host Site

I. OVERVIEW

A pilot project was conducted in the City of West St. Paul to install and monitor more than 500 Light-Emitting Diode (LED) streetlights over the course of two years. The pilot began in late 2012 with approval from the Minnesota Public Utilities Commission to conduct the project, intended to inform the Company's development of an LED street lighting rate option. Information collected from this pilot including installation, operation, and maintenance requirements; energy consumption; light output and photometry performance; and customer feedback are all summarized in this report and are under analysis by the Company. We anticipate filing our LED street lighting rate Petition sometime this year.

With the declining price and advancing performance of LED lighting technology and increasing interest among customers in more options to reduce their energy consumption and costs, the Company was interested in testing LED streetlights on our system. This pilot provided an opportunity to monitor the technology in our unique climate and gain experience with the installation, operations and maintenance of the fixtures. West St. Paul also had the chance to test out the technology to determine if it met their performance and aesthetic needs, and provide feedback.

We partnered with General Electric (GE) to replace 537 high pressure sodium (HPS) fixtures with their Evolve LED cobrahead streetlights. The pilot replaced 100-, 150-, and 250-Watt luminaires with LED equivalents. Table 1 below shows the wattage of the original fixtures, along with their LED replacements.

Table 1:
LED Streetlight Wattage

HPS Wattage	HPS System Power Consumption[1]	LED Wattage	LED System Power Consumption[1]
100 Watts	127 Watts	67 Watts	67 Watts
150 Watts	183 Watts	94 Watts	94 Watts
250 Watts	305 Watts	130 Watts	130 Watts

The current industry standard for the lifetime of LED fixtures is more than 60,000 hours or 15 years. Through this pilot we found that replacing the HPS lights with LEDs resulted in a 45 to 55 percent reduction in energy consumption. Installation

[1] The system usage numbers represent the actual wattage consumed by the lamps and ballasts vs. the nameplate wattage.

was completed in January 2013, so this report includes two years of observation and 20 months of energy data.[2]

II. SUMMARY

- Replacing the HPS luminaires with LED luminaires resulted in 45 to 55 percent reduced energy consumption.
- The average photopic luminance of LED fixtures is superior to that of HPS fixtures, allowing the replacement of higher wattage HPS fixtures with lower wattage LED equivalents. This is primarily driven by the higher efficacy (lumens per watt) rating of the LED luminaires.
- Other photometry improvements include:
  - Decreased light trespass;
  - Improved Backlight, Uplight, Glare (BUG) rating; and
  - Better residential and vehicular visibility: LED streetlights have a high color rendering index (CRI) with enhanced visual acuity to better see colors and shapes.
- LED fixtures were easier to install and as a result require slightly less installation time than the HPS fixtures.
- Over the course of the pilot, there were only two service calls for LED fixtures requiring repairs.

III. ENERGY USAGE

Of particular interest in this pilot project was the energy usage of the LED streetlights. As Table 1 shows, we were able to replace 100W, 150W and 250W HPS luminaires with 67W, 94W, and 130W LED luminaires based on the higher efficiency ratings of the LED fixtures. To measure the actual energy consumption of the fixtures in the pilot, we metered three of the LED luminaires over the course of the pilot. Digital read meters were tied into the LEDs at the end of March 2013, allowing us to collect nearly two years' worth of data. Table 2 below shows the average monthly kWh consumption of the LEDs compared with the average monthly usage of the HPS fixtures they replaced, calculated from energy consumption based on average annual burn hours and total wattage.

[2] Full meter readings began in June of 2013 due to a technical complication with the 67 W metering devices.

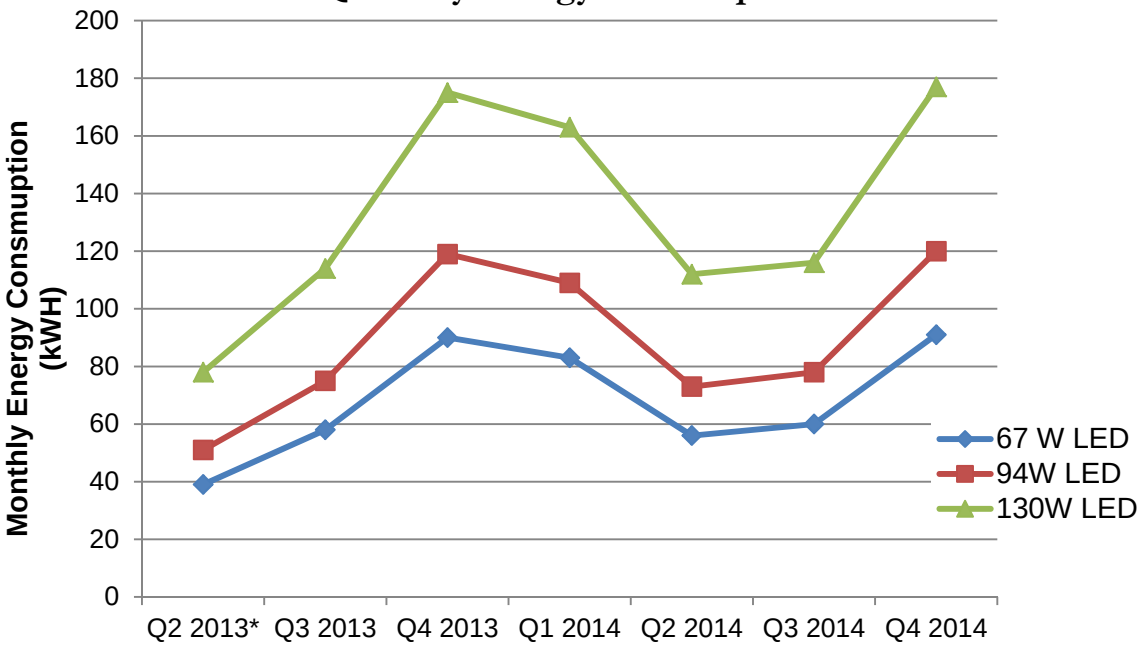
Table 2:
Monthly kWh Consumption: LED vs. HPS

HPS			LED			Energy Savings
Wattage	System Power Consumption	Average Monthly Energy Usage	Wattage	System Power Consumption	Average Monthly Energy Usage	
100 W	127 W	44 kWh	67 W	67W	24.2 kWh	45%
150 W	183 W	63 kWh	94 W	94W	31.7 kWh	50%
250 W	305 W	105 kWh	130 W	130W	47.4 kWh	55%

As stated above, the appropriate HPS baseline against which to measure LED performance is the *total* wattage drawn by each HPS fixture. For HPS technology this is higher than nameplate, given HPS ballasts use energy as well, in addition to the bulb. Our 45 – 55 percent range of observed savings in kWh consumption over time for LEDs vs. HPS is in line with expectations set by the nominal differences in kW system load of LED over HPS.

Figure 1 below illustrates the energy consumption patterns of the LED fixtures over the course of the pilot. The higher usage in the first and fourth quarters is based on more hours of darkness in the winter months. In the second and third quarters, usage is lower due to longer days and less need for street lighting. The monthly usage data on which this chart is based is included as Attachment B to this report.

Figure 1:
Quarterly Energy Consumption



* Only one full month of data was available from the second quarter of 2013. The consumption for that quarter was calculated by multiplying the June 2013 meter reading by three.

LED technology has evolved over the course of the pilot program, resulting in improved efficiency of the luminaires and better light quality. The Company has continued to track these technological improvements, which will inform the development of a broader LED streetlight program for our customers.

IV. OPERATION AND MAINTENANCE

Over the course of the two-year pilot program, only 2 out of 118 total lighting-related service calls were for LED fixture repairs.[4] One instance required the replacement of the power door on the fixture due to the driver failure. The other was bad wiring in the photo control base, so the shell of the fixture was replaced.

Based on the Company's minimum requirements, these LED fixtures are expected to last 13 years, and by industry standards they are expected to last more than 15 years. This lifetime expectancy of LEDs, along with their long-life photo controls, should result in fewer crew visits compared to their HPS predecessors, which required lamp replacement approximately every five years.

V. PHOTOMETRY PERFORMANCE

A variety of tests were conducted over the course of the pilot to measure the quantity and quality of illumination from the LED fixtures. Light measurements are taken on a grid pattern around the fixtures to obtain average foot candle values, using the original HPS as a baseline for expected performance. We monitored LED fixtures at two different locations in West St. Paul for photometric performance based on luminance, collecting light level readings and electric usage. Photos of the installed LED fixtures which demonstrate the resulting light quality and color rendering are included in Attachment C to this report.

The lighting performance is tested using baseline foot candle readings in the selected test areas, comparing existing HPS fixtures with the performance of the LED replacements. The average luminance of the existing 100 W HPS fixtures was measured at 0.49 foot candles (fc) Photopic at one site and 0.39 fc Photopic at the second site. The 67 W LED replacements at those same sites measured 0.65 fc Photopic and 0.66 fc Photopic respectively. The results shown in Table 3 illustrate a significant increase in the luminance at the two sites and the key observations from these initial light measurements include:

[4] The majority of the total service calls were non-LED light related; the other calls were not related to the functionality of the LED lights themselves, but rather other service issues such as photo control replacements, redirecting light fixtures, addressing conductor or wire issues, and storm-related repairs.

- A 33 percent increase and 69 percent increase in measured photopic foot candles at sites I and II, respectively, measured over an equivalent grid.
- The LED luminaires have demonstrated superior performance based on their utilized illumination efficacy. The LED luminaires deliver more foot candles per watt in the target area than the incumbent equivalent HPS luminaires.

Table 3:
Illumination Measurements for Pilot Sites

	Site I (Thompson Ave)		Site II (Emerson Ave)	
	100W HPS	**67W LED**	**100 W HPS**	**67W LED**
Average Illuminance (fc)	0.49	0.65	0.39	0.66
Max. Illuminance (fc)	1.9	1.7	1.2	1.7
Min. Illuminance (fc)	0.1	0.1	0.1	0.1
Ave/Min (Uniformity)	3	6	3	6
System Power (W)	127	67	127	67
1000 Ave (fc/W)	3.86	9.70	3.07	9.85
1000 Min (fc/W)	0.79	1.49	0.79	1.49

The BUG rating for the LED fixtures was also an improvement over the HPS fixtures. This rating is measured in a lab setting; LED fixtures scored higher on backlighting and uplighting, and matched the HPS fixture performance for glare. The BUG rating is an important factor in selecting an LED streetlight fixture, as the goal is to direct the LED light towards the roadway and avoid lighting the surrounding yards and windows of residents in close proximity to a streetlight.

VI. CITY PARTNER FEEDBACK

The City of West St. Paul was selected based on criteria developed by the Company for the pilot program. As a street lighting customer that was scheduled for re-lamping in 2012, had the capacity to replace approximately 500 lights, and was located centrally to enable observation by other interested parties, West St. Paul was the only community among several possible candidates to satisfy all the criteria. The lighting design for the pilot was specific to West St. Paul, and the fixtures were selected to fit the circumstances of the application.

We received positive feedback from customers surveyed in the impacted area of West St. Paul, which we reported in our September 2013 status report. The satisfaction rates among customers were very high, with 87 percent reporting they were satisfied with the lighting and 77 percent reporting that they were highly satisfied. Customers surveyed expressed a strong preference for the new LED lighting over the old lighting, for its enhancement of the neighborhood appearance,

improved brightness and contribution to making the neighborhood feel safer. Additional surveying was not conducted for the final report, but we did collect feedback from City of West St. Paul staff on their experience with the pilot. Public Works Director and City Engineer Matt Saam shared these comments:

> *The City of West St. Paul has been pleased with the results of the Xcel LED pilot installation in our town. The LED light provides a much visually truer light than the old HPS lights. Objects at night appear crisper & without a yellow/orange hue to them. The City has also received complements from residents who enjoy the more street-focused and down directional nature of the light/fixture versus the HPS fixture which seemed to allow light to more easily bleed into private yard areas.*

The City of West St. Paul has been an excellent partner in this project, which has demonstrated the improved quality of light and significant energy savings resulting from the LED replacements. Their experience serves as a promising example of the benefits other communities could enjoy from this technology.

CONCLUSION

The West St. Paul LED street lighting pilot was a valuable opportunity for the Company to test out a new technology in anticipation of broader adoptions, and a positive experience for the city to experience the benefits of LED streetlights on their roadways. Advantages of the LED fixtures observed through the pilot include improved night visibility due to higher CRI, lower energy consumption, longer anticipated lifetime, and reduced maintenance needs. The Company has been working to develop an LED street lighting rate option for areas where we own, operate, and maintain the street lighting system. Results of this pilot project have helped to inform the development of that rate, which we anticipate filing sometime this year.

Dated: March 13, 2015

Northern States Power Company

GLOSSARY OF TERMS

- **BUG Rating:** A rating system for outdoor lighting that measures backlight, uplight, and glare.

- **Foot Candles:** A measurement of luminance, equivalent to the illumination produced by one candle at a distance of one foot. Equal to one lumen incident per square foot.

- **Luminaires:** A lighting unit consisting of one or more electric lamps with all of the necessary parts and wiring.

- **Luminance:** A measure of the brightness of a light source or an illuminated surface.

- **Luminous Efficacy:** A measure of the efficiency with which a light source produces visible light from electricity.

- **Photometry:** The science of the measurement of light, in terms of its intensity, relative illuminating power, and perceived brightness to the human eye.

- **Photopic Luminance:** Measures luminance in well-lit conditions.

SUPPORTING DATA

Table 1:
LED Streetlight Monthly kWh Consumption

	LED/HPS		
LED Read Dates	**67W/100W**	**94W/150W**	**130W/250W**
June 2013	13	17	26
July 2013	16	20	31
August 2013	24	32	49
September 2013	18	23	34
October 2013	31	41	61
November 2013	24	32	48
December 2013	35	46	66
January 2014	30	40	60
February 2014	29	37	55
March 2014	24	32	48
April 2014	23	30	45
May 2014	18	24	36
June 2014	15	19	31
July 2014	18	24	36
August 2014	19	23	36
September 2014	23	31	44
October 2014	26	35	53
November 2014	29	39	57
December 2014	36	46	67
January 2015	32	42	65
Average Values	**24.15**	**31.65**	**47.4**

PHOTOS

Photo 1: A street in West St. Paul lit by LED street lighting

Photo 2: The pilot used General Electric's Evolve™ LED Scalable Cobrahead lighting fixtures.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 8
Date Received: December 14, 2015 Comments

Question:

The City requests any and all studies, testing, the RFP, vendor data submittals, Xcel RFP review documents, validation of fixture and illumination performance, brightness, appearance, visibility, warranty, etc. used by Xcel Energy and their vendors to allow us to understand the criteria used and the results generated to conclude and make these statements.

Response:

The Company objects to this information request as overly broad and unduly burdensome as it is not limited in scope. The Company also objects to these requests to the extent that it seek materials protected by confidentiality agreements or other privilege.

Preparer: Alison Archer
Title: Assistant General Counsel
Department: Deputy General Counsel
Telephone: 612.215.4662
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 9
Date Received: December 14, 2015 Comments

Question:

To ensure the public obtains the best value, it is expected that a city review and vetting process may be needed. How will cities be allowed to review, test, and validate the proposed fixture/lamp that will be used for this LED rate tariff? How will this vetting process occur over time when LED fixture(s) are changed or new fixtures are made available?

Response:

The Company has already tested and reviewed these products through our pilot programs in West St. Paul, Denver and Amarillo. Each of these cities was selected in part due to their location, in proximity to other interested communities in order to facilitate observation. In addition, the Company has installed LED fixtures in western Wisconsin that cities can view if desired. The Company will also work with each city prior to installation of LED to discuss the process, timeline, and specific lights being used in that city.

The Company will continue to work with manufactures and industry experts regularly to ensure that any changes to fixture efficiency are tested and implemented as appropriate.

Preparer: Bob Schommer
Title: Manager, LED Program
Department: Distribution Business Operations
Telephone: 651.779.3145
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 10
Date Received: December 14, 2015 Comments

Question:

Lifecycle & Warranty – The Docket does not present the assumed lifecycle or the vendor warranty provided for the LED products and other infrastructure (poles, wires, etc.) that were assumed in developing this Docket. The City requests these vendor warranty commitments and lifecycle assumptions.

Response:

The Company objects to this information request as overly broad and unduly burdensome as it is not limited in scope. The Company also objects to these requests to the extent that they seek materials protected by confidentiality agreements or other privilege.

Preparer: Alison Archer
Title: Assistant General Counsel
Department: Deputy General Counsel
Telephone: 612.215.4662
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 11
Date Received: December 14, 2015 Comments

Question:

Maintenance Savings – We request an understanding of what is included in the Table 2 maintenance savings category. Do we understand correctly that the overall maintenance savings per fixture would be $0.91/month which equals about =$10.92/year and about $164 over 15 years or about $218 over 20 years?

Response:

Yes, the estimated monthly O&M savings is $0.91 per month or $10.92 per year. Attachment A shows the calculation of the O&M savings.

The Company expects the conversion from HPS to LED fixtures to lower O&M costs by eliminating the need for streetlight relamps and reducing, but not eliminating, the number of streetlighting service orders. Current HPS streetlights must have the lamp/bulb replaced every 5-6 years, whereas the lighting componentry of the LED fixtures is not expected to be replaced independently from the fixture during its useful life. In addition, the Company expects the street lighting service orders to be reduced, since the majority of the current service orders are associated with lighting componentry specific to HPS streetlights that will be replaced(i.e., the lamp and ballast). However, the Company expects service orders associated with wiring, the standard or the pole component failures will occur regardless of the streetlight fixture type.

Preparer: Nick Paluck
Title: Rate Consultant
Department: Regulatory Analysis
Telephone: (612) 330-2905
Date: December 29, 2015

Company-Owned LED Street Lighting System Service O&M Savings

Rate Code A30

		NSP-MN Per HPS/LED Street Light Equivalent			
Relamp Expense	**Total**	**100W/39W**	**150W/65W**	**250W/155W**	**#REF!**
Relamp Exp Forecast	$502,344				
No. of Rate Code A30 Street Lights	109,872				
Relamp Expense Savings	**$4.57**	**$4.57**	**$4.57**	**$4.57**	**$4.57**

Service Order Expense	**Total**				
Annual HPS Fixture Related Service Order Expense	$698,703				
No. of Rate Code A30 Street Lights	109,872				
Service Order Expense Savings	**$6.36**	**$6.36**	**$6.36**	**$6.36**	**$6.36**

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 12
Date Received: December 14, 2015 Comments

Question:

Base Rate Energy and Demand Charge Savings – We understand this Table 2 category is the energy savings based on wattage reduction when comparing the existing HPS fixture directly to the proposed LED fixture. Is this understanding correct? If not, please clarify. We do not see a calculated electrical saving in Kilowatt/Hour. So as the kilowatt energy rates go up, which it will, our savings should also go up. With this rate tariff, the savings price is fixed. Is this understanding correct? What is the Kilowatt/Hour savings for each LED fixture proposed?

Response:

Certain costs are allocated by class in a Class Cost of Service Study based on that class' energy and demand. The Base Rate Energy and Demand Charge Savings category recognizes that LED fixtures will reduce the demand and energy allocators used to allocate costs to the street lighting class and includes these savings in the proposed LED rate. The wattage differential is the basis of this difference.

Street lighting rates are priced by wattage, not kWh, although the amount of energy used is an important factor in the design. Attachment A to this response contains wattage range categories and the annual kWh usage for both the HPS and LED fixtures in the Base Rate and Demand Charge Saving section of the analysis. The usage is based on 4,160 hours of annual operation.[1]

The savings amount is not fixed in this proposal. The savings estimates are based on the proposed LED rates compared to the current HPS rates and current fuel costs. Increases in underlying common costs to serve the street lighting class will be reflected in future LED and HPS rates, but as long as LED fixtures stay at expected

[1] Note: the HPS annual usage includes kWh used by the ballast in addition to the lamp wattage. A customer would need to divide their estimated savings by the annual usage to determine savings on a per kWh basis.

price levels, the reduced fuel costs from the lower energy usage will result in bill savings compared to the HPS alternative.

Preparer:	Nick Paluck
Title:	Rate Consultant
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Date:	December 29, 2015

Streetlighting Wattage & Annual Usage Assumptions

Rate Code A30

HPS	Demand Wattage (Watts)	Annual Hours	Annual Expected Usage (kWh)
100W	117	4160	487
150W	171	4160	711
250W	307	4160	1277
400W	482	4160	2005

LED	Demand Wattage (Watts)	Annual Hours	Annual Expected Usage (kWh)
30W-40W (100W Equiv.)	39	4160	161
50W-75W (150W Equiv.)	65	4160	272
110W-165W (250W Equiv.)	155	4160	643
200W-250W (400W Equiv.)	244	4160	1015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 13
Date Received: December 14, 2015 Comments

Question:

Incremental Capital Revenue Requirement – We understand this Table 2 category is the capital costs related to furnishing and installing the proposed LED fixture plus the interest charged for this capital expense. This capital category results in estimated lifecycle costs as follows:

a. Table 2 presents the incremental cost of LED fixtures when compared to existing HPS. Using these rates and assuming both a 15 and 20 year lifecycle results in (monthly rate increase x 12 months x 15 years; or if 20 years) as follows:
   - 100W/39W at $1.91 equals $344 total for 15 years; $458 for 20 years
   - 150W/65W at $2.11 equals $380 total; $506
   - 250W/155W at $3.15 equals $567 total; $756
   - 400W/246W at $4.62 equals $832 total; $1109

Are these calculations correct? Do the above calculations represent the incremental cost above the HPS rate? What percentage of the above lifecycle calculated costs exceed the total proposed fixed LED fixture and install cost elements only?

Response:

The calculations included in the question above appear to capture the revenue necessary for the return on capital required for purchase and installation of the various LED fixtures over the 15- and 20-year timeframes. That cash flow also compensates the Company for the carrying cost of of the LED fixtures over the 15- and 20-year timeframes, as well as the property taxes and insurance. While the values include the revenue required for capital costs of the LED fixtures and installations above the current HPS rates, it may not be incremental to future HPS rates over this period because the Company would be required to replace HPS fixtures during this period as well.

Additionally, the lifecycle revenue represented in the question occurs over time, whereas the fixture and installation costs are incurred upfront. As such, the lifecycle revenues would have to be discounted to a present value and the insurance property and income tax would have to removed in order to create an apples-to-apples comparison.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 14
Date Received: December 14, 2015 Comments

Question:

The Docket states "higher cost of LED Fixtures" and "more expensive than HPS counterparts". The City has recently procured a 93W LED fixture as a replacement to our 310W HPS equivalent fixture. Our estimated furnish and install cost is approximately $395. Thus our City experience does not match the above capital pricing. Therefore, why are the proposed Docket incremental capital costs significantly higher than our recent City experience?

Response:

It is not clear from the question what the City of Minneapolis is comparing, as only one data point was provided in the question. However, the Company LED pricing was competitively bid based on volume across all our jurisdictions. Despite the competitive bids, the LED streetlight fixture pricing was still more expensive than equivalent HPS fixtures. In addition, the Company is not aware of any other utility that has purchased LED fixtures that meet our specifications at prices below equivalent HPS wattages.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 15
Date Received: December 14, 2015 Comments

Question:

In addition, this total incremental capital category results in the overall LED fixture rate to be more expensive than the HPS fixture rate. Since this incremental capital category significantly offsets all of the maintenance and energy savings, we request greater details about the sub components that are included in the capital requirement.

Response:

The LED capital requirement pricing component calculation is comprised of the following upfront and ongoing costs (i.e. sub-components):

- LED fixture
- Long-life photo control
- Installation cost of fixture and photo control
- HPS fixture salvage value
- Ongoing property tax cost
- Ongoing carrying costs

The LED capital requirement pricing component offsets the O&M and energy and demand allocation savings. When the fuel savings is included in the calculation, however, an overall bill savings is expected.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 16
Date Received: December 14, 2015 Comments

Question:

Because the technology is evolving, the LED fixture costs have steadily been reducing in price. The rate capitalization of the proposed LED fixtures appears to be fixed. If LED fixture cost decreases in price over time, then no further rate reduction is included. Is this conclusion correct? For clarity what has been included in the incremental capital category and/or the vendor RFP process that accounts for the ever-changing LED fixture price? Also, how will other substitute LED fixtures that are proposed or when new fixtures are specified be considered related to pricing?

Response:

The proposed LED rates are based, in part, on the indictive pricing we have negotiated. However, the actual cost of the LED fixtures will be reflected in future rates similar to how current rates are calculated for other services. Therefore, if LED fixture pricing changes in year two or three of the program, actual capital costs will be reflected in a future test year revenue requirement accordingly.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 17
Date Received: December 14, 2015 Comments

Question:

Pre Pay Option – This is the first time the City has learned about a change to the pre-pay option, so we have several clarifying questions: How was the Table 2 Pre-Pay Option pricing determined?

Response:

The LED Pre-Pay Option pricing was calculated by subtracting the LED O&M and Allocation (Energy and Demand) savings from the current HPS Pre-Pay Option pricing. The LED Pre-Pay Option is intended for existing Pre-Pay Option customers who desire to upgrade their lighting systems to LED fixtures. However, Pre-Pay Option customers who choose to convert to LED fixtures are responsible for the cost of the LED fixtures that meet the requirements of their street lighting system. This is consistent with currently effective Street Lighting System Service (A30) tariff language that states "Pre-Pay Option requires customer payment for the lighting system cost before establishing service."

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 18
Date Received: December 14, 2015 Comments

Question:

Similar to above the Table 2 Incremental Capital Revenue Requirement (monthly increase x 12 months x 15 years for LED; the bulleted items below show the savings over 15 years versus the HPS equivalent.)

- 100W/39W reduces by $27 cost/year; $938 savings/15 years
- 150W/65W reduces by $11 cost/year; $958 savings/15 years
- 250W/155W reduces by $106 cost/year; $1276 savings/15 years
- 400W/246W reduces by $204 cost/year; $1573 savings/15 years

The above sets of pre-pay LED numbers do not make sense relative to the numbers above. We request that Xcel Energy provide the details on these differences and how these pre-pay calculations were determined?

Response:

The Pre-Pay Option monthly street lighting value on Table 2 is the savings amount. Therefore, the current Pre-Pay Option rate is reduced by the amount shown in Table 2 to get to the proposed LED Pre-Pay Option rate. The annual savings by fixture size are rounded to the nearest dollar below:

- $21 annual savings for a 100W HPS equivalent LED streetlight;
- $25 annual savings for a 150W HPS equivalent LED streetlight;
- $30 annual savings for a 250W HPS equivalent LED streetlight; and
- $42 annual savings for a 400W HPS equivalent LED streetlight.

These figures represent potential O&M and energy and demand allocation savings to Pre-Pay Option customers, whereas the figures cited in the question above represent the revenue required for the recovery of capital costs. Given the difference in the

basis of the figures, we agree that they are different and that they should not be compared.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 19
Date Received: December 14, 2015 Comments

Question:

We have heard that this pre-pay option may apply to a separate rate tariff? If so, which tariff(s)? Will pre-pay apply to the A30 rate code? If so, how will it be applied? Will cities be able to pay up front -- only the fixture and install capital costs without interest charges -- on any of the LED programs? If so, which programs? And at what rates?

Response:

Per the Street Lighting System Service (A30) tariff, "Pre-Pay Option requires customer payment for the lighting system cost before establishing service." The LED Pre-Pay Option is for existing rate code A30 Pre-Pay Option customers who desire to upgrade their street lighting systems to LED fixtures. However, to be consistent with the tariff Pre-Pay Option customers who choose to convert to LED fixtures are responsible for the cost of the LED fixtures that meet the requirements of their streetlights system. The Pre-Pay Option is not available to existing streetlights that are not already receiving the Pre-Pay Option rate for their existing HPS fixtures.

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 20
Date Received: December 14, 2015 Comments

Question:

The A30 Rate Code states "Pre-pay Option Surcharge". Please explain how this is used and will be applied.

Response:

The Pre-Pay Option monthly surcharge is designed to recover the incremental cost of service for Pre-Pay Option lighting systems with a price that exceeds $1,200. Pre-Pay Option customers who choose to convert to LED fixtures are responsible for the cost of the LED fixtures that meet the requirements of their streetlights system.

Preparer: Nick Paluck
Title: Rate Consultant
Department: Regulatory Analysis
Telephone: (612) 330-2905
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 21
Date Received: December 14, 2015 Comments

Question:

Underground rate – This is first time the City has learned about a change to the underground rate or has seen these numbers, so we have clarifying questions: What creates the significant cost differences between the regular LED rates and these underground rates? We request Xcel Energy provide details on these differences.

Response:

It is more expensive to run wire underground than running it overhead. Therefore, underground streetlights are more expensive to install because the wire connecting the poles must be placed underground instead of running the wire overhead. In addition, certain service orders to repair streetlight outages can be more expensive to fix (e.g., underground fault). Underground street lighting rates are set to recognize and recover this additional cost of providing underground streetlight service. The Company is not proposing any changes to the underlying differences between overhead and underground rates in this docket. The proposal starts with each of those existing rates and applies changes associated with the LED fixtures.

Preparer: Nick Paluck
Title: Rate Consultant
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Telephone: (612) 330-2905
Date: December 29, 2015

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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 22
Date Received: December 14, 2015 Comments

Question:

Minnesota Power tariff format – The Minnesota Power LED rate tariff presented more details and breakdown of the various costs related to their proposed LED fixtures. These details and cost breakdowns can help cities and other agencies understand the LED rates and will assist with their decision making. We request this same format be used by Xcel Energy for this Docket and future petitions.

Response:

The Company strives to provide detailed information for parties to evaluate our proposals. However, every utility has unique information systems, customer base, infrastructure requirements and organizational structures. As a result, each utility's cost and rate structures are unique as well. In this case, the format of the data the Company provided is largely a function of the data available and the benefits derived from adding LED technology specific to our costs. However, we note the Company's resulting LED rates compared to the HPS option are similar to the Minnesota Power results, despite the differences in data formats.

Preparer: Nick Paluck
Title: Rate Consultant
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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 23
Date Received: December 14, 2015 Comments

Question:

Fuel Clause – Table 2 indicates that there is actually a rate increase for LED retrofitting, be it not for the fuel clause charge reduction. Our understanding is that the fuel clause is variable based on demand, coal price, etc**.** Thus, it appears entirely possible that the LED rate will be higher in comparison to keeping the HPS fixtures over both the short and long-term. Is this a correct understanding?

Response:

The Company expects LED fixtures to result in a bill savings for customers now and in the future when compared to the HPS rate. This is captured in the four to five percent saving expectation the Company outlined in the LED Streetlight rate proposal. Because the LED fixtures use less energy than HPS fixtures, customers on the LED rate will pay less in fuel charges than the alternative HPS rate. In fact, if fuel prices increase, the overall bill savings on the LED rate would increase compared to the HPS rate.

Preparer: Nick Paluck
Title: Rate Consultant
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Xcel Energy
Docket No.: E002/M-15-920
Response To: City of Minneapolis Information Request No. 24
Date Received: December 14, 2015 Comments

Question:

For all cities to better understand the process steps and other items, we have developed the following clarifying questions:

1. As a voluntary service and if a city decides to opt-in, what are the requirements?
2. If a city decides to not opt-in to LED fixtures and continues with HPS, what are the implications?
3. To accomplish the proper city review processes and timelines, what are the implications if the LED opt-in occurs after the anticipated 5 year conversion timeline?
4. The Docket states "established a tentative plan for installing the LED fixtures that will follow our existing re-lamping schedule" for HPS fixtures. The City requests that this "tentative plan" be made available now so each city can anticipate and determine their efforts and next steps.

Response:

1. If a city opts-in, the Company will change all cobra-head style streetlights to LED fixtures as part of the Company's rollout schedule. The Company will also work with the city to determine if there are any other roadway-style lights (shoebox fixtures as an example) that the city would like change to LED cobra-heads as part of the program.
2. At this point there are no implications. The Company will continue to provide the HPS rate. However, if the price of HPS increases over the LED price or there are governmental mandates that HPS can no longer be used, the Company would then convert the lights to LED.
3. The Company would change the lights out as they fail or, if there is crew availablilty, a full conversion could be scheduled.
4. The Company will meet with each city several months in advance of their scheduled LED conversion to share the scheduled rollout for that community.

Preparer: Bob Schommer
Title: Manager, LED Program
Department: Distribution Business Operations
Telephone: 651.779.3145
Date: December 29, 2015

CERTIFICATE OF SERVICE

I, SaGonna Thompson, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

DOCKET NO. E002/M-15-920

Dated this 29th day of December 2015

/s/

SaGonna Thompson
Regulatory Administrator

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