

Case UE 180

Exhibit COP/COG/LOC/200

Witnesses: Richard Gray, John Harris, Andrea Fogue, John Heberling, and Lon L. Peters

BEFORE THE PUBLIC UTILITY COMMISSION  
OF THE STATE OF OREGON

CITY OF PORTLAND (COP)  
CITY OF GRESHAM (COG)  
LEAGUE OF OREGON CITIES (LOC)

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**Direct Testimony of Richard Gray, John Harris,  
Andrea Fogue, John Heberling and Lon L. Peters**

**on**

**Service Restoration Priority  
Schedule 91 (Street and Highway Lighting) Charges**

August 2006

1 **Q. PLEASE IDENTIFY YOURSELVES.**

2

3 A. (by Mr. Gray) My name is Richard Gray. I am currently employed as a Contract  
4 Administrator and Senior Management Analyst with the Office of Transportation for the  
5 City of Portland (“PDOT”). My business address is 1120 S.W. 5<sup>th</sup> Avenue, Room 800,  
6 Portland, Oregon 97204. My qualifications are listed in COP/305.

7 (by Mr. Harris) My name is John S. Harris. I am employed as the Transportation  
8 and Streetlighting Superintendent for the City of Gresham, Department of Environmental  
9 Services. My business address is 2123 SE Hogan Road, Gresham, Oregon 97080. My  
10 qualifications are listed in COP/COG/LOC/201.

11 (by Ms. Fogue) My name is Andrea Fogue. I am employed by the League of  
12 Oregon Cities as Senior Staff Associate. My business address is 1201 Court Street NE,  
13 Suite 200, Salem, Oregon 97301. My qualifications are listed in LOC/100.

14 (by Mr. Heberling) My name is John Heberling. I am a Vice President at D.  
15 Hittle & Associates, Inc. My business address is 19101 36<sup>th</sup> Avenue West, Suite 209,  
16 Lynnwood, Washington 98036. My qualifications are listed in LOC/101.

17 (by Mr. Peters) My name is Lon L. Peters. My business address is 607 S.E.  
18 Manchester Place, Portland, Oregon 97202. I am the President of Northwest Economic  
19 Research, Inc. My qualifications are listed in COP/303.

20 **Q. ON WHOSE BEHALF ARE YOU SPONSORING THIS TESTIMONY?**

21

22 A. This entire testimony is jointly sponsored by the City of Portland (“Portland”), the  
23 City of Gresham (“Gresham”), and the League of Oregon Cities (“League”). For  
24 simplicity, these parties are collectively referred to herein as “Oregon cities” or “cities”.

25 |

1 **Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?**

2  
3 A. In this testimony we address two issues. First, we address the critical need for  
4 Portland General Electric (“PGE”) to refine and augment its current rule and related  
5 procedures governing the way it establishes restoration priorities after a widespread  
6 outage. Simply put, PGE should agree to work with Oregon cities to develop lists of  
7 critical accounts that will receive priority restoration due to their importance to public  
8 welfare. PGE should also establish protocols and procedures to ensure continuous, direct  
9 communications between utility representatives and the cities’ critical account personnel.  
10 Second, in sections II through V, we review a range of proposals, assumptions and  
11 calculations associated with service to streetlights under PGE’s proposed Schedule 91,  
12 including maintenance costs, operating hours, and restrictions on Option C lights. This  
13 review demonstrates that PGE’s proposed charges for maintenance are overstated, that  
14 streetlight energy consumption is overstated, and that proposed changes, and current  
15 practices, in the availability of Option C streetlights are unreasonable. We also conclude  
16 that PGE’s accounting and cost of capital for streetlight costs are unsubstantiated.

17 I. Restoration Priority

18

19 **Q. WHAT IS THE PURPOSE OF THIS SECTION?**

20

21 A. In this section, we explain why PGE’s existing service restoration rule needs to be  
22 refined and augmented if it is to be sufficient to meet the needs of the emergency service  
23 providers and municipal governments located within PGE’s service territory. We provide  
24 specific recommendations for steps that PGE can (and should) take to be prepared to  
25 respond to critical public safety events.

26 |

1 **Q. WHY IS SERVICE RESTORATION OF CRITICAL IMPORTANCE TO**  
2 **THE CITIES?**

3  
4 A. Gresham and Portland serve as the municipal governments for approximately  
5 650,000 residents, as well as businesses and industry. In total, the population of Oregon  
6 cities is over 2.5 million. (See Portland State University, College of Urban Studies &  
7 Public Affairs, 2005 Annual Oregon Population Report, available at  
8 [www.pdx.edu/media/p/r/prc\\_2005completed.pdf](http://www.pdx.edu/media/p/r/prc_2005completed.pdf).) Oregon cities provide emergency  
9 management direction and coordination, 911 emergency communications, and police,  
10 fire, water, wastewater and roadway/transportation services. These basic infrastructure  
11 services are critical for life, public health and public safety, especially during times of  
12 electrical outages and other emergency situations.

13 **Q. WHAT POTENTIAL PROBLEMS DO YOU FORESEE WITH PGE'S**  
14 **SERVICE RESTORATION RULE?**

15  
16 A. Service restoration rules should establish clear, concise procedures for utility  
17 personnel as well as the customers they serve and the government agencies responsible  
18 for public safety and welfare. Without them there is additional room for error and delay.  
19 In a worst case scenario, delayed restoration of electrical service could mean increased  
20 risk of unhealthy conditions, loss of property, injury and even fatalities.

21 **Q. HAVE OREGON CITIES HAD PROBLEMS IN THE PAST WITH**  
22 **RESTORATION OF SERVICE?**

23  
24 A. Not to our knowledge. However, in light of national events in the last five years,  
25 all Oregon cities are collaborating with emergency service providers to increase  
26 capabilities to respond to emergency situations, whether they are caused by natural or  
27 human forces. Part of emergency preparedness is to have clearly defined plans and  
28 priorities for restoration of utility services.

1 **Q. HOW MANY OF THE CITIES' ACCOUNTS ARE CONSIDERED**  
2 **"CRITICAL" TO PUBLIC SAFETY AND WELFARE?**

3  
4 A. Staff from the cities are working on lists of current critical facilities in PGE's  
5 service territory without adequate on-site backup generation. An exemplary list of these  
6 types of critical facilities is provided as COP/COG/LOC/202.

7 **Q. WHAT IS PGE'S CURRENT RESTORATION POLICY?**

8  
9 A. PGE's current policy can be found in Rule C, section 8, pp. C-13 and C-14.

10 **Q. HAS THE COMMISSION APPROVED THIS RULE?**

11  
12 A. Yes.

13 **Q. DO YOU FIND THE RESPONSE AND RESTORATION CRITERIA**  
14 **ADEQUATE AS DRAFTED?**

15  
16 A. Not quite, for two reasons. First, although PGE's Rule C does call out critical  
17 facilities for priority restoration, the language regarding "critical Customers" is  
18 exemplary, rather than specific. Given the cities' experience since UE 115, and given  
19 other lessons learned from national experience, the cities strongly prefer that a specific  
20 list of critical accounts be established, for which PGE agrees to establish restoration  
21 priority. Second, the present rule makes no provision for direct communications between  
22 the cities' critical service personnel and PGE's Operation Center staff.

23 **Q. WHAT DO YOU PROPOSE INSTEAD?**

24  
25 A. PGE should develop a set of Service Priorities that lists "Protecting Public Safety"  
26 as the top priority, and should work with individual cities to identify specific accounts  
27 that support public safety.

28 |

1 **Q. HOW SHOULD THIS RULE BE IMPLEMENTED?**

2  
3 A. PGE should designate a utility representative for each critical account for each  
4 city, available via individual cell phone or pager at all hours to serve as the prime point of  
5 communication during emergencies. The utility representative should also have a current  
6 list and address of all critical service facilities including city staff names and cell phone  
7 or pager numbers. PGE representatives should work with cities' staff to regularly update  
8 the list of critical facilities. This direct communication with responsible city personnel  
9 should accelerate restoration of service to critical facilities in the event of a wide-spread  
10 emergency.

11 II. Schedule 91: Streetlight Maintenance Charges

12  
13 **Q. WHAT IS THE PURPOSE OF THIS SECTION?**

14  
15 A. In this section, we review several of PGE's assumptions underlying the proposed  
16 charges in Schedule 91 for maintenance of Option A and Option B luminaires, and  
17 conclude that proposed maintenance charges are overstated.

18 **Q. HOW MUCH ARE MAINTENANCE COSTS PROPOSED TO INCREASE**  
19 **IN THIS CASE?**

20  
21 A. According to PGE/1300, Workpapers pp. 208-209 (provided as  
22 COP/COG/LOC/203), Schedule 91 maintenance costs are proposed to increase by 78.9  
23 percent, which implies a simple escalation rate of almost 16 percent per year from 2002  
24 to 2007. Schedule 15 maintenance costs are proposed to increase by 100.7 percent, or  
25 about 20 percent annually (Workpapers pp. 213-214, provided as COP/COG/LOC/204).  
26 These increases seemed unreasonable to us, so we requested, and PGE conducted, a  
27 publicly-noticed workshop to review the assumptions that go into the proposed rate

1 increases. Based on this workshop, we have found several of PGE's assumptions to be  
2 unreasonable and in need of revision.

3 **Q. WHICH ASSUMPTIONS DO YOU ADDRESS?**

4  
5 A. PGE's streetlight cost study incorporates assumptions in a multitude of areas. In a  
6 publicly-noticed workshop, the cities met with PGE staff to review the streetlight cost  
7 study, and the cities now recommend changes in the following areas: (a) true-up of  
8 fixture-specific maintenance cost estimates to total budget levels; (b) projected repair  
9 frequencies; (c) updates to the labor productivity assumptions from the 1992  
10 maintenance study; and (d) projected use of various crew types to perform maintenance  
11 (crew dispatch assumptions).

12 (a) True-Up of Estimates to Budgets

13

14 **Q. HOW DOES PGE GENERALLY DEVELOP MAINTENANCE COST**  
15 **PROJECTIONS?**

16

17 A. In broad terms, PGE first develops estimates of repair frequency (in percent) by  
18 "work element" (i.e., replacing or repairing lamps, photo-controls, starters (high-pressure  
19 sodium [HPS] only), refractors, circuits, luminaire replacements, power door  
20 replacements, and "other"). See PGE/1300 Workpapers, p. 313, provided as  
21 COP/COG/LOC/205. According to PGE, these frequencies are based on data for 2002-  
22 04. These repair frequencies are multiplied by the sum of the labor and parts costs  
23 associated with each "work element", to derive an annual repair or maintenance cost for  
24 each type of lamp. See, e.g., PGE/1300 Workpapers, Section 7, Luminaire Maintenance  
25 Rate Design, pp. 283-284 for an example, provided as COP/COG/LOC/206.

26 |

1 **Q. DO YOU AGREE WITH THESE PROJECTIONS?**

2

3 A. Not entirely. We address below the specific assumptions regarding repair  
4 frequency, labor productivity increases since 1992, and crew dispatch. However, in  
5 general we approve of the “bottoms up” approach taken by PGE: for given repair  
6 frequencies, PGE projects the cost of making individual repairs, including labor and  
7 parts, and sums those individual estimates to determine total projected maintenance costs  
8 for 2007.

9 **Q. AFTER PGE DEVELOPS THE “BOTTOMS UP” APPROACH, WHAT**  
10 **ADJUSTMENT DOES PGE MAKE?**

11

12 A. After developing the “work element”-specific projected repair costs, PGE then  
13 makes a comparison with the company’s total projected budget for streetlight  
14 maintenance, which in this case is just over nine percent higher than the total of the  
15 facility- or fixture-specific projections. See PGE/1300, Workpapers p. 282, column  
16 entitled “Equal % Factor” (the exact figure is 9.008 percent), provided as  
17 COP/COG/LOC/207. PGE thus multiplies all the facility-specific maintenance charges  
18 by 1.09 percent, for Options A and B lights, in order to ensure that the total projected  
19 costs are equal to the total projected budget. See PGE/1300, Workpapers pp. 278-281 for  
20 the “budget true-up”, provided as COP/COG/LOC/208. In other words, the detailed  
21 analysis of maintenance costs is essentially discarded in favor of the budget forecast.

22 **Q. DO YOU AGREE WITH THIS “BUDGET TRUE-UP” INCREASE?**

23

24 A. No. PGE has not provided any support for why its budget projections should  
25 override the detailed assumptions regarding facility-specific maintenance. The budget  
26 appears to be a “place-holder”, somewhat unrelated to projected maintenance expenses.



1 **Q. WHAT DOES THIS BUDGET TRUE-UP DO TO THE PRICE SIGNALS**  
2 **ASSOCIATED WITH INDIVIDUAL TASKS PERFORMED BY PGE?**  
3

4 A. The budget true-up signals customers that the costs of maintenance are higher  
5 than the fixture-specific costs suggest. The true-up thus signals customers that PGE's  
6 maintenance costs are more expensive than they should be, thus providing an irrational  
7 incentive for cities to want to perform maintenance themselves. Cities should make  
8 decisions regarding providing specific maintenance services based on the most accurate  
9 information available about purchasing those services from PGE instead. The budget  
10 true-up reduces the accuracy of choosing to purchase maintenance services from PGE.

11 **Q. WHAT SHOULD THE COMMISSION REQUIRE OF PGE?**  
12

13 A. PGE should not adopt the budget true-up, but should use the facility-specific  
14 assumptions, as modified by our testimony below. This will reduce test year total  
15 maintenance costs by at least \$253,000, depending on further adjustments discussed  
16 below.

17 (b) Projected Repair Frequencies

18 **Q. ON WHAT DOES PGE BASE ITS PROJECTED REPAIR**  
19 **FREQUENCIES?**  
20

21 A. PGE uses data from 2002-2004. See PGE/1300, Workpapers p. 313, provided as  
22 COP/COG/LOC/205. For eight repair codes (listed above), PGE divides the number of  
23 reported repairs by the total number of "fixtures" to derive the eight repair frequencies.

24 **Q. DO YOU AGREE THAT THE DATA FROM THE 2002-2004 PERIOD**  
25 **REPRESENTS CURRENT REPAIR FREQUENCIES?**  
26

27 A. No. PGE now provides cities with monthly streetlight repair lists by billing code.  
28 An example of these repair lists is provided as COP/COG/LOC/209.

29 |

1 **Q. WHAT DO THESE RECENT REPAIR LISTS INDICATE?**

2

3 A. We provide results for the Cities of Portland and Gresham, based on actual  
4 reported repairs, annualized from the first six to seven months of 2006. The results for  
5 the City of Portland indicate that repair frequencies have dropped significantly from the  
6 levels reported by PGE for 2002-2004. The overall repair frequency (number of repairs  
7 divided by number of fixtures) in Portland is about 55 percent of the system repair  
8 frequency reported by PGE for 2002-2004. The number of fixtures in Portland is over  
9 one-third of the total number of fixtures on PGE's system.

10 The results for the City of Gresham are, not surprisingly, somewhat different.  
11 However, in five of the eight categories, the actual repair frequency during the first seven  
12 months of the year was below PGE's data for 2002-2004, in some cases substantially.  
13 See COP/COG/LOC/210 for the results for the two cities, which represent about 40  
14 percent of the total number of fixtures on the PGE system.

15 **Q. WHY DO YOU THINK THE RECENT DATA SHOW SUCH A**  
16 **REDUCTION FROM THE 2002-2004 PERIOD?**

17

18 A. In the public workshop on streetlight costs, PGE staff suggested that repair  
19 frequencies increased from 1992 (the previous study, also documented at PGE/1300,  
20 Workpapers, p. 313, provided as COP/COG/LOC/205) to 2002-2004 because the system  
21 has aged. Although this sounds plausible, it appears that the repairs made by PGE since  
22 2002 have taken care of much of the aging problem, and that repair frequencies have  
23 returned to levels closer to those experienced in 1992. This is not surprising: one would  
24 expect the repair frequency to change over time, with more repairs required of aging  
25 components. However, replacement of aging components causes the average age of the  
26 system to fall, all else equal, which should reduce repair frequencies. Also, the average

1 age of the system is affected by load growth, which causes new components to be added,  
2 in turn also reducing the average age of the system. Thus, we conclude that the repair  
3 frequencies from 2002 to 2004 are not reasonable projections for 2007.

4 **Q. WHAT DO YOU RECOMMEND INSTEAD?**

5  
6 A. The repair frequencies assumed in the maintenance cost study should be reduced  
7 significantly. Based on 2006 actual data for Portland and Gresham, we recommend that  
8 repair frequencies in the maintenance study be reduced by 40 percent across the board.  
9 This is the difference between the total repair frequency experienced in Portland and  
10 Gresham during the first half of 2006 and the system repair frequencies reported by PGE  
11 for 2002-2004. The calculations in support of the 40 percent reduction are provided in  
12 COP/COG/LOC/210.

13 (c) Updates to the 1992 Maintenance Study: Labor Productivity Assumptions

14  
15 **Q. ABOVE YOU HAVE REFERENCED THE 1992 MAINTENANCE STUDY.  
16 HAS THAT STUDY BEEN UPDATED BY PGE FOR THIS CASE?**

17  
18 A. Yes. Repair frequencies have been updated with data from 2002 to 2004,  
19 although that information now appears to be outdated, as discussed above. In addition,  
20 PGE explained in the public workshop that certain labor productivity assumptions have  
21 been updated for this case. Specifically, labor productivity improvements in four areas  
22 are projected by PGE for 2007: group relamping, starter replacement (HPS only),  
23 luminaire replacement, and power door maintenance. (For labor productivity  
24 improvements except group relamping, see PGE/1300, Workpapers p. 286, provided as  
25 COP/COG/LOC/211, for an example as applied to Cobra Head – Power Door Fixtures.  
26 The man-hours in the first column show the assumptions in UE 115 for 2002, based on  
27 the 1992 study; the man-hours in the second column show the projections for 2007. For

1 the group relamping assumption, see PGE/1300, Workpapers p. 309, and a handout at the  
2 streetlight workshop, provided as COP/COG/LOC/212.) The following table shows the  
3 comparison between test periods 2002 (UE 115) and 2007 (UE 180); the information is  
4 derived from pp. 286 and 309 of the Workpapers and a handout at the streetlight  
5 workshop:

Work Element	Labor for Repairs Man-hours (exc. Relamping)		Change from UE 115 to UE 180	
	UE 115	UE 180	Man-hours	Percentage
Group Relamping	40 lamps/day	60 lamps/day		(50.0%)
Starter Replacement	0.807	0.525	(0.282)	(34.9%)
Luminaire Replacement	1.714	1.028	(0.686)	(40.0%)
Power Doors	1.208	0.725	(0.483)	(40.0%)

6  
7 **Q. WHAT DO YOU CONCLUDE FROM THE DATA PROVIDED BY PGE?**  
8  
9 A. Productivity improvements in the range of 35 to 50 percent have been achieved in  
10 these four work elements in the five years since 2002. PGE has updated the streetlight  
11 maintenance study to reflect these productivity improvements.

12 **Q. DO YOU FIND THAT THESE UPDATES ARE SUFFICIENT?**  
13  
14 A. No. PGE has updated only four of the eight labor estimates. We recommend that  
15 PGE be required to reduce the remaining four labor estimates to reflect the average  
16 productivity improvements since 1992 in those three labor categories that have been  
17 updated for improvements in productivity: by 35 to 50 percent.

18 |

1           (d) Crew Dispatch Assumptions

2  
3       **Q.    HOW DOES PGE PROJECT THE LABOR COSTS ASSOCIATED WITH**  
4       **EACH TYPE OF REPAIR (WORK ELEMENT)?**

5  
6       A.    First, PGE constructs three crew types: Lamp Replacer (two-man), Eagle (one-  
7       man), and Line Crew (three-man). Second, PGE builds an hourly labor cost for each  
8       crew type that includes payroll, overheads, tool loadings, and transportation. Third, PGE  
9       assumes that specific repairs are conducted by some combination of the three crew types.  
10       For example, lamp and photocell replacements are assumed to be performed by Lamp  
11       Replacers 50 percent of the time, Eagles 40 percent of the time, and Line Crews ten  
12       percent of the time. Glassware replacements are assumed to be performed by Eagles 25  
13       percent of the time and Lamp Replacers 75 percent of the time. See PGE/1300,  
14       Workpapers, p. 309, provided as COP/COG/LOC/212. According to statements by PGE  
15       staff at the streetlight workshop, these combinations are based on experience and  
16       projected changes in crew dispatch methods.

17       **Q.    DO YOU AGREE WITH THIS APPROACH TO RATE-MAKING?**

18  
19       A.    No. PGE has projected unnecessarily high labor costs associated with streetlight  
20       repairs. That is, PGE has not assumed that the least-cost crews (Eagle) will be dispatched  
21       to make specific repairs.

22       **Q.    ARE YOU RECOMMENDING A SPECIFIC DISPATCH PROTOCOL**  
23       **FOR PGE'S REPAIR CREWS?**

24  
25       A.    No. We are not proposing that the Commission (or the Cities) micro-manage  
26       PGE's decisions regarding which crews to dispatch to make individual repairs. However,  
27       we do recommend that, for rate-setting purposes, PGE should assume that the least-cost  
28       dispatch of crews take place. This is analogous to assuming least-cost dispatch of PGE's

1 generators and market purchases to meet loads. Specifically, PGE should assume that all  
2 street light repairs are conducted by Eagle crews.

3 III. Schedule 91: Streetlight Operating Hours

4

5 **Q. WHAT IS THE PURPOSE OF THIS SECTION?**

6

7 A. In this section we review PGE's assumptions regarding the number of operating  
8 hours assumed for streetlight service.

9 **Q. WHAT DOES PGE ASSUME FOR OPERATING HOURS?**

10

11 A. PGE assumes 4,150 operating hours for streetlights. This number of hours,  
12 multiplied by the assumed hourly consumption of electricity for each luminaire, yields  
13 the total annual energy consumption by luminaire type, which is then multiplied by the  
14 projected cost of energy to derive the energy cost component of streetlight charges for all  
15 three options.

16 **Q. DO YOU AGREE WITH THIS ASSUMPTION?**

17

18 A. No. First, this value is based on assumed total of 4,200 streetlight "burn hours"  
19 less 50 hours to account for outages. This value resulted from a 1984 study that  
20 contemplated additional monitoring that has not taken place. (See Commission Order 83-  
21 724.) Second, PacifiCorp assumes 3,931 operating hours for Portland, or about five  
22 percent less. See COP/COG/LOC/213. Third, we have separately calculated the  
23 operating hours for streetlights based on data downloaded from the U.S. Naval  
24 Observatory, specifications for our current photocells, and a study of the relationship  
25 between latitude and on/off times for photocells. This calculation supports a conclusion  
26 that the number of operating hours (before outages) is 4,045, based on the assumption

1 that lights go on 22 minutes after sunset and go off 19 minutes before sunrise. See  
2 COP/COG/LOC/214.

3 **Q. WHAT DO YOU PROPOSE IN THIS CASE?**

4  
5 A. First, we propose that PGE use 4,045 hours less the stipulated 50 hours for  
6 outages, for a net “burn hour total” of 3,995/year. This is a reduction of about 3.73  
7 percent in the assumed annual consumption of energy by streetlights and is close to the  
8 amount used by PacifiCorp. Schedule 91 should be modified to reflect this amount of  
9 energy consumption. Second, we propose that the Commission order Portland and PGE  
10 enter into a joint study to determine a value based on actual measurements. This study  
11 would be a collaborative effort similar to what Portland and PGE did in 1984 to  
12 determine the number of outages. The study will probably require at least two years to  
13 collect sufficient data.

14 IV. Schedule 91: Restrictions on Option C Streetlights

15  
16 **Q. WHAT IS THE PURPOSE OF THIS SECTION?**

17  
18 A. In this section, we recommend that proposed restrictions on Option C lights be  
19 removed, to permit Cities (a) to choose to perform maintenance if the cost is lower than  
20 PGE’s proposed charges, and (b) to switch from Option B to Option C if that choice is  
21 cost-effective for the City.

22 **Q. WHAT RESTRICTIONS DOES PGE PROPOSE FOR OPTION C**  
23 **STREETLIGHTS?**

24  
25 A. PGE proposes that (a) new Option C lights be metered and billed under Schedule  
26 32, rather than unmetered and billed under Schedule 91, and (b) Cities be prohibited from  
27 having Option C lights on company-owned poles. See PGE/1300, Kuns-Cody/19-20 and  
28 PGE/1302, Kuns-Cody/69, respectively.

1 **Q. HAS PGE ADEQUATELY EXPLAINED THE NEED FOR THE CHANGE**  
2 **REGARDING OPTION C LIGHTS?**

3  
4 A. No. In response to City of Portland Data Request 013, PGE has made several  
5 assertions and allegations. See COP/COG/LOC/215, which is a copy of PGE's response  
6 to COP/PGE-013.

7 **Q. PLEASE EVALUATE THIS RESPONSE.**

8  
9 A. We find PGE's response to be entirely inadequate. First, PGE asserts that there is  
10 little new activity for this service; in contrast, Portland and Gresham want to preserve the  
11 ability to switch all of their Option B lights to Option C, especially in light of the  
12 proposed increases in maintenance charges, and Portland requires all new larger  
13 residential and commercial developments to install what become Option C lights.  
14 Second, PGE asserts "significant administrative costs" that are not included in rates.  
15 However, PGE has not provided any evidence of such costs. Based on our collective  
16 experience with streetlight systems totaling over 50 years, we cannot understand PGE's  
17 assertion. Option C lights are part of the managed inventory of streetlights in each City.  
18 Furthermore, PGE provides no maintenance of Option C lights, and incurs no capital  
19 costs associated with installing or replacing Option C lights. PGE only bills the Cities for  
20 energy consumed by Option C lights, based on a stipulated number of operating hours  
21 and an assumed consumption of kW/luminaire. If anything, Option C lights should  
22 cause lower administrative costs than Options A and B. Third, PGE alleges inadvertent  
23 power diversion and the omission of auditing costs for Option C lights. PGE has  
24 presented no evidence that power diversion takes place, and has not explained how the  
25 auditing of Option C lights differs in any way from Options A and B. Finally, PGE  
26 asserts, again without evidence, that its streetlight billing system has a limited number of



1 billing codes and that the company wants to “free up” codes for Options A and B. Even  
2 if true, we believe that the benefits of avoiding modifications to the streetlight billing  
3 system are far outweighed by the negative consequences of eliminating Option C.

4 **Q. IS PGE’S PROPOSAL CONSISTENT WITH YOUR UNDERSTANDING**  
5 **OF THE PURPOSES OF SB 1149?**

6  
7 A. No. Our understanding is that one objective of SB 1149 is for the customer be  
8 offered choices of unbundled services at unbundled rates. By erecting an economic  
9 barrier to Option C lights, PGE is effectively removing one option or choice that is  
10 currently available to Oregon cities.

11 **Q. IS METERING REQUIRED FOR STREETLIGHT SERVICE?**

12  
13 A. Clearly not. PGE proposes to continue unmetered service for Options A and B  
14 lights and for grandfathered Option C lights, but to require meters only for new Option C  
15 lights. PGE’s proposal discriminates against cities that want to provide their own  
16 maintenance of streetlights.

17 **Q. WHAT ARE THE EXPECTED CONSEQUENCES OF THESE**  
18 **RESTRICTIONS?**

19  
20 A. First, Cities would be economically prohibited from installing new Option C  
21 lights, because the fixed cost of service under Schedule 32 would exceed the avoided net  
22 cost of maintenance. For instance, cities may have locations where they want to install  
23 “infill lights” (perhaps only one additional light). PGE’s proposed monthly charges  
24 under Schedule 91 for a 100 Watt Cobrahead HPS light with Power Door are \$6.80 for  
25 Option B and \$3.57 for what would be Option C. If the customer is required to purchase  
26 service for that one light under proposed Schedule 32, the monthly charge would be  
27 \$13.65. See COP/COG/LOC/216. That is, given the choice between a metered Option C

1 light and an unmetered Option B light, Cities will choose an unmetered Option B light  
2 because it will be far less expensive overall, even if the City could maintain the light for  
3 less than PGE proposes. As a consequence, Cities will be forced to purchase streetlight  
4 maintenance from PGE, even if the City could perform maintenance less expensively.  
5 The result is higher than necessary costs for streetlight maintenance, and a reduction in  
6 competitive pressure on PGE to keep its streetlight maintenance costs under control.

7 **Q. PLEASE DESCRIBE YOUR ASSESSMENT OF THE COMBINATION OF**  
8 **SIGNIFICANT INCREASES IN OPTION B CHARGES AND THE**  
9 **PROPOSAL TO METER NEW OPTION C LIGHTS.**  
10

11 A. This appears to be an attempt by PGE to force Cities to give up maintenance of  
12 streetlights. PGE proposes to erect a barrier to new Option C lights while increasing  
13 significantly (and unreasonably, given the above arguments) the cost of Option B lights.  
14 From the point of view of a regulated utility, this is not surprising. Option B lights  
15 provide an opportunity to overcharge for maintenance, based on a myriad of arcane  
16 assumptions about the frequency and cost of streetlight repairs. Option B thus looks like  
17 a “cash cow”, which PGE proposes to protect by erecting a “barrier to exit” from Option  
18 B service. (This new “barrier to exit” from Option B is supported by a continued “barrier  
19 to entry” to Option C, which is discussed next.)

20 **Q. WHAT DO YOU RECOMMEND REGARDING NEW OPTION C**  
21 **LIGHTS?**  
22

23 A. PGE should be required to continue to offer new Option C lights under Schedule  
24 91, as it does today.

25 |

1 **Q. WHAT DOES PGE PROPOSE REGARDING OPTION C LIGHTS ON**  
2 **COMPANY-OWNED POLES?**

3  
4 A. As in previous cases, PGE continues to propose that Option C lights only be  
5 allowed on customer-owned poles.

6 **Q. IS THIS REASONABLE?**

7  
8 A. No. PGE has legitimate concerns about safety and reliability when non-PGE  
9 personnel perform maintenance on fixtures attached to PGE's poles. However, PGE  
10 already uses presumably qualified contract crews for streetlight work, which means that  
11 the company must have satisfied itself that non-PGE personnel could be relied on to  
12 perform this maintenance safely (and cost-effectively). In the conversions from mercury  
13 vapor to HPS vapor lights in the 1980s, PGE extensively relied on contact crews. If PGE  
14 can hire qualified contractor personnel to do this work, so can the cities.

15 **Q. WHAT DO YOU RECOMMEND REGARDING MAINTENANCE ON**  
16 **PGE-OWNED POLES?**

17  
18 A. PGE should allow its customers to install, maintain, transfer or remove consumer-  
19 owned lights mounted to PGE-owned distribution poles as long as the work is done by  
20 qualified personnel. Allowing non-PGE personnel to provide maintenance services on  
21 consumer-owned equipment located on PGE-owned poles is consistent with our  
22 understanding of the Commission's rules and regulations relating to safety standards  
23 (OAR Division 24) and pole and conduit attachments (OAR Division 28), and is an  
24 generally accepted practice among electric utilities. In fact, this approach is in the  
25 process of being implemented by PacifiCorp through Advice Filing 06-012, filed April  
26 20, 2006 and currently under review by Staff and interested parties. In its proposal,  
27 PacifiCorp provides that: "Consumer owned lights, mounted to Company owned

1 distribution poles, shall be installed, maintained, transferred or removed only by qualified  
2 personnel.” See Advice Filing 06-012, Provision 2, page 2 of Schedule 53. (Please note  
3 that although Portland, Gresham and the League agree that this particular portion of  
4 PacifiCorp’s Advice Filing 06-012 merits implementation, other aspects of the proposal  
5 raise issues that remain unresolved. The testimony contained herein should be construed  
6 as an endorsement of the entirety of PacifiCorp’s Advice Filing 06-012.) Thus,  
7 PacifiCorp’s approach, if approved by the Commission, will not prohibit maintenance of  
8 customer- (consumer-) owned lights on Company-owned poles, but simply require that  
9 “qualified personnel” perform such maintenance. PGE should adopt a similar position,  
10 propose reasonable standards for such “qualification” and submit those standards to the  
11 Commission for review and approval. Without such standards in place, customers cannot  
12 make an informed choice between Options B and C. If customers can meet Commission-  
13 approved qualification standards, then they should be permitted to maintain customer-  
14 owned lights on company-owned poles. PGE’s current policy is anti-competitive, and  
15 artificially and unreasonably prevents entities from entering into the maintenance  
16 business.

17 **Q. WHAT RULE OR SCHEDULE CHANGES DO YOU RECOMMEND?**

18  
19 A. Schedule 91 should be amended by elimination of the first sentence under the  
20 description of Option C on Original Sheet 91-1, and PGE should separately propose  
21 reasonable qualification standards for crews performing maintenance of Option C lights  
22 on company-owned poles.

23 |

1 V. Schedule 91: Accounting and Cost of Capital for Streetlights

2  
3 **Q. WHAT IS THE PURPOSE OF THIS SECTION?**

4  
5 A. In this section, we note three deficiencies in PGE's filing: two regarding  
6 accounting and billing for circuit charges, and one regarding the support in general for  
7 the recovery of investments in streetlight facilities.

8 **Q. WHAT IS THE ACCOUNTING PROBLEM FOR CIRCUITS?**

9  
10 A. PGE proposes a significant increase in the circuit charge under Schedule 91, from  
11 \$0.64/month to \$1.52/month. The current charge resulted from a stipulation in UE 115.  
12 Although PGE has provided some support for the derivation of the proposed circuit  
13 charge, that support is based on an allocation of costs within FERC Account 373 that is  
14 not documented. PGE asserts that subaccount 373-1 contains investment information  
15 related solely to circuits. However, we really do not know which portion of FERC  
16 Account 373 belongs to circuits versus the other components of Account 373.

17 **Q. WHAT IS THE BILLING PROBLEM FOR CIRCUITS?**

18  
19 A. At this time we simply do not know which streetlights depend on company-owned  
20 circuits. In response to data request COP/PGE-057, PGE provided a map showing the  
21 location of the three options for streetlights in the City of Portland, and the following  
22 statements:

23 Not all of the Option C lights subject to the circuit charge are identifiable at this  
24 time within the City of Portland. The PGE streetlight circuit revenue requirements  
25 are derived from the FERC 373-1 account, which is based on allocations from  
26 blanket jobs when installed. These costs are allocated to all Option A and B lights

1 and those Option C lights with a company-supplied circuit. PGE maintains a  
2 count of Option C lights subject to a circuit charge for billing purposes.  
3 Thus, some streetlights are paying for circuits that they do not use, some streetlights may  
4 not be paying for circuits that they do use, and the overall level of the circuit charge is not  
5 verifiable because it is based on “allocations from blanket jobs”, which have not been  
6 documented. (Based on statements made by PGE staff at the streetlight workshop,  
7 “blanket jobs” are combinations of various tasks, performed as a group, without tracking  
8 the contribution of individual tasks to the total cost of the “job”. Allocation factors are  
9 then necessary to distribute the cost of the blanket job to specific tasks. This is another  
10 example of inappropriate bundling of charges.) There is no apparent connection between  
11 the mapping system that produced the response to COP/PGE-057 and the billing system  
12 that ensures proper assessment of circuit charges. See COP/COG/LOC/217 and 217A for  
13 a copy of PGE’s response to COP/PGE-057.

14 **Q. WHAT DO YOU PROPOSE REGARDING CIRCUIT CHARGES?**

15  
16 A. The Commission should require the following changes in PGE’s accounting and  
17 billing systems. First, investments in company-owned circuits that support streetlights  
18 should be identified individually, rather than being based on undocumented allocation  
19 factors from blanket jobs. Second, the annual costs of these investments should be  
20 recovered only from those lights that actually rely on company-owned circuits. These  
21 changes are necessary in order to send the correct price signals to Cities that may be  
22 considering ownership of circuits, rather than paying the circuit charge to PGE.

23 |

1 **Q. WHAT IS THE INVESTMENT RECOVERY PROBLEM?**

2

3 A. PGE's recovery of investment costs for streetlights depends on factors that are  
4 developed internally at PGE and not documented: the recovery factors associated with  
5 the installation costs of circuits, lamps and poles (see PGE 1300, Workpapers p. 236,  
6 provided as COP/COG/LOC/218). Theoretically, these recovery factors should be tied  
7 to the return on investment plus depreciation. Although we know what PGE's requested  
8 return on investment is, we do not know what depreciation rates are implicit in these  
9 recovery factors, or whether the depreciation rates are reasonable. The book depreciation  
10 amounts listed by PGE for the subaccounts in FERC Account 373 seem unusually high to  
11 us. See PGE/1300, Workpapers p. 244, provided as COP/COG/LOC/219. We have filed  
12 additional discovery requests on PGE regarding these recovery factors.

13 **Q. WHAT DO YOU RECOMMEND TO REMEDY THESE LATTER**  
14 **CONCERNS?**

15

16 A. The Commission should require PGE to break down these recovery factors into  
17 their components and justify each component by reference to the requested/allowed  
18 return on equity and the appropriate depreciation schedule.

19 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

20

21 A. Yes.

**Qualification Statement of John Harris**

1  
2

3 **Q. PLEASE STATE YOUR NAME, EMPLOYER, AND BUSINESS**  
4 **ADDRESS.**

5

6 A. My name is John S. Harris. I am employed as the Transportation and  
7 Streetlighting Superintendent for the City of Gresham, Department of Environmental  
8 Services. My business address is 2123 S.E. Hogan Road, Gresham, Oregon 97080.

9 **Q. PLEASE STATE YOUR EDUCATIONAL QUALIFICATIONS.**

10

11 A. I received a Bachelor's degree in Geology from the University of Tennessee in  
12 1976.

13 **Q. PLEASE REVIEW YOUR EXPERIENCE IN THE ELECTRIC UTILITY**  
14 **INDUSTRY.**

15

16 A. My experience includes eight years in Development Review for the City of  
17 Gresham, including all public utilities and streetlighting; 16 years experience as  
18 streetlight program coordinator and superintendent, including design review for all new  
19 streetlighting in the City of Gresham; and nine years experience as the Transportation  
20 Superintendent. In addition, I am the contract administrator for all publicly-financed  
21 streetlighting projects in the City of Gresham.

22 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE COMMISSION?**

23

24 A. No.

25 **Q. DOES THIS COMPLETE YOUR QUALIFICATION STATEMENT?**

26

27 A. Yes.



**BEFORE THE PUBLIC UTILITY COMMISSION  
OF OREGON**

**UE 180**

In the Matter of	)	
	)	WITNESS QUALIFICATION
PORTLAND GENERAL ELECTRIC	)	STATEMENT FOR
COMPANY	)	ANDREA FOGUE
	)	
Request for a General Rate Revision.	)	(LOC/100)

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**LOC/100**

**Witness Qualification Statement for Andrea Fogue**

August 9, 2006

WITNESS QUALIFICATION STATEMENT

NAME: Andrea Fogue

EMPLOYER: League of Oregon Cities (“LOC”)

TITLE: Senior Staff Associate

ADDRESS: 1201 Court Street NE, Suite 200, Salem, Oregon 97301

EDUCATION: B.A., Central University of Iowa

EXPERIENCE: I have been employed by the LOC for approximately six years. During my tenure, I have been (and continue to be) the principal LOC employee responsible for identifying, evaluating and responding to legislative and regulatory initiatives and proceedings involving energy policy issues directly or indirectly impacting the interests of Oregon cities. In that regard, I have served (and continue to serve) as the LOC’s liaison to trade organizations and other entities with interests in the energy industry. For example, I serve as the Northwest Energy Efficiency Alliance’s liaison to Oregon local governments. I also have been appointed to and served on governmental advisory bodies, including the Portfolio Advisory Committee established by SB 1149 where I served as a charter member.

OTHER EXPERIENCE: On behalf of the LOC, I have participated in numerous Oregon Public Utility Commission proceedings covering a broad range of issues. These proceedings have including administrative rulemakings (e.g., AR 394, AR 421, AR 498, and AR 499), private utility general rate cases (e.g., UE 115, UE 116, UE 179), utility resource planning proceedings (e.g., UE 118, UE 119), general policy matters (e.g., UM 1121), and corporate merger and restructuring proceedings (e.g., UF 4218 and UM 1209). Prior to coming to Oregon I worked with the Iowa League of Cities where I was also responsible for energy policy issues.

**BEFORE THE PUBLIC UTILITY COMMISSION  
OF OREGON**

**UE 180**

In the Matter of	)	
	)	WITNESS QUALIFICATION
PORTLAND GENERAL ELECTRIC	)	STATEMENT FOR
COMPANY	)	JOHN HEBERLING
	)	
Request for a General Rate Revision.	)	(LOC/101)

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**LOC/101**

**Witness Qualification Statement for John Heberling**

August 9, 2006

WITNESS QUALIFICATION STATEMENT

Name: John L. Heberling  
Title: Vice President  
Employer: D. Hittle & Associates, Inc.  
Business Address: 19101 36<sup>th</sup> Ave. W., Suite 209  
Lynnwood, WA 98036  
425-672-9651  
Education: B.S. Electrical Engineering, University of Washington  
B.S. Industrial Engineering, University of Washington  
Registration: Registered Professional Engineer

Experience:

I have over 28 years of experience as a consultant to electric utilities, municipal, state and federal government agencies, private power developers, and banks and financial institutions involved with the funding of energy-related projects. My practice area focuses on regulatory, economic and technical issues related to utility infrastructure systems, including development of numerous feasibility evaluations, planning studies, financial and economic analyses, rate studies, long-range operating projections, due diligence reviews and reports in the support of bond issuance and non-recourse loans. I have been involved in a number of studies addressing various aspects of electric utility operation, financial planning, revenue requirements and retail rates.

My experience includes project management on numerous large planning studies, preparation of analyses and reports associated with the issuance of over \$4 billion of revenue bonds, evaluation of alternative ownership options for utility systems, estimation of the value of electric system facilities, economic evaluations of utility expansion and renewal alternatives, preparation of pro-forma projections of operating revenues and expenses for utility systems and development of analytical computer models.

Specific project experience includes preparation of retail rate studies for Columbia River Peoples Utility District, St. Helens, Oregon; Central Lincoln Peoples Utility District, Newport, Oregon; Hermiston Energy Services, Hermiston, Oregon; Ferry County Public Utility District, Republic, Washington and the City and Borough of Sitka, Alaska. I have prepared studies of alternative electric utility ownership structures and

costs for Rockwood Peoples Utility District, Gresham, Oregon; Clackamas County PAC; the City of Millersburg, Oregon; the City of Hermiston, Oregon; Asotin County Public Utility District, Lewiston, Washington; and the Town of Steilacoom, Washington. Other experience includes valuation of electric utility facilities and properties. I have also provided expert witness testimony before the Regulatory Commission of Alaska, and the Oregon Public Utility Commission.

## **Examples of Critical Facilities**

Police stations

Fire stations

911 call centers

Wastewater treatment facilities

Water supply pumps

Emergency operations centers

Designated emergency shelters

City Halls

Portland General Electric

Proposed Estimated Revenues  
FORECAST  
S/JAN05A  
2007

Street Light Revenue Components Schedule 81

Description	OPTION-A		OPTION-B		OPTION-C		TOTAL	
	Revenue (2)	% Change	Revenue (2)	% Change	Revenue	% Change	Revenue	% Change
Energy Only	System \$ 1,945,772	-2.4%	\$ 5,097,816	-2.5%	\$ 1,089,458	-2.5%	\$ 8,113,047	-2.5%
Luminaires	Total Charges \$ 4,673,899	10.3%	\$ 8,502,302	22.6%	\$ 1,089,458	-2.5%	\$ 14,245,659	16.1%
Fixed Charges	Maintenance Group Lamp \$773,528	86.7%	\$1,839,585	75.8%	-	-	2,613,112	78.9%
	Emergency Maint. Investment \$236,420		\$534,576		-	-	770,986	
(Investment, Maintenance, Repl Cost, Circult, etc.)	Circuit Chg \$537,108	-14.4%	\$1,305,009		-	-	1,842,117	-14.4%
	Repl Cost (1) \$851,952	141.9%	\$1,564,901	138.1%	-	-	2,216,853	138.2%
		6.5%			-	-	38,714	6.5%
Luminaires	Total Charges \$ 2,728,127	21.6%	\$ 3,404,486	99.1%	\$ -	-	\$ 6,132,612	55.1%
Poles	Total \$ 2,053,395	-6.9%	\$ 96,692	32.7%	-	-	\$ 2,150,087	-5.7%
	Investment \$2,053,395	-6.9%	-	-	-	-	\$2,053,395	-6.9%
	Emergency Repl \$0		\$96,692	32.7%	-	-	\$96,692	32.7%
	Total Investment \$3,387,989	-10.0%	-	-	-	-	\$3,387,989	-10.0%
Total Fixed	\$4,781,521	7.4%	\$3,501,178	96.4%	-	-	\$8,282,700	32.9%
Total Charges	\$6,727,293	4.4%	\$8,588,985	22.7%	1,089,458	-2.5%	\$16,395,746	12.7%

(1) Replacement Cost is a subfactor because it is recovered in both investment and maintenance.  
(2) Adding individual components may not match totals due to rounding.

Portland General Electric

Current Estimated Revenues  
FORECAST  
SJAN05A  
2007

Schedule 91

Street Light Revenue Components

Description	Revenue (2)			
	OPTION-A	OPTION-B	OPTION-C	TOTAL
Energy Only	System Energy \$ 1,994,388	\$ 5,226,189	\$ 1,096,843	\$ 8,317,420
Luminaires	Total Charges \$ 4,238,759	\$ 6,936,125	\$ 1,096,843	\$ 12,271,726
Fixed Charges (Investment, Maintenance, Repl Cost, Circuit, etc.)	Maintenance \$414,271	\$1,046,143	-	1,460,414
	Investment \$1,558,759	-	-	1,558,759
	Circuit Chg \$269,568	\$657,354	-	926,922
	Repl Cost (1) \$34,459	-	-	34,459
Luminaires	Without Energy \$ 2,244,371	\$ 1,709,935	\$ -	\$ 3,954,306
Poles	Total Charges \$2,206,390	\$72,885	-	\$2,279,275
	Investment \$ 2,206,390	-	\$ -	2,206,390
	Emergency Repl -	\$72,885	-	\$72,885
	Total Investment \$3,765,149	-	-	\$3,765,149
	Total Fixed \$ 4,450,761	\$ 1,782,820	\$ -	\$ 6,233,581
<b>Total Charges</b>	<b>\$ 6,445,149</b>	<b>\$ 7,009,010</b>	<b>\$ 1,096,843</b>	<b>\$ 14,551,002</b>

(1) Replacement Cost is a subcontractor because it is recovered in both investment and maintenance.  
(2) Adding individual components may not match totals due to rounding.



Portland General Electric

Proposed Estimated Revenues  
 FORECAST  
 SJAN05A  
 2007

Street Light Revenue Components Schedule 15

Description		TOTAL	
		Revenue (2)	% Change
Energy Only	System	\$ 2,100,480	-1.9%
	Luminaires	\$ 3,680,824	7.7%
Fixed Charges	Total Charges		
	Maintenance	\$473,066	100.7%
	Group Lamp	\$133,132	-
	Emergency Maint.	\$339,934	-
	Investment	\$798,708	-24.7%
	Service Charge	\$366,879	-
	Repl Cost (1)	\$20,611	2.8%
	Luminaires	\$ 1,580,344	23.9%
	Without Energy		
	Poles	\$ 770,243	-1.1%
	Total Charges	\$791,044	-0.4%
	Investment	\$20,802	40.1%
	Emergency Repl		
	Total Investment	\$1,589,752	-14.3%
	Total Fixed	\$ 2,350,587	14.4%
	Area Lights	\$ 4,451,067	6.0%

(1) Replacement Cost is a subcontractor because it is recovered in in both investment and maintenance.  
 (2) Adding individual components may not match totals due to rounding.

**Current Estimated Revenues**  
**FORECAST**  
**SJAN05A**  
**2007**

Street Light Revenue Components	Schedule 15	TOTAL
Description		Revenue (2)
Energy Only	System	\$ 2,142,046
Luminaires	Total Charges	\$ 3,418,039
Fixed Charges	Maintenance	\$235,666
(Investment, Maintenance, Repl Cost, Circuit, etc.)	Investment	\$1,060,368
	Service Charge	\$0
	Repl Cost (1)	\$20,041
Luminaires	Without Energy	\$ 1,275,993
Poles	Total Charges	\$ 779,199
	Investment	\$794,043
	Emergency Repl	\$14,844
	Total Investment	\$1,854,411
	Total Fixed	\$ 2,055,192
	===== Total Charges	===== \$ 4,197,238

(1) Replacement Cost is a subcontractor because it is recovered in in both investment and maintenance.  
 (2) Adding individual components may not match totals due to rounding.

Portland General Electric

STREETLIGHT MAINTENANCE  
FREQUENCY - SURVEY SUMMARY

STREETLIGHTS	PRIMARY REPAIR CODE	DESCRIPTION	1992 SURVEY Results		GRID System Data	
			MONTHS IN SAMPLE	TOTAL COMPONENTS	ANNUALIZED COMPONENTS	FREQUENCY
	AB	LAMPS	2,749	5,191	9,275	7.47% AB
	BB	PHOTO-CONTROLS	2,404	4,339	6,748	5.43% BB
	CA	STARTERS (HPS Only)	140	210	755	0.66% CA
	EA	REFRACTORS	178	267	80	0.06% EA
	FA	CIRCUITS	99	149	1,248	1.00% FA
	LC/HR	LUMINAIRE REPLACEMENT	78	117	1,038	0.84% LC/HR (1)
	OTH	OTHER - NOT DEFINED	394	591	836	0.67% OTH
	PD	POWER DOOR REPLACEMENT	6	9	87	0.23% PD (2)
			6,048	11,073	20,067	17.95%

STREETLIGHT SYSTEM COUNTS:		COUNT	%
TOTAL FIXTURE (As of April 2003)		124,193	100%
POWER DOORS		38,217	31%
Non-PD (HPS)		76,376	61%
HPS Only		114,593	92%
NON-HPS		9,600	8%
NON-PDs		83,976	69%

ADDITIONAL DETAIL:		POWER DOORS	LC/HR
		193	0.51%
		845	0.98%
		10	0.03%
		745	0.98%

(1) The "LC" and "HR" category in the GRID Data System both refer to replacement of the luminaire.  
 (2) The "POWER DOOR REPLACEMENT" (PD) category derived from store room inventory statistics.  
 (3) The survey data from field crews which had missing manhours were eliminated from the sample.  
 The majority of the missing data was from the four-man crews and since relampers do a large number of trips in relation to the total trips, a reduction in manhours per trip occurred.  
 There is no way to compensate for this in this study.

Portland General Electric

**STREETLIGHT MAINTENANCE EXPENSE**  
 2007 Costs FOR STREET LIGHT FIXTURES

ANNUAL COSTS	Mercury Vapor					
	Code 29 7,000-L	Code 21 7,000-L	Code 22 10,000-L	Code 23 21,000-L	Code 24 55,000-L	
Group Lamp Replacement (5-Year Cycle)	5.00	5.65	5.65	7.15	6.81	9.16
Emergency Lamp Replacement (%/Year)	7.47%	0.45	0.35	1.01	0.88	1.76
Emergency PC Replacement (%/Year)	5.43%	0.25	0.25	0.25	0.25	0.25
Emergency Lamp+PC Labor (%/Year)	7.72%	6.53	6.53	6.53	6.53	6.53
Emergency Glassware Breakage (%/Year)	0.06%	0.11	0.06	0.06	0.08	0.10
Emergency Starter Replacement (%/Year)	0.98%	0.62	0.62	0.62	0.62	0.62
Emergency Circuit Repair (%/Year)	1.00%	1.11	1.11	1.11	1.11	1.11
Emergency Luminaire Replacement (%/Year)	0.98%	2.87	2.75	3.51	2.74	3.27
Emergency Other - Not Defined (%/Year)	0.67%	0.82	0.82	0.82	0.82	0.82
Emergency Power Door Replacement(%/Year)	0.23%	0.00	0.00	0.00	0.00	0.00
<b>TOTAL</b>						
Annual Maintenance	\$18.41	\$18.15	\$21.07	\$19.86	\$23.63	
Monthly Rate	\$ 1.53	\$ 1.51	\$ 1.76	\$ 1.65	\$ 1.97	

Portland General Electric

STREETLIGHT MAINTENANCE EXPENSE  
2007 Costs FOR STREET LIGHT FIXTURES

		Mercury Vapor				
Unit Costs		Code 29 7,000-L	Code 21 7,000-L	Code 22 10,000-L	Code 23 21,000-L	Code 24 55,000-L
Group Lamp + PC Replacement Lamp & PC Plus 24.0% Stores Labor ( 60 LAMPS/DAY)	\$131.80 /HR	\$10.68 17.57	\$10.68 17.57	\$18.17 17.57	\$16.49 17.57	\$28.23 17.57
Cost per Lamp & PC		28.25	28.25	35.75	34.06	45.81
Emergency Lamp Replacement Lamp Plus 24.0% Stores Labor captured elsewhere	\$0.00 /HR 0.000 hrs	5.99 0.00	4.69 0.00	13.49 0.00	11.80 0.00	23.55 0.00
Cost per Lamp		5.99	4.69	13.49	11.80	23.55
Emergency PC Replacement PC Plus 24.0% Stores Labor captured elsewhere	\$0.00 /HR 0.000 hrs	4.69 0.00	4.69 0.00	4.69 0.00	4.69 0.00	4.69 0.00
Cost per Lamp		4.69	4.69	4.69	4.69	4.69
Emergency Lamp and/or PC Replacement Materials captured elsewhere Labor (.667 Man-hours)	\$126.92 /HR 0.667 hrs	0.00 84.67	0.00 84.67	0.00 84.67	0.00 84.67	0.00 84.67
Cost per Lamp & PC		84.67	84.67	84.67	84.67	84.67
Emergency Glassware Breakage Glass Plus 24.0% Stores Labor (.647 Man-hours)	\$123.22 /HR 0.647 hrs	84.57 79.67	12.98 79.67	12.98 79.67	49.71 79.67	79.33 79.67
Cost per Glassware		164.24	92.65	92.65	129.38	159.00
Emergency Starter Replacement(HPS Only) Starter Plus 24.0% Stores Labor (.807 Man-hours)	\$122.04 /HR 0.525 hrs	0.00 64.05	0.00 64.05	0.00 64.05	0.00 64.05	0.00 64.05
Cost per Photocell		64.05	64.05	64.05	64.05	64.05
Emergency Circuit Replacement No materials required Labor (.905 Man-hours)	\$122.04 /HR 0.905 hrs	0.00 110.40	0.00 110.40	0.00 110.40	0.00 110.40	0.00 110.40
Cost per Circuit		110.40	110.40	110.40	110.40	110.40
Emergency Luminaire Replacement Fixture Plus 24.0% Stores Labor (1.714 Man-hours)	\$160.59 /HR 1.028 hrs	126.47 165.16	114.93 165.16	192.26 165.16	114.06 165.16	167.68 165.16
Cost per Luminaire		291.63	280.08	357.42	279.22	332.84
Other Emergency Repairs - Not Defined No materials required Labor (.993 Man-hours)	\$122.04 /HR 0.993 hrs	0.00 121.17	0.00 121.17	0.00 121.17	0.00 121.17	0.00 121.17
Cost per Luminaire		121.17	121.17	121.17	121.17	121.17
Power Doors - Power Doors Plus 24.0% Stores Labor (1.208 Man-hours)	\$0.00 /HR 0.000 hrs	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
Cost per POWER DOOR		0.00	0.00	0.00	0.00	0.00

Portland General Electric

Maintenance Rate Design - True-Up Mechanism

	Lighting Maintenance Model Before Adj.		Total	Equal % Factor	Estimated True-Up	2007 EOM Adj.	Budget (1)	Difference	Ledger
	Option A	Option B							
<b>Schedule 91 (Street Lights)</b>									
Group Lamp (Preventative)	\$238,420	\$534,576	\$770,996	27%	\$ 1,055,053	\$1,061,746	\$259,974	\$260,750	38% N37612
Emergency (Corrective)	473,167	1,162,994	1,628,161	56%	\$ 1,633,849	1,649,766	\$58,238	23,885	1% N37613
<b>Total</b>	<b>\$709,587</b>	<b>\$1,697,570</b>	<b>\$2,397,177</b>	<b>86%</b>	<b>\$ 2,690,702</b>	<b>\$2,711,512</b>	<b>\$60,310</b>	<b>\$14,335</b>	<b>13%</b>
<b>Schedule 16 (Area Lights)</b>									
Group Lamp (Preventative)	\$133,132	-	\$133,132	5%	\$ 72,637	\$73,793	\$44,891	(\$59,309)	-4% N37614
Emergency (Corrective)	278,473	-	278,473	10%	\$ 298,488	300,873	\$63,860	22,400	8% N37615
<b>Total</b>	<b>\$411,605</b>	<b>-</b>	<b>\$411,605</b>	<b>16%</b>	<b>\$ 371,085</b>	<b>\$374,666</b>	<b>\$136,790</b>	<b>(\$36,639)</b>	<b>-6%</b>
<b>Total Lighting</b>	<b>\$1,121,212</b>	<b>\$1,697,570</b>	<b>\$2,808,782</b>	<b>100%</b>	<b>\$ 3,061,786</b>	<b>\$3,086,178</b>	<b>\$647,700</b>	<b>\$277,396</b>	<b>9.6%</b>
					Adj. (2) \$ (24,393)				
					\$ 3,081,795				
<b>Total Lighting</b>	<b>\$369,552</b>	<b>\$634,576</b>	<b>\$804,128</b>		<b>\$1,127,890</b>	<b>\$1,136,539</b>		<b>\$231,411</b>	<b>26%</b>
Group Lamp (Preventative)	\$751,961	\$1,152,994	\$1,904,955		\$1,954,105	\$1,950,639		\$45,984	2%
Emergency (Corrective)									
<b>Schedule 91 (Street Lights)</b>									
Group Lamp (Preventative)	\$281,751	\$592,730	\$844,481			\$ 1,061,746		\$217,265	26% N37612
Emergency (Corrective)	\$511,995	\$1,256,855	\$1,768,840			1,649,766		(119,074)	-7% N37613
<b>Total</b>	<b>\$773,528</b>	<b>\$1,639,585</b>	<b>\$2,013,112</b>			<b>\$2,711,512</b>		<b>\$69,398</b>	<b>4%</b>
<b>Schedule 16 (Area Lights)</b>									
Group Lamp (Preventative)	\$163,011	-	\$163,011			\$ 73,793		(\$79,218)	-32% N37614
Emergency (Corrective)	\$20,055	-	\$20,055			300,873		(19,182)	-6% N37615
<b>Total</b>	<b>\$473,066</b>	<b>-</b>	<b>\$473,066</b>			<b>\$374,666</b>		<b>(\$68,400)</b>	<b>-21%</b>
<b>Total Lighting</b>	<b>\$1,246,593</b>	<b>\$1,639,585</b>	<b>\$2,086,178</b>			<b>\$3,086,178</b>		<b>(\$0)</b>	<b>0.0%</b>
<b>Total Lighting</b>	<b>\$414,762</b>	<b>\$622,730</b>	<b>\$897,492</b>			<b>\$ 1,136,539</b>		<b>\$ 136,047</b>	<b>14%</b>
Group Lamp (Preventative)	\$632,040	\$1,256,855	\$2,088,895			\$ 1,950,639		\$ (138,256)	-7%
Emergency (Corrective)									

(1) \$947,100 of transportation cost allocated to N37615. Re-allocated to all ledgers based on COS Model results.  
 (2) Adjustment applied to true-up collection.D10

Portland General Electric

1.09008  
 Equal % True-Up

MAINTENANCE RATES			
PROPOSED			
	OPTION-A	OPTION-B	OPTION-C
	\$0.94	\$0.94	\$0.00
	\$0.89	\$0.89	0.00
	\$1.09	\$1.09	0.00
	\$1.01	\$1.01	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$2.09	\$2.09	0.00
	\$2.10	\$2.10	0.00
	\$2.13	\$2.13	0.00
	\$1.89	\$1.89	0.00
	\$1.91	\$1.91	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$1.65	\$1.65	0.00
	\$1.92	\$1.92	0.00
	\$1.80	\$1.80	0.00
	\$2.15	\$2.15	0.00
	\$1.80	\$1.80	0.00

LAMP CODE	MAINTENANCE RATES		
	E-18 Phase I (Model Design Before True-Up)		
	OPTION-A	OPTION-B	OPTION-C
1	0.86	\$0.86	\$0.00
2	0.82	\$0.82	0.00
3	1.00	\$1.00	0.00
4	0.93	\$0.93	0.00
5	1.34	\$1.34	0.00
6	0.00	\$0.00	0.00
7	0.00	\$0.00	0.00
8	1.37	\$1.37	0.00
9	1.92	\$1.92	0.00
10	1.93	\$1.93	0.00
11	1.95	\$1.95	0.00
12	1.73	\$1.73	0.00
13	1.75	\$1.75	0.00
14	0.00	\$0.00	0.00
15	0.00	\$0.00	0.00
16	0.00	\$0.00	0.00
17	0.00	\$0.00	0.00
18	0.00	\$0.00	0.00
19	0.00	\$0.00	0.00
20	0.00	\$0.00	0.00
21	1.51	\$1.51	0.00
22	1.76	\$1.76	0.00
23	1.65	\$1.65	0.00
24	1.97	\$1.97	0.00
25	1.65	\$1.65	0.00

Portland General Electric

1.090008  
 Equal % True-Up

MAINTENANCE RATES			
PROPOSED			
	OPTION-A	OPTION-B	OPTION-C
	\$0.00	\$0.00	0.00
	\$1.84	\$1.84	0.00
	\$0.00	\$0.00	0.00
	\$1.67	\$1.67	0.00
	\$1.82	\$1.82	0.00
	\$1.87	\$1.87	0.00
	\$1.90	\$1.90	0.00
	\$1.79	\$1.79	0.00
	\$1.79	\$1.79	0.00
	\$1.81	\$1.81	0.00
	\$1.85	\$1.85	0.00
	\$1.87	\$1.87	0.00
	\$1.87	\$1.87	0.00
	\$1.85	\$1.85	0.00
	\$1.79	\$1.79	0.00
	\$2.25	\$2.25	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$1.79	\$1.79	0.00
	\$3.08	\$3.08	0.00
	\$1.89	\$1.89	0.00
	\$2.05	\$2.05	0.00
	\$1.79	\$1.79	0.00

LAMP CODE	MAINTENANCE RATES		
	OPTION-A	OPTION-B	OPTION-C
26	0.00	\$0.00	0.00
27	1.69	\$1.69	0.00
28	0.00	\$0.00	0.00
29	1.53	\$1.53	0.00
30	1.67	\$1.67	0.00
31	1.72	\$1.72	0.00
32	1.74	\$1.74	0.00
33	1.64	\$1.64	0.00
34	1.64	\$1.64	0.00
35	1.66	\$1.66	0.00
36	1.70	\$1.70	0.00
37	1.72	\$1.72	0.00
38	1.72	\$1.72	0.00
39	1.70	\$1.70	0.00
40	1.64	\$1.64	0.00
41	2.06	\$2.06	0.00
42	0.00	\$0.00	0.00
43	0.00	\$0.00	0.00
44	0.00	\$0.00	0.00
45	0.00	\$0.00	0.00
46	1.64	\$1.64	0.00
47	2.83	\$2.83	0.00
48	1.73	\$1.73	0.00
49	1.88	\$1.88	0.00
50	1.64	\$1.64	0.00

E-18 Phase I (Model Design Before True-Up)





Portland General Electric

1.09008  
 Equal % True-Up

MAINTENANCE RATES			
PROPOSED			
	OPTION-A	OPTION-B	OPTION-C
	\$0.00	\$0.00	0.00
	\$1.86	\$1.86	0.00
	\$1.90	\$1.90	0.00
	\$0.00	\$0.00	0.00
	\$1.79	\$1.79	0.00
	\$2.10	\$2.10	0.00
	\$2.09	\$2.09	0.00
	\$2.11	\$2.11	0.00
	\$1.71	\$1.71	0.00
	\$1.73	\$1.73	0.00
	\$1.76	\$1.76	0.00
	\$1.77	\$1.77	0.00
	\$3.19	\$3.19	0.00
	\$1.78	\$1.78	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$0.00	\$0.00	0.00
	\$2.43	\$2.43	0.00
	\$2.21	\$2.21	0.00
	\$2.22	\$2.22	0.00
	\$2.48	\$2.48	0.00
	\$2.50	\$2.50	0.00
Average Price====>	\$1.80	\$1.79	\$0.00

LAMP CODE	MAINTENANCE RATES		
	OPTION-A	OPTION-B	OPTION-C
76	0.00	\$0.00	0.00
77	1.71	\$1.71	0.00
78	1.74	\$1.74	0.00
79	0.00	\$0.00	0.00
80	1.64	\$1.64	0.00
81	1.93	\$1.93	0.00
82	1.92	\$1.92	0.00
83	1.94	\$1.94	0.00
84	1.57	\$1.57	0.00
85	1.59	\$1.59	0.00
86	1.61	\$1.61	0.00
87	1.62	\$1.62	0.00
88	2.93	\$2.93	0.00
89	1.63	\$1.63	0.00
90	0.00	\$0.00	0.00
91	0.00	\$0.00	0.00
92	0.00	\$0.00	0.00
93	0.00	\$0.00	0.00
94	0.00	\$0.00	0.00
95	2.23	\$2.23	0.00
96	2.03	\$2.03	0.00
97	2.04	\$2.04	0.00
98	2.28	\$2.28	0.00
99	2.29	\$2.29	0.00
Average Price====>	\$1.86	\$1.87	\$0.00

E-18 Phase I (Model Design Before True-Up)

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### Streetlight Repairs completed by Bill Code Customer

Repairs for

07

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Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
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#### 14001 - CITY OF PORTLAND

7449	03/02/2006	06/08/2006	B1-1-24A	11	Light is out	NW SL TZMIN 1400FS	Relamp Failure, Photo Control Failure, Circuit Failure, Free Related
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9578	04/14/2006	06/13/2006	D1-1-32A	4262	Light is out	3345 SW PALATINE ST	Relamp Failure, Photo Control Failure, Circuit Failure
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9928	04/28/2006	06/13/2006	D1-1-22B	373	Light is out	110 SW NEVADA ST	Relamp Failure, Photo Control Failure
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10209	05/09/2006	06/01/2006	D1-2-08C	212	Light is out	3551 SE 69 AV	Relamp Failure, Photo Control Failure
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10326	05/12/2006	06/01/2006	D1-2-08C	120	Light is out	6829 SE RHONE ST	Relamp Failure, Photo Control Failure
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10336	05/12/2006	06/16/2006	A1-2-31B	91902	Light is out	NE HALSEY ST 45 AV	Relamp Failure, Photo Control Failure
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10345	05/12/2006	06/26/2006	A1-2-26D	2255	Light is out	13737 NE HALSEY ST	Relamp Failure, Photo Control Failure
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10364	05/15/2006	06/01/2006	D1-2-20B	1820	Light is out	6712 SE 62 AV	Relamp Failure, Photo Control Failure
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10418	05/16/2006	06/04/2006	D1-1-01A	133	Light is cycling on and off	1202 SE 37 AV	Relamp Failure, Photo Control Failure
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10458	05/17/2006	06/30/2006	A1-2-22B	94740	Light is cycling on and off	11016 SE SANDY	Relamp Failure, Photo Control Failure, Head Replacement
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### Streetlight Repairs completed by Bill Code Customer

Repairs for June

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Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
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#### 14001 - CITY OF PORTLAND

10632	05/19/2006	06/22/2006	D1 1-33D	4005	Light is on during the day	1030 SW STEPHENSON ST	Photo Control Failure
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10535	05/18/2006	06/22/2006	D1 1-33A	3	Light is on during the day	10393 SW BOONE FY RD	Photo Control Failure
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10537	05/19/2006	06/13/2006	A1 1-13A	98502	Light is out.	PP&L NE 42 RAMP 1 LT SO LOMBARD EASTBOUND	Relamp Failure, Photo Control Failure
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10660	05/22/2006	06/30/2006	A1 2-33D	98401	Light is out.	420 NE 99TH AVE	Relamp Failure, Photo Control Failure
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10703	05/22/2006	06/30/2006	D1 2-06B	89	Light is out.	17431 SE WILSON ST	Relamp Failure, Photo Control Failure
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10705	05/23/2006	06/04/2006	D1 2-03C	8493	Light is on during the day	1853 SE 112 AV	Relamp Failure, Photo Control Failure
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10714	05/24/2006	06/05/2006	A1 1-22C	92246	Light is out.	PP&L ALLEY E/O MISSOURI 2 NO FALLING	Photo Control Failure
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10730	05/24/2006	06/08/2006	D1 1-32B	40	Light is out.	4416 SW DICKINSON ST	Relamp Failure, Photo Control Failure
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10731	05/24/2006	06/08/2006	D1 1-32B	39	Light is out.	4405 SW DICKINSON ST	Relamp Failure, Photo Control Failure
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10732	05/24/2006	06/08/2006	D1 1-31A	9397	Light is out.	4800 SW DICKINSON ST 12	Relamp Failure, Photo Control Failure
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10749	05/25/2006	06/04/2006	A1 2-28C	5813	Light is on during the day	1940 NE 122 AV	Photo Control Group
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10752	05/26/2006	06/06/2006	A1 2-25C	9002	Light is out.	2323 NE 148 PL	Relamp Failure
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10770	05/28/2006	06/08/2006	D1 1-08B	64	Light is out.	44 21 SW PATTON	Light Working
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10771	05/29/2006	06/09/2006	D1 2-16D	822	Light is out.	13719 SE CLINTON ST	Relamp Failure, Photo Control Failure
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10772	05/29/2006	06/09/2006	D1 2-11A	10432	Light is out.	13719 SE CLINTON ST	Light Working
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10774	05/30/2006	06/19/2006	A1 1-22A	89710	Light is out.	PP&L SE NE ALBERTA SP E/O RONDNEY	Relamp Failure, Photo Control Failure
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10775	05/30/2006	06/13/2006	A1 1-22A	89710	Light is out.	PP&L SE COR NE ALBERTA MALLORY	Relamp Failure, Photo Control Failure
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### Streetlight Repairs completed by Bill Code Customer

Repairs for June

Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
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#### 14001 - CITY OF PORTLAND

10823	05/31/2006	06/03/2006	D1-1-02C	138	Light is on during the day	1233 SE HARRISON ST	Relamp Failure
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10830	05/31/2006	06/04/2006	D1-2-03C	9637	Light is on during the day	1807 SE 112 AV	Relamp Failure, Photo Control Failure
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10845	06/01/2006	06/12/2006	D1-2-03A	9579	Light is out.	1119 SE 114 PL	Relamp Failure, Circuit Failure, Tree Related
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10875	06/02/2006	06/06/2006	A1-2-30A	99847	Light is out.	PPAL NE 62 AV / SIO KICKITAT ST	Relamp Failure, Photo Control Failure
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10878	06/02/2006	06/10/2006	D1-1-01D	306	Light is on during the day	1526 SE 40 AV	Photo Control Failure
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10885	06/02/2006	06/02/2006	A1-1-33D2	429	Light is out.	1731 NW EVERETT ST 101	Relamp Failure
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10887	06/02/2006	06/02/2006	D1-2-18B	190	Light is out.	4630 SE HOGGATE BL	Circuit Failure
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10889	06/02/2006	06/02/2006	A1-1-33B	56	Light is out.	2364 NW OVERTON ST 5	Relamp Failure
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10898	06/02/2006	06/02/2006	A1-1-32A	135	Light is out.	2520 NW WESTOVER RD	Relamp Failure, Photo Control Failure
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10900	06/02/2006	06/02/2006	D1-1-02C	9994	Light is out.	2037 SE SPRUCE AV	Tree Related
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10903	06/02/2006	06/02/2006	A1-2-32C	211	Light is out.	319 SE GILHAM AV	Relamp Failure
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10905	06/02/2006	06/02/2006	A1-1-33B	142	Light is out.	2218 NW PETTYGROVE ST	Relamp Failure
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10907	06/02/2006	06/02/2006	A1-1-28C	180	Light is out.	1617 NW 24 AV	Relamp Failure, Circuit Failure
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### Streetlight Repairs completed by Bill Code Customer

Repairs for June

Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
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14001 - CITY OF PORTLAND  
 10910 06/02/2006 06/04/2006 D1-2-10B 8760 Light is out 3414 SE 111 AV  
 Relamp Failure, Photo Control Failure

10927 06/05/2006 06/07/2006 A1-2-31A 340 Light is cycling on and off 6150 NE WILLOW ST 1  
 Relamp Failure

10929 06/05/2006 06/30/2006 A1-1-24B 9190 Light is out  
 Relamp Failure, Photo Control Failure  
 Power Door Replaced

10932 06/05/2006 06/12/2006 A1-1-28D 6 Light is out  
 Relamp Failure

10934 06/05/2006 06/07/2006 A1-1-15A 96605 Light is out  
 Relamp Broken

10967 06/05/2006 06/07/2006 A1-1-23A 98716 Light is cycling on and off  
 Relamp Failure

11028 06/07/2006 06/07/2006 A1-1-36B 241 Fix on the Fly  
 Starter Failure, Starter Failure

11061 06/08/2006 06/13/2006 A1-2-35A 10235 Light is on during the day  
 Photo Control Failure

11084 06/09/2006 06/19/2006 D1-2-03C 1658 Light is on during the day  
 Relamp Failure, Photo Control Failure

11094 06/09/2006 06/29/2006 D1-2-10C 2790 Light is out  
 Relamp Failure, Photo Control Failure

11102 06/09/2006 06/13/2006 D1-1-32A 1096 Light is out  
 Relamp Failure, Photo Control Failure

11104 06/09/2006 06/23/2006 D1-1-11A 338 Light is out  
 Relamp Failure

11110 06/09/2006 06/12/2006 D1-2-11A 2982 Light is out  
 Photo Control Failure



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### Streetlight Repairs completed by Bill Code Customer

Repairs for June

Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
<b>14001 - CITY OF PORTLAND</b>							
11112	06/09/2006	06/30/2006		D1-2-11B	389 Light is out	12615 SE POWELL BLVD	*Head Replacement
11115	06/09/2006	06/12/2006		D1-3-07D	2152 Light is out	FLAGGERS-POWELL VLY 1ST LIGHT W/O/F 174 AV	Light Working
11137	06/09/2006	06/13/2006		D1-1-33B	3728 Light is out	1455 SW STEPHENSON ST	*Relamp Failure, Photo Control Failure
11150	06/10/2006	06/14/2006		A1-1-09B	115 Light is out	8431 N CURTIS AV	*Relamp Failure, Photo Control Group
11183	06/12/2006	06/15/2006		D1-2-01C	10186 Light is cycling on and off	14602 SE CARUTHERS ST	*Relamp Failure
11240	06/13/2006	06/18/2006		A1-2-25A	7730 Light is out	15821 NE ROSE PKY	*Relamp Failure
11271	06/13/2006	06/15/2006		A1-1-09B	112 Light is out	8523 N CURTIS AV	Photo Control Failure
11290	06/14/2006	06/15/2006		A1-1-23C	94310 Light is out	PP&L NE 14TH AV 1 N/O SHAVER ST	*Relamp Failure, Photo Control Failure
11305	06/14/2006	06/21/2006		A1-1-13D	96004 Light is out	PP&L NE 35 AV 1 SP N/O KILLINGSWORTH ST	*Relamp Failure, Photo Control Failure
11328	06/15/2006	06/22/2006		D1-3-06C	12671 Light is cycling on and off	18946 SE MILL ST	*Starter Failure
11352	06/15/2006	06/21/2006		A1-1-13C	93405 Light is cycling on and off	6340 NE 31ST AV.	*Relamp Failure, Photo Control Failure
11381	06/16/2006	06/16/2006		A1-1-26A	99508 Light is out	2612 NE 23 AVE	Light Working
11383	06/16/2006	06/16/2006		A1-1-26D	98404 Light is cycling on and off	2424 NE 21 AVE	Light Working
11385	06/16/2006	06/16/2006		A1-1-28C	94403 Light is cycling on and off	2526-28 NE 13 AVE	Light Working

Report ID: SLS-8109M REV2  
Data Date: 07/01/2006

### Streetlight Repairs completed by Bill Code Customer

Repairs for June

Page 6 of 7  
UE 180  
COP/COG/LOC/209

Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activty Description
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#### 14001 - CITY OF PORTLAND

11415	06/16/2006	06/30/2006	A1 1-24B	94962	Light is on during the day	PP&L SW COR NE KILLINGSWORTH 33 AV	Relamp Failure, Photo Control Failure
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11417	06/16/2006	08/21/2006	A1 1-26D	2	Light is on during the day	PP&L NE LOMBARD ST 2 BLD 18TH AV W/S	Relamp Failure, Photo Control Failure
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11420	06/16/2006	06/21/2006	A1 1-13C	94208	Light is out	3270 NE AINSWORTH ST.	Relamp Failure, Photo Control Failure
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11426	06/16/2006	06/18/2006	D1 1-12C	22	Light is out	3605 SE 28 AV	Relamp Failure, Photo Control Failure
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11510	06/20/2006	06/30/2006	A1 1-14A	97905	Light is on during the day	PP&L NE COLUMBIA BLVD 3 EDO LOMBARD PL	Photo Control Failure
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11512	06/20/2006	06/22/2006	A1 1-10A	97800	Light is on during the day	PP&L N VANCOUVER AV 1 S/O SCHMEER RD W/S	Relamp Failure
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11532	06/21/2006	06/21/2006	A1 1-35C	12	Fix on the fly	1336 E BURNSIDE ST	Relamp Failure, Photo Control Failure
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11544	06/21/2006	06/22/2006	A1 2-27C	6228	Light is out	PP&L NE COR EUGENE ST 108 AV	Relamp Failure, Photo Control Failure
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11546	06/21/2006	06/22/2006	A1 2-27C	6229	Light is out	PP&L NE EUGENE ST 1 W/O 111 AV	Relamp Failure, Photo Control Failure
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11565	06/21/2006	06/25/2006	A1 1-16A	170	Light is out	2210 N DEKUM ST	Relamp Failure, Photo Control Failure
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Report ID: SLS-8109M REV2  
 Data Date: 07/01/2006

Streetlight Repairs completed by Bill Code Customer

Repairs for June

UE 180  
 COP/COGL O/C/209

Problem Number	Reported Date	Completed Date	Map	Mount	Problem Description	Address Location	Activity Description
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14001 - CITY OF PORTLAND

11577	06/22/2006	06/25/2006	B1-1-01C	78	Light is out	7540 N RENO AV	Relamp Failure
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11610	06/22/2006	06/26/2006	A1-2-30D	99148	Light is out	PP&L NE 61 AV HANCOCK ST	Relamp Failure, Retractor Broken
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11655	06/23/2006	06/28/2006	A1-2-29A	99943	Light is out	PP&L NE 80 AV 1 S/O FREMONT ST	Relamp Failure, Circuit Failure, Photo Control Failure
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11678	06/26/2006	06/28/2006	A1-1-21A	8	Light is out	1529 N PRESCOTT ST	Relamp Failure, Photo Control Failure
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11711	06/26/2006	06/28/2006	B1-1-12A	113	Light is out	7715 N JERSEY ST	Relamp Failure, Photo Control Failure
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11821	06/28/2006	06/28/2006	A1-1-36C	73	Fix on the Fly	2812 SE ASH ST	Starter Failure, Starter Failure
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**STREETLIGHT MAINTENANCE FREQUENCY SURVEY**  
**City of Portland**  
**January - June 2006 (six months)**  
 Revised 8/3/06 by WCK

PRIMARY REPAIR CODE	DESCRIPTION	MONTHS IN SAMPLE =====> TOTAL COMPONENTS	----- TOTALS -----		1992 SURVEY Results	2002-2004 GRID System data Results
			6 ANNUALIZED COMPONENTS	SURVEY FREQUENCY		
AB	LAMPS	967	1934	4.39%	5.51%	7.47%
BB	PHOTO-CONTROLS	817	1634	3.71%	4.82%	5.43%
CA	STARTERS (HPS Only)	71	142	0.32%	0.33%	0.66%
EA	REFRACTORS	16	32	0.07%	0.28%	0.06%
FA	CIRCUITS	155	310	0.70%	0.16%	1.00%
LC/HR	LUMINAIRE REPLACEMENT	121	242	0.55%	0.12%	0.84%
OTH	OTHER - NOT DEFINED	27	54	0.12%	0.63%	0.67%
PD	POWER DOOR REPLACEMENT	21	42	0.10%	0.04%	0.23%
		=====	=====	=====	=====	=====
		2195	4390	9.97%	8.92%	17.95%
STREETLIGHT SYSTEM COUNTS: (As of April 2005)		TOTAL FIXTURES	COUNT	%		
		POWER DOORS	44033	100.00%		
		Non-PD (HPS)	33542	76.17%		
		HPS Only	9557	21.70%		
		NON-HPS	908	2.06%		
		NON-PDs	26	0.06%		
			0	0.00%		

- (1) The "LC" and "HR" category in the GRID Data System both refer to replacement of the luminaire.
- (2) The "POWER DOOR REPLACEMENT" (PD) category derived from storeroom inventory statistics.
- (3) The survey data from field crews which had missing manhours were eliminated from the sample.  
 The majority of the missing data was from the four-man crews and since relampers do a large number of trips in relation to the total trips, a reduction in manhours per trip occurred.  
 There is no way to compensate for this in this study.

Portland General Electric

STREETLIGHT MAINTENANCE EXPENSE  
2007 Costs FOR SPECIAL FIXTURES  
COBRA HEAD - POWER DOOR FIXTURES  
High Pressure Sodium

Unit Costs		Code 84 9,500-L	Code 85 16,000-L	Code 89 22,000-L	Code 86 25,500-L	Code 87 48,000-L
Group Lamp + PC Replacement Lamp & PC Plus 24.0% Stores Labor ( 60 LAMPS/DAY)	\$131.80 /HR	\$15.56 17.57	\$16.16 17.57	\$16.20 17.57	\$16.26 17.57	\$17.11 17.57
Cost per Lamp & PC		33.13	33.74	33.78	33.83	34.68
Emergency Lamp Replacement Lamp Plus 24.0% Stores Labor captured elsewhere	\$0.00 /HR 0.000 hrs	10.87 0.00	11.48 0.00	11.52 0.00	11.57 0.00	12.42 0.00
Cost per Lamp		10.87	11.48	11.52	11.57	12.42
Emergency PC Replacement PC Plus 24.0% Stores Labor captured elsewhere	\$0.00 /HR 0.000 hrs	4.69 0.00	4.69 0.00	4.69 0.00	4.69 0.00	4.69 0.00
Cost per Lamp		4.69	4.69	4.69	4.69	4.69
Emergency Lamp and/or PC Replacement Materials captured elsewhere Labor (.667 Man-hours)	\$126.92 /HR 0.667 hrs	0.00 84.67	0.00 84.67	0.00 84.67	0.00 84.67	0.00 84.67
Cost per Lamp & PC		84.67	84.67	84.67	84.67	84.67
Emergency Glassware Breakage Glass Plus 24.0% Stores Labor (.647 Man-hours)	\$123.22 /HR 0.647 hrs	12.50 79.67	12.50 79.67	40.00 79.67	40.00 79.67	40.00 79.67
Cost per Glassware		92.17	92.17	119.67	119.67	119.67
Emergency Starter Replacement(HPS Only) Starter Plus 24.0% Stores Labor (.807 Man-hours)	\$122.04 /HR 0.525 hrs	34.13 64.05	34.13 64.05	37.10 64.05	37.10 64.05	37.10 64.05
Cost per Photocell		98.18	98.18	101.14	101.14	101.14
Emergency Circuit Replacement Material Plus 24.0% Stores Labor (.905 Man-hours)	\$122.04 /HR 0.905 hrs	0.00 110.40	0.00 110.40	0.00 110.40	0.00 110.40	0.00 110.40
Cost per Circuit		110.40	110.40	110.40	110.40	110.40
Emergency Luminaire Replacement Fixture (COP Storeroom) Labor (1.714 Man-hours)	\$160.59 /HR 1.028 hrs	108.02 165.16	109.22 165.16	141.53 165.16	147.51 165.16	141.17 165.16
Cost per Luminaire		273.18	274.38	306.69	312.67	306.33
Other Emergency Repairs - Not Defined Fixture Plus 24.0% Stores Labor (.993 Man-hours)	\$122.04 /HR 0.993 hrs	0.00 121.17	0.00 121.17	0.00 121.17	0.00 121.17	0.00 121.17
Cost per Luminaire		121.17	121.17	121.17	121.17	121.17
Power Doors - Power Doors Plus 24.0% Stores Labor (1.208 Man-hours)	\$122.04 /HR 0.725 hrs	63.36 88.48	69.12 88.48	80.64 88.48	86.40 88.48	92.16 88.48
Cost per POWER DOOR		151.84	157.60	169.12	174.88	180.64

Portland General Electric

**STREETLIGHT MAINTENANCE  
 LABOR RATES  
 March 1, 2007**

<u>CATEGORY: DESCRIPTION</u>	<u>LOADING</u>	<u>STRAIGHT TIME</u>
<b><u>LAMP REPLACER:(Two-Man Crew)</u></b>		
Hourly Rate		\$34.26
Line Truck Driver "A"		21.54
Payroll loading	APPD 5-201-01 82%	46.01
Tool loading	APPD 5-201-01 9%	3.08
Transportation (Man-lift)	Reduced Cost 80%	26.91
Hourly Rate Per Crew		<u>\$131.80 LAMP REPLACER Rate</u>
<b><u>EAGLE:(One-Man Crew)</u></b>		
Hourly Rate		\$35.98
Payroll loading	APPD 5-201-01 82%	29.67
Tool loading	APPD 5-201-01 9%	3.24
Transportation (Man-lift)	Reduced Cost 85%	28.59
Hourly Rate Per Man		<u>\$97.48 EAGLE Rate</u>
<b><u>LINE CREW:(Typical 3-Man Crew)</u></b>		
Working Line Foreman		\$38.38
Journeyman Lineman		34.26
Line Truck Driver "B"		24.84
Payroll loading	APPD 5-201-01 82%	80.37
Tool loading	APPD 5-201-01 9%	8.77
Transportation (Man-lift)	APPD 5-201-01 Inflation Adjusted 100.0%	33.64
Total Rate per vehicle	Hourly Rate Per Crew	<u>\$220.26 THREE-MAN CREW Rate</u>
<b><u>Weighted Rate for Emergency Lamp and/or Photocell Replacement:</u></b>		
50.0% done by Lamp Replacers.		
40.0% done by Eagles.		
10.0% done by Three-man crews.	Hourly Rate	<u>126.921</u>
<b><u>Weighted Rate for Emergency Glassware Replacement:</u></b>		
25.0% done by Eagles.		
75.0% done by Lamp Replacers.	Hourly Rate	<u>\$123.22</u>
<b><u>Weighted Rate for Emergency Starter, Other, Circuit &amp; Power Door Replacement:</u></b>		
80.0% done by Eagles.		
20.0% done by Three-man crews.	Hourly Rate	<u>\$122.04</u>
<b><u>Weighted Rate for Emergency Luminaire Replacement:</u></b>		
5.0% done by Lamp Replacers.		
45.0% done by Eagles.		
50.0% done by Three-man crews.	Hourly Rate	<u>160.588</u>

Stores Loading 24% Per 2007 Budget Work Sheet

**GROUP LAMP PROGRAM Assumptions:**

- a) Group Lamp Cycle = 5 Years
- b) Group Lamp Rate = 60 Per Workday
- c) Group Lamp Cost = \$ 17.57 Per Lamp

# 2007 Street and Area Light Cost-Of-Service Study

UE 180  
COP/COG/LOC/212  
p. 2

2007 / 2002

## Highlights to 2007 Cost-Of-Service Study:

(Compared to the 2001 Rate Case)

- **Investment** – Investment in Poles and Lights is down due to <sup>new study of</sup> depreciation of equipment and less growth in PGE owned streetlight equipment. Average equipment costs have increased slightly. Average investment revenues in poles and luminaires were reduced by 10%.
- **Labor costs** – Journeyman Lineman wages have increased by 29% or about 4.3% per year since 2001.
- **Transportation costs** – Increased by 80% since 2001.
- **Maintenance - Repair Efficiencies** – efficiencies ↑
  1. Increased Group Lamp Frequency by 50% (from 40 to 60 lamps per day), which reduces the overall labor cost per unit. Group Lamp labor component compares favorably to recent contract bids.
  2. Repair times for emergency starter, luminaire and Power Door replacements were reduced by over 35% on average. c.f. old study in '92
- **Circuit charges** – Investment in circuits is applied to all Option A & B and about 2,500 Option C Luminaires. Charges have increased from \$0.64 <sup>very old #</sup> (as stipulated in UE-115) to \$1.52 per light per month or about 139%. <sub>would have been \$1.35 w/o stipulation</sub>
- **CIO Rate Design** – (Customer Impact Offset) Reduced overall increase to distribution energy costs for the streetlight class by about \$900,000. This mechanism was used to limit the increase in distribution energy costs to no more than 2 times the average for each class by schedule.
- **Impacts to the Streetlight Jurisdictions** –  
The impact to each jurisdiction varies due to the mix of lights and poles. (Increases vary from 4% to 24% for the top 80% of lighting jurisdictions) <sup>needs to be communicated to individual jurisdictions</sup>
- Proposed prices do not include the impact of the Port Westward Plant.

manually tracked

Portland  
Gresham

Group Lamp : no notice to customer

UE 180  
COP/COG/LOC/213

Street Light Burning Time in Minutes  
Sun Rise and Sun Set for 1999  
Portland, OR

Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		
	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	Dawn	Midnight	
1	853	412	795	373	712	333	613	292	522	263	453	218	443	207	495	231	583	281	677	339	772	392	841	421	
2	852	411	793	372	709	331	610	290	520	262	452	217	443	207	497	232	586	283	681	341	774	393	843	422	
3	851	410	790	370	706	330	607	289	516	260	450	216	444	207	500	234	589	285	683	342	778	395	844	422	
4	850	409	787	369	703	329	604	288	514	259	448	216	445	208	503	235	592	287	686	344	780	396	845	422	
5	849	408	784	367	699	327	600	286	511	248	448	215	446	208	505	236	595	289	690	346	783	398	847	422	
6	847	407	782	366	696	326	597	285	509	247	447	214	447	208	508	238	599	291	693	348	786	399	849	423	
7	846	406	778	364	694	325	594	284	505	245	446	213	448	209	510	239	601	292	696	350	788	400	849	423	
8	845	405	776	363	690	323	590	282	503	244	445	213	449	209	513	241	604	294	699	352	791	401	851	423	
9	844	404	773	361	687	322	587	281	501	243	444	212	451	210	518	242	607	296	703	354	794	403	852	423	
10	842	403	770	360	684	321	585	280	498	242	444	212	452	210	519	244	611	298	705	355	796	404	853	423	
11	841	402	767	358	680	319	582	279	495	240	443	211	454	211	521	245	614	300	708	357	799	405	853	423	
12	839	400	764	357	677	318	578	277	493	239	441	210	454	211	524	247	617	302	712	359	801	406	854	423	
13	837	399	762	356	673	316	575	276	491	238	441	210	456	212	526	248	620	304	715	361	804	407	855	423	
14	836	398	758	354	671	315	572	275	488	237	440	209	458	213	530	250	623	306	718	363	806	408	856	423	
15	834	397	756	353	668	314	569	274	486	236	440	209	460	214	533	252	627	308	721	364	808	409	856	422	
16	832	395	752	351	664	312	566	272	484	235	440	209	461	214	535	253	630	310	724	366	811	410	857	422	
17	830	394	750	350	661	311	563	271	481	233	439	208	463	215	538	255	633	312	727	368	813	411	857	422	
18	828	393	746	348	658	310	560	270	479	232	439	208	465	216	541	256	636	314	731	370	815	412	858	422	
19	826	391	743	347	655	309	557	268	477	231	439	208	467	217	544	258	640	316	733	371	818	413	858	421	
20	824	390	740	345	651	307	554	267	475	230	439	207	469	218	547	260	643	318	736	373	820	414	858	421	
21	822	389	737	344	648	306	551	266	473	229	439	207	471	219	550	262	645	319	740	375	823	415	858	420	
22	819	387	734	343	645	305	548	264	471	228	439	207	473	220	552	263	648	321	742	376	825	416	858	420	
23	817	386	731	341	641	303	545	263	469	227	439	207	475	221	556	265	652	323	745	378	827	417	858	419	
24	815	385	728	340	639	302	542	262	467	226	440	207	477	222	559	267	655	325	749	380	828	417	858	419	
25	812	383	724	338	636	301	540	261	465	225	440	207	479	223	562	269	658	327	751	381	831	418	857	418	
26	810	382	722	337	632	299	536	259	464	224	441	207	481	224	564	270	661	329	754	383	833	419	857	417	
27	807	380	719	336	629	298	533	258	462	223	441	207	483	225	568	272	664	331	758	385	834	419	857	417	
28	805	379	715	334	626	297	531	257	460	222	441	207	486	226	571	274	668	333	760	386	836	420	856	416	
29	802	377	711	333	622	295	527	255	458	221	442	207	488	227	574	276	671	335	764	388	838	420	855	415	
30	800	376	708	332	619	294	525	254	457	220	442	207	491	229	577	278	674	337	766	389	840	421	855	414	
31	798	375	705	331	616	293	522	253	455	219	442	207	493	230	579	279	677	339	769	391	842	421	854	413	
Daylight Savings Adj																									
Total Minutes	25713	12233	21176	9897	20591	9691	16981	8184	15049	7288	13283	6305	14372	6690	18617	7871	18846	9266	22496	11335	24252	12258	26459	13034	
Dusk to Dawn Hours	428.6	203.9	352.9	165.0	343.2	161.5	283.0	136.4	250.8	121.5	221.4	105.1	239.5	111.5	277.0	131.2	314.1	374.9	374.9	188.9	404.2	204.3	441.0	217.2	
Dusk to Midnight Hours																									
Pacific																									
Total Annual Burning Hours																									
Dusk to Dawn Hours																									
Dusk to Midnight Hours																									

Burning times are 30 minutes after sunset to 30 minutes before sunrise.  
Dusk to midnight timers are not adjusted for daylight savings time



Date	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	7:32	17:17	9:45	294:00:00	7:13	17:39	10:26	6:21	13:34	452:09:00
2	7:31	17:18	9:48	303:48:00	7:12	17:40	10:28	6:20	13:32	465:41:00
3	7:30	17:20	9:50	313:38:00	7:11	17:42	10:31	6:18	13:29	479:10:00
4	7:28	17:21	9:53	323:31:00	7:09	17:43	10:34	6:17	13:26	492:36:00
5	7:27	17:23	9:56	333:27:00	7:08	17:45	10:37	6:15	13:23	505:59:00
6	7:26	17:24	9:59	343:26:00	7:07	17:46	10:39	6:14	13:21	519:20:00
7	7:24	17:26	10:01	353:27:00	7:05	17:48	10:43	6:12	13:17	532:37:00
8	7:23	17:27	10:04	363:31:00	7:04	17:49	10:45	6:11	13:15	545:52:00
9	7:22	17:29	10:07	373:38:00	7:03	17:51	10:48	6:09	13:12	559:04:00
10	7:20	17:30	10:10	383:48:00	7:01	17:52	10:51	6:08	13:09	572:13:00
11	7:19	17:32	10:13	394:01:00	7:00	17:54	10:54	6:06	13:06	585:19:00
12	7:17	17:33	10:16	404:17:00	6:58	17:55	10:57	6:05	13:03	598:22:00
13	7:16	17:34	10:19	414:36:00	6:57	17:56	10:59	6:04	13:01	611:23:00
14	7:14	17:36	10:22	424:58:00	6:55	17:58	11:03	6:02	12:57	624:20:00
15	7:13	17:37	10:25	435:23:00	6:54	17:59	11:05	6:01	12:55	637:15:00
16	7:11	17:39	10:28	445:51:00	6:52	18:01	11:09	5:59	12:51	650:06:00
17	7:09	17:40	10:31	456:22:00	6:50	18:02	11:12	5:58	12:48	662:54:00
18	7:08	17:42	10:34	466:56:00	6:49	18:04	11:15	5:56	12:45	675:39:00
19	7:06	17:43	10:37	477:33:00	6:47	18:05	11:18	5:55	12:42	688:21:00
20	7:05	17:45	10:40	488:13:00	6:46	18:07	11:21	5:53	12:39	701:00:00
21	7:03	17:46	10:43	498:56:00	6:44	18:08	11:24	5:52	12:36	713:36:00
22	7:01	17:47	10:46	509:42:00	6:42	18:09	11:27	5:51	12:33	726:09:00
23	7:00	17:49	10:49	520:31:00	6:41	18:11	11:30	5:49	12:30	738:39:00
24	6:58	17:50	10:52	531:23:00	6:39	18:12	11:33	5:48	12:27	751:06:00
25	6:56	17:52	10:55	542:18:00	6:37	18:14	11:37	5:46	12:23	763:29:00
26	6:54	17:53	10:59	553:17:00	6:35	18:15	11:40	5:45	12:20	775:49:00
27	6:53	17:54	11:02	564:19:00	6:34	18:16	11:42	5:44	12:18	788:07:00
28	6:51	17:56	11:05	575:24:00	6:32	18:18	11:46	5:42	12:14	800:21:00



Mar	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	6:49	17:57	11:08	586:32:00	6:30	18:19	11:49	5:41	12:11	812:32:00
2	6:47	17:59	11:11	597:43:00	6:28	18:21	11:53	5:39	12:07	824:39:00
3	6:46	18:00	11:14	608:57:00	6:27	18:22	11:55	5:38	12:05	836:44:00
4	6:44	18:01	11:18	620:15:00	6:25	18:23	11:58	5:37	12:02	848:46:00
5	6:42	18:03	11:21	631:36:00	6:23	18:25	12:02	5:35	11:58	860:44:00
6	6:40	18:04	11:24	643:00:00	6:21	18:26	12:05	5:34	11:55	872:39:00
7	6:38	18:05	11:27	654:27:00	6:19	18:27	12:08	5:33	11:52	884:31:00
8	6:36	18:07	11:30	665:57:00	6:17	18:29	12:12	5:31	11:48	896:19:00
9	6:35	18:08	11:34	677:31:00	6:16	18:30	12:14	5:30	11:46	908:05:00
10	6:33	18:10	11:37	689:08:00	6:14	18:32	12:18	5:28	11:42	919:47:00
11	6:31	18:11	11:40	700:48:00	6:12	18:33	12:21	5:27	11:39	931:26:00
12	6:29	18:12	11:43	712:31:00	6:10	18:34	12:24	5:26	11:36	943:02:00
13	6:27	18:14	11:46	724:17:00	6:08	18:36	12:28	5:24	11:32	954:34:00
14	6:25	18:15	11:50	736:07:00	6:06	18:37	12:31	5:23	11:29	966:03:00
15	6:23	18:16	11:53	748:00:00	6:04	18:38	12:34	5:22	11:26	977:29:00
16	6:21	18:18	11:56	759:56:00	6:02	18:40	12:38	5:20	11:22	988:51:00
17	6:20	18:19	11:59	771:55:00	6:01	18:41	12:40	5:19	11:20	1000:11:00
18	6:18	18:20	12:03	783:58:00	5:59	18:42	12:43	5:18	11:17	1011:28:00
19	6:16	18:22	12:06	796:04:00	5:57	18:44	12:47	5:16	11:13	1022:41:00
20	6:14	18:23	12:09	808:13:00	5:55	18:45	12:50	5:15	11:10	1033:51:00
21	6:12	18:24	12:12	820:25:00	5:53	18:46	12:53	5:14	11:07	1044:58:00
22	6:10	18:25	12:16	832:41:00	5:51	18:47	12:56	5:13	11:04	1056:02:00
23	6:08	18:27	12:19	845:00:00	5:49	18:49	13:00	5:11	11:00	1067:02:00
24	6:06	18:28	12:22	857:22:00	5:47	18:50	13:03	5:10	10:57	1077:59:00
25	6:04	18:29	12:25	869:47:00	5:45	18:51	13:06	5:09	10:54	1088:53:00
26	6:02	18:31	12:28	882:15:00	5:43	18:53	13:10	5:07	10:50	1099:43:00
27	6:00	18:32	12:32	894:47:00	5:41	18:54	13:13	5:06	10:47	1110:30:00
28	5:59	18:33	12:35	907:22:00	5:40	18:55	13:15	5:05	10:45	1121:15:00
29	5:57	18:35	12:38	920:00:00	5:38	18:57	13:19	5:03	10:41	1131:56:00
30	5:55	18:36	12:41	932:41:00	5:36	18:58	13:22	5:02	10:38	1142:34:00
31	5:53	18:37	12:44	945:25:00	5:34	18:59	13:25	5:01	10:35	1153:09:00

Apr	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	5:51	18:39	12:48	958:13:00	5:32	19:01	13:29	4:59	10:31	1163:40:00
2	5:49	19:40	12:51	971:04:00	5:30	20:02	14:32	3:58	9:28	1173:08:00
3	6:47	19:41	12:54	983:58:00	6:28	20:03	13:35	3:57	10:25	1183:33:00
4	6:45	19:42	12:57	996:55:00	6:26	20:04	13:38	3:56	10:22	1193:55:00
5	6:43	19:44	13:00	1009:55:00	6:24	20:06	13:42	3:54	10:18	1204:13:00
6	6:41	19:45	13:04	1022:59:00	6:22	20:07	13:45	3:53	10:15	1214:28:00
7	6:40	19:46	13:07	1036:06:00	6:21	20:08	13:47	3:52	10:13	1224:41:00
8	6:38	19:48	13:10	1049:16:00	6:19	20:10	13:51	3:50	10:09	1234:50:00
9	6:36	19:49	13:13	1062:29:00	6:17	20:11	13:54	3:49	10:06	1244:56:00
10	6:34	19:50	13:16	1075:45:00	6:15	20:12	13:57	3:48	10:03	1254:59:00
11	6:32	19:51	13:19	1089:04:00	6:13	20:13	14:00	3:47	10:00	1264:59:00
12	6:30	19:53	13:22	1102:26:00	6:11	20:15	14:04	3:45	9:56	1274:55:00
13	6:29	19:54	13:25	1115:51:00	6:10	20:16	14:06	3:44	9:54	1284:49:00
14	6:27	19:55	13:29	1129:20:00	6:08	20:17	14:09	3:43	9:51	1294:40:00
15	6:25	19:57	13:32	1142:52:00	6:06	20:19	14:13	3:41	9:47	1304:27:00
16	6:23	19:58	13:35	1156:27:00	6:04	20:20	14:16	3:40	9:44	1314:11:00
17	6:21	19:59	13:38	1170:05:00	6:02	20:21	14:19	3:39	9:41	1323:52:00
18	6:20	20:01	13:41	1183:46:00	6:01	20:23	14:22	3:37	9:38	1333:30:00
19	6:18	20:02	13:44	1197:30:00	5:59	20:24	14:25	3:36	9:35	1343:05:00
20	6:16	20:03	13:47	1211:17:00	5:57	20:25	14:28	3:35	9:32	1352:37:00
21	6:15	20:04	13:50	1225:07:00	5:56	20:26	14:30	3:34	9:30	1362:07:00
22	6:13	20:06	13:53	1239:00:00	5:54	20:28	14:34	3:32	9:26	1371:33:00
23	6:11	20:07	13:56	1252:56:00	5:52	20:29	14:37	3:31	9:23	1380:56:00
24	6:10	20:08	13:59	1266:55:00	5:51	20:30	14:39	3:30	9:21	1390:17:00
25	6:08	20:10	14:02	1280:57:00	5:49	20:32	14:43	3:28	9:17	1399:34:00
26	6:06	20:11	14:05	1295:02:00	5:47	20:33	14:46	3:27	9:14	1408:48:00
27	6:05	20:12	14:07	1309:09:00	5:46	20:34	14:48	3:26	9:12	1418:00:00
28	6:03	20:13	14:10	1323:19:00	5:44	20:35	14:51	3:25	9:09	1427:09:00
29	6:02	20:15	14:13	1337:32:00	5:43	20:37	14:54	3:23	9:06	1436:15:00
30	6:00	20:16	14:16	1351:48:00	5:41	20:38	14:57	3:22	9:03	1445:18:00

May	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON	BEFORE MID NIGHT	AFTER MIDNIGHT		
1	5:58	20:17	14:19	1366:07:00	5:39	20:39	15:00	3:21	9:00	1454:18:00
2	5:57	20:18	14:22	1380:29:00	5:38	20:40	15:02	3:20	8:58	1463:16:00
3	5:55	20:20	14:24	1394:53:00	5:36	20:42	15:06	3:18	8:54	1472:10:00
4	5:54	20:21	14:27	1409:20:00	5:35	20:43	15:08	3:17	8:52	1481:02:00
5	5:53	20:22	14:30	1423:50:00	5:34	20:44	15:10	3:16	8:50	1489:52:00
6	5:51	20:24	14:32	1438:22:00	5:32	20:46	15:14	3:14	8:46	1498:38:00
7	5:50	20:25	14:35	1452:57:00	5:31	20:47	15:16	3:13	8:44	1507:22:00
8	5:48	20:26	14:38	1467:35:00	5:29	20:48	15:19	3:12	8:41	1516:03:00
9	5:47	20:27	14:40	1482:15:00	5:28	20:49	15:21	3:11	8:39	1524:42:00
10	5:46	20:28	14:43	1496:58:00	5:27	20:50	15:23	3:10	8:37	1533:19:00
11	5:44	20:30	14:45	1511:43:00	5:25	20:52	15:27	3:08	8:33	1541:52:00
12	5:43	20:31	14:48	1526:31:00	5:24	20:53	15:29	3:07	8:31	1550:23:00
13	5:42	20:32	14:50	1541:21:00	5:23	20:54	15:31	3:06	8:29	1558:52:00
14	5:41	20:33	14:52	1556:13:00	5:22	20:55	15:33	3:05	8:27	1567:19:00
15	5:40	20:34	14:55	1571:08:00	5:21	20:56	15:35	3:04	8:25	1575:44:00
16	5:38	20:36	14:57	1586:05:00	5:19	20:58	15:39	3:02	8:21	1584:05:00
17	5:37	20:37	14:59	1601:04:00	5:18	20:59	15:41	3:01	8:19	1592:24:00
18	5:36	20:38	15:02	1616:06:00	5:17	21:00	15:43	3:00	8:17	1600:41:00
19	5:35	20:39	15:04	1631:10:00	5:16	21:01	15:45	2:59	8:15	1608:56:00
20	5:34	20:40	15:06	1646:16:00	5:15	21:02	15:47	2:58	8:13	1617:09:00
21	5:33	20:41	15:08	1661:24:00	5:14	21:03	15:49	2:57	8:11	1625:20:00
22	5:32	20:42	15:10	1676:34:00	5:13	21:04	15:51	2:56	8:09	1633:29:00
23	5:31	20:43	15:12	1691:46:00	5:12	21:05	15:53	2:55	8:07	1641:36:00
24	5:30	20:44	15:14	1707:00:00	5:11	21:06	15:55	2:54	8:05	1649:41:00
25	5:30	20:45	15:16	1722:16:00	5:11	21:07	15:56	2:53	8:04	1657:45:00
26	5:29	20:46	15:18	1737:34:00	5:10	21:08	15:58	2:52	8:02	1665:47:00
27	5:28	20:47	15:19	1752:53:00	5:09	21:09	16:00	2:51	8:00	1673:47:00
28	5:27	20:48	15:21	1768:14:00	5:08	21:10	16:02	2:50	7:58	1681:45:00
29	5:27	20:49	15:23	1783:37:00	5:08	21:11	16:03	2:49	7:57	1689:42:00
30	5:26	20:50	15:24	1799:01:00	5:07	21:12	16:05	2:48	7:55	1697:37:00
31	5:25	20:51	15:26	1814:27:00	5:06	21:13	16:07	2:47	7:53	1705:30:00

Jun	Sunrise	Sunset	Accumulated		TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
			Length of Day	length of day	TURN OFF	TURN ON	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	5:25	20:52	15:27	1829:54:00	5:06	21:14	16:08	2:46	7:52	1713:22:00
2	5:24	20:53	15:29	1845:23:00	5:05	21:15	16:10	2:45	7:50	1721:12:00
3	5:24	20:54	15:30	1860:53:00	5:05	21:16	16:11	2:44	7:49	1729:01:00
4	5:23	20:54	15:31	1876:24:00	5:04	21:16	16:12	2:44	7:48	1736:49:00
5	5:23	20:55	15:32	1891:56:00	5:04	21:17	16:13	2:43	7:47	1744:36:00
6	5:22	20:56	15:34	1907:30:00	5:03	21:18	16:15	2:42	7:45	1752:21:00
7	5:22	20:57	15:35	1923:05:00	5:03	21:19	16:16	2:41	7:44	1760:05:00
8	5:22	20:57	15:36	1938:41:00	5:03	21:19	16:16	2:41	7:44	1767:49:00
9	5:21	20:58	15:37	1954:18:00	5:02	21:20	16:18	2:40	7:42	1775:31:00
10	5:21	20:59	15:37	1969:55:00	5:02	21:21	16:19	2:39	7:41	1783:12:00
11	5:21	20:59	15:38	1985:33:00	5:02	21:21	16:19	2:39	7:41	1790:53:00
12	5:21	21:00	15:39	2001:12:00	5:02	21:22	16:20	2:38	7:40	1798:33:00
13	5:21	21:00	15:40	2016:52:00	5:02	21:22	16:20	2:38	7:40	1806:13:00
14	5:21	21:01	15:40	2032:32:00	5:02	21:23	16:21	2:37	7:39	1813:52:00
15	5:21	21:01	15:41	2048:13:00	5:02	21:23	16:21	2:37	7:39	1821:31:00
16	5:21	21:02	15:41	2063:54:00	5:02	21:24	16:22	2:36	7:38	1829:09:00
17	5:21	21:02	15:41	2079:35:00	5:02	21:24	16:22	2:36	7:38	1836:47:00
18	5:21	21:02	15:42	2095:17:00	5:02	21:24	16:22	2:36	7:38	1844:25:00
19	5:21	21:03	15:42	2110:59:00	5:02	21:25	16:23	2:35	7:37	1852:02:00
20	5:21	21:03	15:42	2126:41:00	5:02	21:25	16:23	2:35	7:37	1859:39:00
21	5:21	21:03	15:42	2142:23:00	5:02	21:25	16:23	2:35	7:37	1867:16:00
22	5:21	21:03	15:42	2158:05:00	5:02	21:25	16:23	2:35	7:37	1874:53:00
23	5:22	21:03	15:42	2173:47:00	5:03	21:25	16:22	2:35	7:38	1882:31:00
24	5:22	21:04	15:42	2189:29:00	5:03	21:26	16:23	2:34	7:37	1890:08:00
25	5:22	21:04	15:41	2205:10:00	5:03	21:26	16:23	2:34	7:37	1897:45:00
26	5:23	21:04	15:41	2220:51:00	5:04	21:26	16:22	2:34	7:38	1905:23:00
27	5:23	21:04	15:40	2236:31:00	5:04	21:26	16:22	2:34	7:38	1913:01:00
28	5:24	21:04	15:40	2252:11:00	5:05	21:26	16:21	2:34	7:39	1920:40:00
29	5:24	21:03	15:39	2267:50:00	5:05	21:25	16:20	2:35	7:40	1928:20:00
30	5:25	21:03	15:39	2283:29:00	5:06	21:25	16:19	2:35	7:41	1936:01:00

Jul	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	5:25	21:03	15:38	2299:07:00	5:06	21:25	16:19	2:35	7:41	1943:42:00
2	5:26	21:03	15:37	2314:44:00	5:07	21:25	16:18	2:35	7:42	1951:24:00
3	5:26	21:03	15:36	2330:20:00	5:07	21:25	16:18	2:35	7:42	1959:06:00
4	5:27	21:02	15:35	2345:55:00	5:08	21:24	16:16	2:36	7:44	1966:50:00
5	5:28	21:02	15:34	2361:29:00	5:09	21:24	16:15	2:36	7:45	1974:35:00
6	5:28	21:02	15:33	2377:02:00	5:09	21:24	16:15	2:36	7:45	1982:20:00
7	5:29	21:01	15:32	2392:34:00	5:10	21:23	16:13	2:37	7:47	1990:07:00
8	5:30	21:01	15:31	2408:05:00	5:11	21:23	16:12	2:37	7:48	1997:55:00
9	5:31	21:00	15:30	2423:35:00	5:12	21:22	16:10	2:38	7:50	2005:45:00
10	5:31	21:00	15:28	2439:03:00	5:12	21:22	16:10	2:38	7:50	2013:35:00
11	5:32	20:59	15:27	2454:30:00	5:13	21:21	16:08	2:39	7:52	2021:27:00
12	5:33	20:59	15:26	2469:56:00	5:14	21:21	16:07	2:39	7:53	2029:20:00
13	5:34	20:58	15:24	2485:20:00	5:15	21:20	16:05	2:40	7:55	2037:15:00
14	5:35	20:57	15:22	2500:42:00	5:16	21:19	16:03	2:41	7:57	2045:12:00
15	5:36	20:57	15:21	2516:03:00	5:17	21:19	16:02	2:41	7:58	2053:10:00
16	5:37	20:56	15:19	2531:22:00	5:18	21:18	16:00	2:42	8:00	2061:10:00
17	5:38	20:55	15:17	2546:39:00	5:19	21:17	15:58	2:43	8:02	2069:12:00
18	5:39	20:54	15:15	2561:54:00	5:20	21:16	15:56	2:44	8:04	2077:16:00
19	5:40	20:53	15:14	2577:08:00	5:21	21:15	15:54	2:45	8:06	2085:22:00
20	5:41	20:52	15:12	2592:20:00	5:22	21:14	15:52	2:46	8:08	2093:30:00
21	5:42	20:51	15:10	2607:30:00	5:23	21:13	15:50	2:47	8:10	2101:40:00
22	5:43	20:50	15:08	2622:38:00	5:24	21:12	15:48	2:48	8:12	2109:52:00
23	5:44	20:49	15:06	2637:44:00	5:25	21:11	15:46	2:49	8:14	2118:06:00
24	5:45	20:48	15:04	2652:48:00	5:26	21:10	15:44	2:50	8:16	2126:22:00
25	5:46	20:47	15:01	2667:49:00	5:27	21:09	15:42	2:51	8:18	2134:40:00
26	5:47	20:46	14:59	2682:48:00	5:28	21:08	15:40	2:52	8:20	2143:00:00
27	5:48	20:45	14:57	2697:45:00	5:29	21:07	15:38	2:53	8:22	2151:22:00
28	5:49	20:44	14:55	2712:40:00	5:30	21:06	15:36	2:54	8:24	2159:46:00
29	5:50	20:43	14:52	2727:32:00	5:31	21:05	15:34	2:55	8:26	2168:12:00
30	5:52	20:41	14:50	2742:22:00	5:33	21:03	15:30	2:57	8:30	2176:42:00
31	5:53	20:40	14:48	2757:10:00	5:34	21:02	15:28	2:58	8:32	2185:14:00

Aug	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	5:54	20:39	14:45	2771:55:00	5:35	21:01	15:26	2:59	8:34	2193:48:00
2	5:55	20:38	14:43	2786:38:00	5:36	21:00	15:24	3:00	8:36	2202:24:00
3	5:56	20:36	14:40	2801:18:00	5:37	20:58	15:21	3:02	8:39	2211:03:00
4	5:57	20:35	14:38	2815:56:00	5:38	20:57	15:19	3:03	8:41	2219:44:00
5	5:59	20:34	14:35	2830:31:00	5:40	20:56	15:16	3:04	8:44	2228:28:00
6	6:00	20:32	14:32	2845:03:00	5:41	20:54	15:13	3:06	8:47	2237:15:00
7	6:01	20:31	14:30	2859:33:00	5:42	20:53	15:11	3:07	8:49	2246:04:00
8	6:02	20:29	14:27	2874:00:00	5:43	20:51	15:08	3:09	8:52	2254:56:00
9	6:03	20:28	14:24	2888:24:00	5:44	20:50	15:06	3:10	8:54	2263:50:00
10	6:05	20:26	14:22	2902:46:00	5:46	20:48	15:02	3:12	8:58	2272:48:00
11	6:06	20:25	14:19	2917:05:00	5:47	20:47	15:00	3:13	9:00	2281:48:00
12	6:07	20:23	14:16	2931:21:00	5:48	20:45	14:57	3:15	9:03	2290:51:00
13	6:08	20:22	14:13	2945:34:00	5:49	20:44	14:55	3:16	9:05	2299:56:00
14	6:09	20:20	14:11	2959:45:00	5:50	20:42	14:52	3:18	9:08	2309:04:00
15	6:11	20:18	14:08	2973:53:00	5:52	20:40	14:48	3:20	9:12	2318:16:00
16	6:12	20:17	14:05	2987:58:00	5:53	20:39	14:46	3:21	9:14	2327:30:00
17	6:13	20:15	14:02	3002:00:00	5:54	20:37	14:43	3:23	9:17	2336:47:00
18	6:14	20:13	13:59	3015:59:00	5:55	20:35	14:40	3:25	9:20	2346:07:00
19	6:16	20:12	13:56	3029:55:00	5:57	20:34	14:37	3:26	9:23	2355:30:00
20	6:17	20:10	13:53	3043:48:00	5:58	20:32	14:34	3:28	9:26	2364:56:00
21	6:18	20:08	13:50	3057:38:00	5:59	20:30	14:31	3:30	9:29	2374:25:00
22	6:19	20:07	13:47	3071:25:00	6:00	20:29	14:29	3:31	9:31	2383:56:00
23	6:20	20:05	13:44	3085:09:00	6:01	20:27	14:26	3:33	9:34	2393:30:00
24	6:22	20:03	13:41	3098:50:00	6:03	20:25	14:22	3:35	9:38	2403:08:00
25	6:23	20:01	13:38	3112:28:00	6:04	20:23	14:19	3:37	9:41	2412:49:00
26	6:24	19:59	13:35	3126:03:00	6:05	20:21	14:16	3:39	9:44	2422:33:00
27	6:25	19:58	13:32	3139:35:00	6:06	20:20	14:14	3:40	9:46	2432:19:00
28	6:27	19:56	13:29	3153:04:00	6:08	20:18	14:10	3:42	9:50	2442:09:00
29	6:28	19:54	13:26	3166:30:00	6:09	20:16	14:07	3:44	9:53	2452:02:00
30	6:29	19:52	13:23	3179:53:00	6:10	20:14	14:04	3:46	9:56	2461:58:00
31	6:30	19:50	13:20	3193:13:00	6:11	20:12	14:01	3:48	9:59	2471:57:00

Sep	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	6:31	19:48	13:17	3206:30:00	6:12	20:10	13:58	3:50	10:02	2481:59:00
2	6:33	19:47	13:14	3219:44:00	6:14	20:09	13:55	3:51	10:05	2492:04:00
3	6:34	19:45	13:11	3232:55:00	6:15	20:07	13:52	3:53	10:08	2502:12:00
4	6:35	19:43	13:08	3246:03:00	6:16	20:05	13:49	3:55	10:11	2512:23:00
5	6:36	19:41	13:05	3259:08:00	6:17	20:03	13:46	3:57	10:14	2522:37:00
6	6:38	19:39	13:02	3272:10:00	6:19	20:01	13:42	3:59	10:18	2532:55:00
7	6:39	19:37	12:58	3285:08:00	6:20	19:59	13:39	4:01	10:21	2543:16:00
8	6:40	19:35	12:55	3298:03:00	6:21	19:57	13:36	4:03	10:24	2553:40:00
9	6:41	19:33	12:52	3310:55:00	6:22	19:55	13:33	4:05	10:27	2564:07:00
10	6:42	19:31	12:49	3323:44:00	6:23	19:53	13:30	4:07	10:30	2574:37:00
11	6:44	19:30	12:46	3336:30:00	6:25	19:52	13:27	4:08	10:33	2585:10:00
12	6:45	19:28	12:43	3349:13:00	6:26	19:50	13:24	4:10	10:36	2595:46:00
13	6:46	19:26	12:40	3361:53:00	6:27	19:48	13:21	4:12	10:39	2606:25:00
14	6:47	19:24	12:36	3374:29:00	6:28	19:46	13:18	4:14	10:42	2617:07:00
15	6:49	19:22	12:33	3387:02:00	6:30	19:44	13:14	4:16	10:46	2627:53:00
16	6:50	19:20	12:30	3399:32:00	6:31	19:42	13:11	4:18	10:49	2638:42:00
17	6:51	19:18	12:27	3411:59:00	6:32	19:40	13:08	4:20	10:52	2649:34:00
18	6:52	19:16	12:24	3424:23:00	6:33	19:38	13:05	4:22	10:55	2660:29:00
19	6:53	19:14	12:21	3436:44:00	6:34	19:36	13:02	4:24	10:58	2671:27:00
20	6:55	19:12	12:17	3449:01:00	6:36	19:34	12:58	4:26	11:02	2682:29:00
21	6:56	19:10	12:14	3461:15:00	6:37	19:32	12:55	4:28	11:05	2693:34:00
22	6:57	19:08	12:11	3473:26:00	6:38	19:30	12:52	4:30	11:08	2704:42:00
23	6:58	19:06	12:08	3485:34:00	6:39	19:28	12:49	4:32	11:11	2715:53:00
24	7:00	19:04	12:05	3497:39:00	6:41	19:26	12:45	4:34	11:15	2727:08:00
25	7:01	19:02	12:01	3509:40:00	6:42	19:24	12:42	4:36	11:18	2738:26:00
26	7:02	19:00	11:58	3521:38:00	6:43	19:22	12:39	4:38	11:21	2749:47:00
27	7:03	18:59	11:55	3533:33:00	6:44	19:21	12:37	4:39	11:23	2761:10:00
28	7:05	18:57	11:52	3545:25:00	6:46	19:19	12:33	4:41	11:27	2772:37:00
29	7:06	18:55	11:49	3557:14:00	6:47	19:17	12:30	4:43	11:30	2784:07:00
30	7:07	18:53	11:46	3569:00:00	6:48	19:15	12:27	4:45	11:33	2795:40:00

Oct	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON MID NIGHT	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	7:08	18:51	11:42	3580:42:00	6:49	19:13	12:24	4:47	11:36	2807:16:00
2	7:10	18:49	11:39	3592:21:00	6:51	19:11	12:20	4:49	11:40	2818:56:00
3	7:11	18:47	11:36	3603:57:00	6:52	19:09	12:17	4:51	11:43	2830:39:00
4	7:12	18:45	11:33	3615:30:00	6:53	19:07	12:14	4:53	11:46	2842:25:00
5	7:14	18:43	11:30	3627:00:00	6:55	19:05	12:10	4:55	11:50	2854:15:00
6	7:15	18:41	11:27	3638:27:00	6:56	19:03	12:07	4:57	11:53	2866:08:00
7	7:16	18:40	11:23	3649:50:00	6:57	19:02	12:05	4:58	11:55	2878:03:00
8	7:17	18:38	11:20	3661:10:00	6:58	19:00	12:02	5:00	11:58	2890:01:00
9	7:19	18:36	11:17	3672:27:00	7:00	18:58	11:58	5:02	12:02	2902:03:00
10	7:20	18:34	11:14	3683:41:00	7:01	18:56	11:55	5:04	12:05	2914:08:00
11	7:21	18:32	11:11	3694:52:00	7:02	18:54	11:52	5:06	12:08	2926:16:00
12	7:23	18:30	11:08	3706:00:00	7:04	18:52	11:48	5:08	12:12	2938:28:00
13	7:24	18:29	11:05	3717:05:00	7:05	18:51	11:46	5:09	12:14	2950:42:00
14	7:25	18:27	11:01	3728:06:00	7:06	18:49	11:43	5:11	12:17	2962:59:00
15	7:27	18:25	10:58	3739:04:00	7:08	18:47	11:39	5:13	12:21	2975:20:00
16	7:28	18:23	10:55	3749:59:00	7:09	18:45	11:36	5:15	12:24	2987:44:00
17	7:29	18:21	10:52	3760:51:00	7:10	18:43	11:33	5:17	12:27	3000:11:00
18	7:31	18:20	10:49	3771:40:00	7:12	18:42	11:30	5:18	12:30	3012:41:00
19	7:32	18:18	10:46	3782:26:00	7:13	18:40	11:27	5:20	12:33	3025:14:00
20	7:33	18:16	10:43	3793:09:00	7:14	18:38	11:24	5:22	12:36	3037:50:00
21	7:35	18:15	10:40	3803:49:00	7:16	18:37	11:21	5:23	12:39	3050:29:00
22	7:36	18:13	10:37	3814:26:00	7:17	18:35	11:18	5:25	12:42	3063:11:00
23	7:37	18:11	10:34	3825:00:00	7:18	18:33	11:15	5:27	12:45	3075:56:00
24	7:39	18:10	10:31	3835:31:00	7:20	18:32	11:12	5:28	12:48	3088:44:00
25	7:40	18:08	10:28	3845:59:00	7:21	18:30	11:09	5:30	12:51	3101:35:00
26	7:42	18:06	10:25	3856:24:00	7:23	18:28	11:05	5:32	12:55	3114:30:00
27	7:43	18:05	10:22	3866:46:00	7:24	18:27	11:03	5:33	12:57	3127:27:00
28	7:44	18:03	10:19	3877:05:00	7:25	18:25	11:00	5:35	13:00	3140:27:00
29	6:46	17:02	10:16	3887:21:00	6:27	17:24	10:57	6:36	13:03	3153:30:00
30	6:47	17:00	10:13	3897:34:00	6:28	17:22	10:54	6:38	13:06	3166:36:00
31	6:48	16:59	10:10	3907:44:00	6:29	17:21	10:52	6:39	13:08	3179:44:00



Nov	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON	BEFORE MID NIGHT	AFTER MIDNIGHT		
1	6:50	16:57	10:08	3917:52:00	6:31	17:19	10:48	6:41	13:12	3192:56:00
2	6:51	16:56	10:05	3927:57:00	6:32	17:18	10:46	6:42	13:14	3206:10:00
3	6:53	16:55	10:02	3937:59:00	6:34	17:17	10:43	6:43	13:17	3219:27:00
4	6:54	16:53	9:59	3947:58:00	6:35	17:15	10:40	6:45	13:20	3232:47:00
5	6:56	16:52	9:56	3957:54:00	6:37	17:14	10:37	6:46	13:23	3246:10:00
6	6:57	16:51	9:54	3967:48:00	6:38	17:13	10:35	6:47	13:25	3259:35:00
7	6:58	16:49	9:51	3977:39:00	6:39	17:11	10:32	6:49	13:28	3273:03:00
8	7:00	16:48	9:48	3987:27:00	6:41	17:10	10:29	6:50	13:31	3286:34:00
9	7:01	16:47	9:46	3997:13:00	6:42	17:09	10:27	6:51	13:33	3300:07:00
10	7:03	16:45	9:43	4006:56:00	6:44	17:07	10:23	6:53	13:37	3313:44:00
11	7:04	16:44	9:40	4016:36:00	6:45	17:06	10:21	6:54	13:39	3327:23:00
12	7:05	16:43	9:38	4026:14:00	6:46	17:05	10:19	6:55	13:41	3341:04:00
13	7:07	16:42	9:35	4035:49:00	6:48	17:04	10:16	6:56	13:44	3354:48:00
14	7:08	16:41	9:33	4045:22:00	6:49	17:03	10:14	6:57	13:46	3368:34:00
15	7:10	16:40	9:30	4054:52:00	6:51	17:02	10:11	6:58	13:49	3382:23:00
16	7:11	16:39	9:28	4064:20:00	6:52	17:01	10:09	6:59	13:51	3396:14:00
17	7:12	16:38	9:26	4073:46:00	6:53	17:00	10:07	7:00	13:53	3410:07:00
18	7:14	16:37	9:23	4083:09:00	6:55	16:59	10:04	7:01	13:56	3424:03:00
19	7:15	16:36	9:21	4092:30:00	6:56	16:58	10:02	7:02	13:58	3438:01:00
20	7:16	16:35	9:19	4101:49:00	6:57	16:57	10:00	7:03	14:00	3452:01:00
21	7:18	16:34	9:17	4111:06:00	6:59	16:56	9:57	7:04	14:03	3466:04:00
22	7:19	16:34	9:15	4120:21:00	7:00	16:56	9:56	7:04	14:04	3480:08:00
23	7:20	16:33	9:13	4129:34:00	7:01	16:55	9:54	7:05	14:06	3494:14:00
24	7:22	16:32	9:11	4138:45:00	7:03	16:54	9:51	7:06	14:09	3508:23:00
25	7:23	16:31	9:09	4147:54:00	7:04	16:53	9:49	7:07	14:11	3522:34:00
26	7:24	16:31	9:07	4157:01:00	7:05	16:53	9:48	7:07	14:12	3536:46:00
27	7:25	16:30	9:05	4166:06:00	7:06	16:52	9:46	7:08	14:14	3551:00:00
28	7:27	16:30	9:03	4175:09:00	7:08	16:52	9:44	7:08	14:16	3565:16:00
29	7:28	16:29	9:01	4184:10:00	7:09	16:51	9:42	7:09	14:18	3579:34:00
30	7:29	16:29	9:00	4193:10:00	7:10	16:51	9:41	7:09	14:19	3593:53:00

Dec	Sunrise	Sunset	Length of Day	Accumulated length of day	TIME		NIGHT LENGTH		TOTAL	Accumulated operating hours
					TURN OFF	TURN ON	BEFORE MIDNIGHT	AFTER MIDNIGHT		
1	7:30	16:28	8:58	4202:08:00	7:11	16:50	9:39	7:10	14:21	3608:14:00
2	7:31	16:28	8:57	4211:05:00	7:12	16:50	9:38	7:10	14:22	3622:36:00
3	7:33	16:28	8:55	4220:00:00	7:14	16:50	9:36	7:10	14:24	3637:00:00
4	7:34	16:27	8:54	4228:54:00	7:15	16:49	9:34	7:11	14:26	3651:26:00
5	7:35	16:27	8:52	4237:46:00	7:16	16:49	9:33	7:11	14:27	3665:53:00
6	7:36	16:27	8:51	4246:37:00	7:17	16:49	9:32	7:11	14:28	3680:21:00
7	7:37	16:27	8:50	4255:27:00	7:18	16:49	9:31	7:11	14:29	3694:50:00
8	7:38	16:27	8:49	4264:16:00	7:19	16:49	9:30	7:11	14:30	3709:20:00
9	7:39	16:27	8:48	4273:04:00	7:20	16:49	9:29	7:11	14:31	3723:51:00
10	7:40	16:27	8:47	4281:51:00	7:21	16:49	9:28	7:11	14:32	3738:23:00
11	7:41	16:27	8:46	4290:37:00	7:22	16:49	9:27	7:11	14:33	3752:56:00
12	7:41	16:27	8:45	4299:22:00	7:22	16:49	9:27	7:11	14:33	3767:29:00
13	7:42	16:27	8:44	4308:06:00	7:23	16:49	9:26	7:11	14:34	3782:03:00
14	7:43	16:27	8:44	4316:50:00	7:24	16:49	9:25	7:11	14:35	3796:38:00
15	7:44	16:27	8:43	4325:33:00	7:25	16:49	9:24	7:11	14:36	3811:14:00
16	7:45	16:27	8:43	4334:16:00	7:26	16:49	9:23	7:11	14:37	3825:51:00
17	7:45	16:28	8:42	4342:58:00	7:26	16:50	9:24	7:10	14:36	3840:27:00
18	7:46	16:28	8:42	4351:40:00	7:27	16:50	9:23	7:10	14:37	3855:04:00
19	7:47	16:28	8:42	4360:22:00	7:28	16:50	9:22	7:10	14:38	3869:42:00
20	7:47	16:29	8:42	4369:04:00	7:28	16:51	9:23	7:09	14:37	3884:19:00
21	7:48	16:29	8:42	4377:46:00	7:29	16:51	9:22	7:09	14:38	3898:57:00
22	7:48	16:30	8:42	4386:28:00	7:29	16:52	9:23	7:08	14:37	3913:34:00
23	7:49	16:30	8:42	4395:10:00	7:30	16:52	9:22	7:08	14:38	3928:12:00
24	7:49	16:31	8:42	4403:52:00	7:30	16:53	9:23	7:07	14:37	3942:49:00
25	7:50	16:32	8:42	4412:34:00	7:31	16:54	9:23	7:06	14:37	3957:26:00
26	7:50	16:32	8:42	4421:16:00	7:31	16:54	9:23	7:06	14:37	3972:03:00
27	7:50	16:33	8:43	4429:59:00	7:31	16:55	9:24	7:05	14:36	3986:39:00
28	7:50	16:34	8:43	4438:42:00	7:31	16:56	9:25	7:04	14:35	4001:14:00
29	7:51	16:35	8:44	4447:26:00	7:32	16:57	9:25	7:03	14:35	4015:49:00
30	7:51	16:35	8:45	4456:11:00	7:32	16:57	9:25	7:03	14:35	4030:24:00
31	7:51	16:36	8:45	4464:56:00	7:32	16:58	9:26	7:02	14:34	4044:58:00

May 22, 2006

TO: Benjamin Walters  
Office of City Attorney

FROM: Patrick G. Hager  
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC  
UE 180  
PGE Response to City of Portland Data Request  
Dated May 8, 2006  
Question No. 013**

**Request:**

**Please provide all justifications for the proposal to meter new Option C streetlights and charge such lights under Schedule 32. See PGE/1300 at 19-20. Please provide an explanation of how the “grandfathering” will be applied by PGE.**

**Response:**

The primary reasons for the proposal are:

1. There is little new activity for this service.
2. There are significant administrative costs associated with providing Option C service not currently included in rates. If we are to continue to offer new Option C service, we need to increase Option C rates to reflect this. Instead we have proposed eliminating the rate option.
3. The control of kilowatt usage or inadvertent power diversion on an Option C system is diminished when it is owned by the customer. In addition, the costs of auditing the Option C system are not included in rates.
4. Our current streetlight billing system has a limited number of billing codes available. Our proposal frees up codes for expanding Option A & B without incurring costs of expanding the billing system.

The “grandfathering” of existing Option C service is meant to allow existing fixtures served under Option C service to remain under Schedule 91 as a courtesy and without the additional conversion costs of wiring and metering.

Cobrahead Power Door 100 under Schedule 91

Charges

Tx/AS	\$	0.0011	per kWh
Dsn	\$	0.028	per kWh
Energy	\$	0.054	per kWh

Cobrahead Power Door 100

Option B		43 kWh/month
	\$	3.23 per month

Monthly Cost

Tx/AS	\$	0.05		
Dsn	\$	1.21		
Energy	\$	2.31		
Maintenance	\$	<u>3.23</u>		
Option B	\$	6.80	Option C	\$ 3.57

Cobrahead Power Door 100 under Schedule 32

Charges

Basic (1 phase)	\$	12.00	per month
Basic (3 phase)	\$	16.00	per month
Tx/AS	\$	0.002140	per kWh
Dsn	\$	0.030730	per kWh
Energy	\$	0.005605	per kWh

Consumption                    43.00 kWh/month

Monthly Cost

Basic (1)	\$	12.00
Tx/AS	\$	0.0920
Dsn	\$	1.3214
Energy	\$	<u>0.2410</u>
	\$	13.65

July 31, 2006

TO: Benjamin Walters  
Office of City Attorney

FROM: Patrick G. Hager  
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC  
UE 180  
PGE Response to City of Portland Data Request  
Dated July 17, 2006  
Question No. 057**

**Request:**

**In response to Data Request COP/PGE-019, PGE stated that locations of Option C luminaries subject to the circuit charge are customer specific and confidential. To the extent that PGE's response to COP/PGE-019 refers to confidentiality on the part of the customer, Portland waives confidentiality with respect to its own Option A, B, and C luminaries and related circuits. The City of Portland specifically requests that PGE provide the location of Option A, B, and C luminaries inside the City of Portland that are subject to the circuit charge.**

**Response:**

Attachment 057-A provides a map with locations of lights within the City of Portland. The individual Option C luminaire locations are shown in the color red and a portion of the Option C luminaires subject to the circuit charge are shown in the color green. Option B lights are shown in the color gray. Not all of the Option C lights subject to the circuit charge are identifiable at this time within the City of Portland. The PGE streetlight circuit revenue requirements are derived from the FERC 373-1 account, which is based on allocations from blanket jobs when installed. These costs are allocated to all Option A and B lights and those Option C lights with a company-supplied circuit. PGE maintains a count of Option C lights subject to a circuit charge for billing purposes.

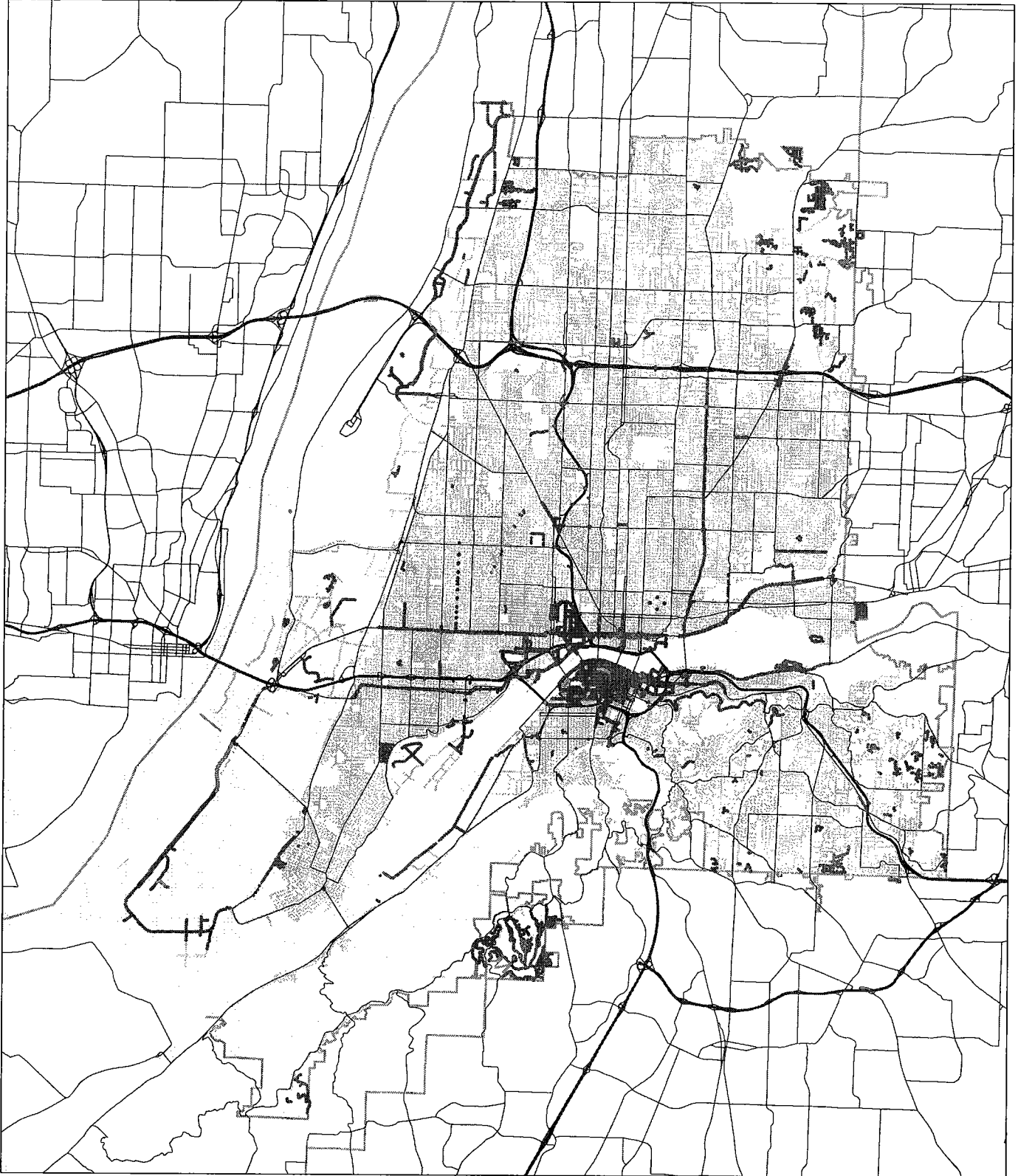
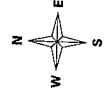
**UE 180**  
**Attachment 057-A**

Map with Locations of Lights Within the City of Portland

Legend

- Option C Lights With Circuit Charge Code Set (142)
- All Option C Lights (10,145)
- FWY
- ARTERIAL
- All Lights in City of Portland (54,246)
- County Boundaries
- Rivers
- City of Portland

UE 180  
COP/COG/LOC/217A





Portland General Electric

2007 RATE CASE - STREET AND AREA LIGHT ANALYSIS  
TEST YEAR (2007) REVENUE REQUIREMENTS  
STREETLIGHT REVENUE REQUIREMENTS  
and  
CAPITAL COST RECOVERY FACTORS

STREETLIGHTS REVENUE REQUIREMENTS:		AREA LIGHTS REVENUE REQUIREMENT:	
	FACTORS(U)	FERC ACCT 373-2 & SCHEDULED POLES	FERC ACCOUNT 373-7 & AREA LIGHT POLES
TOTAL		\$3,685,279	\$1,285,248
POLES	0.65855	\$2,426,942	
LUMINAIRES	0.34145	\$1,258,336	

STREETLIGHTS COST RECOVERY FACTOR ALLOCATION		AREA LIGHT COST RECOVERY FACTOR:	
	USE FERC ACCT 344 (POLES, TOWERS)	RECOVERY FACTOR(U)	
POLES		12.67%	

LUMINAIRES -			
FERC CODE	NET INVESTMENT	WEIGHT	WGTED RECOVERY FACTOR
373-1	\$0	0.00000	12.37%
373-2	4,145,990	0.81563	15.67%
373-7	937,201	0.18437	16.02%
			15.69%

CALCULATED USING THE RATIO OF THE REVENUE REQUIREMENT TO TOTAL REVENUE FOR SCH. 91 STREETLIGHTING AND THE COST RECOVERY FACTOR FOR STREETLIGHTING FOR POLES AND LUMINAIRES.

FERC CODE 373-7 16.02%

FOOTNOTES:  
(1) FROM Voltage Cost Study (RATIO OF INVESTMENT FOR POLES AND LUMINAIRES).  
(2) RECOVERY FACTORS FROM FINANCIAL ANALYSIS.

Portland General Electric

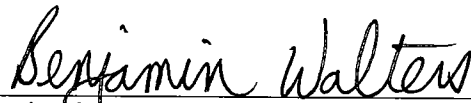
DEPRECIATION ESTIMATES - STREETLIGHT ACCOUNTS  
2007 TEST YEAR

FERC Account	Plant Balance		Book Depreciation 2007	Book Reserve		Tax Depreciation		Tax Reserve		2007 Deferred Taxes	Accumulated Def Taxes	
	YE 2006	YE2007		YE 2006	YE2007	2007	2007	YE 2006	YE2007		YE 2006	YE2007
37301	17,974,206	19,043,493	941,052	10,485,712	696,533	9,891,675	10,520,077	513,927	488,345	(27,576)	513,927	488,345
37302	22,837,265	24,196,165	2,027,981	20,384,756	884,985	12,555,238	13,366,364	652,974	617,930	(35,039)	652,974	617,930
37307	7,749,212	8,212,528	646,507	7,966,923	300,296	4,290,283	4,535,516	221,569	209,678	(11,889)	221,569	209,678
	48,560,683	51,452,186	3,615,540	38,237,391	1,881,813	26,697,197	28,421,957	1,388,470	1,313,953	(74,506)	1,388,470	1,313,953
Total Djsl	2,060,961,943		79,865,958	1,133,054,619	1,206,255,120	(3,162,100)	58,928,014	55,785,413				

CERTIFICATE OF SERVICE

I hereby certify that I served a copy of the foregoing CITY OF PORTLAND/CITY OF GRESHAM/LEAGUE OF OREGON CITIES – DIRECT TESTIMONY OF RICHARD GRAY, JOHN HARRIS, ANDREA FOGUE, JOHN HEBERLING AND LON L. PETERS on the individuals on the attached Service List by electronic mail and, for those individuals who have not waived paper service, by First Class Mail with the U.S. Postal Service in a sealed envelope with postage paid, and deposited in the post office at Portland, Oregon on said day.

DATED this 9<sup>th</sup> day of August, 2006



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Benjamin Walters, OSB #85354  
Senior Deputy City Attorney  
Of Attorneys for City of Portland

**UE 180 - SERVICE LIST**

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