Raquel J. Webster
Senior Counsel

October 23, 2014

BY HAND DELIVERY & ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket 4513 – The Narragansett Electric Company, d/b/a National Grid
Street light Metering Pilot Proposal

Dear Ms. Massaro:

I have enclosed National Grid's[1] Street light Metering Pilot Proposal. On July 25, 2014, the Rhode Island Public Utilities Commission (PUC) opened this docket to review the Company's metering pilot proposal for street lights. The PUC has instructed the Company that the goals of the pilot should, at a minimum, address meter accuracy, integration with the billing system, a comparison to the unmetered rates, and cost allocation.

As explained in the enclosed proposal, the pilot will review the accuracy and capabilities of various metering technologies available for street lights. The Company believes that the pilot will provide important information concerning the value of meter usage for street lighting customers. In performing the pilot, the Company intends to accomplish the following tasks:

1. Evaluate the meter manufacturer's laboratory test results;

2. Confirm the claims of the meter manufacturers through testing by National Grid in a controlled environment using sample sizes of each meter to provide a statistically significant result;

3. Evaluate the technical and communication capabilities of each meter; and

4. Select successful meter candidates for field testing with communications in a sample selected to provide statistically significant results.

[1] The Narragansett Electric Company d/b/a National Grid (National Grid or Company).

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The Company recognizes the technical nature of this proposal, and, therefore, welcomes the opportunity to participate in a technical session with the PUC and parties in this docket to discuss the scope of the proposed metering pilot.

Thank you for your attention to this matter. If you have any questions regarding this filing, please contact me at (781) 907-2121.

Very truly yours,

Raquel J. Webster

Enclosure

cc: Docket 4513 Service List
Karen Lyons, Esq.
Steve Scialabba, Division

The Narragansett Electric Company
d/b/a National Grid

Street light Metering Pilot Proposal

October 23, 2014

Submitted to:

Rhode Island Public Utilities Commission
RIPUC Docket No. 4513

Submitted by:

nationalgrid

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Abbreviations

AMR	Automated Meter Reading
ANSI	American National Standards Institute
CMS	Central Management System
CSS	Customer Service System
DC	Direct Current
ERT	Encoder Receiver Transmitter
FTP	File Transfer Protocol
GIS	Geodetic Information System
GPS	Geographical Positioning System
HPS	High Pressure Sodium
IC	Integrated Circuit
ID	Identification
IDM	Interval Data Message
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IPv6	Internet Protocol version 6
IS	Information Systems
ISO	International Organization for Standardization
JMS	Java Message Service
LED	Light Emitting Diode
MDMS	Meter Data Management System
MDS	Meter Data Services
MIS	Meter Inventory System
MOU	Memorandum Of Understanding
OSI	Open Systems Interconnection model
PKI	Public Key Infrastructure
PNNL	Pacific Northwest National Laboratory
PUC	(Rhode Island) Public Utilities Commission
RF	Radio Frequency
SCM	Standard Consumption Message packet format
SCP	Secure Copy Protocol
SFTP	Secure File Transfer Protocol
SSN	Silver Springs Network, Inc.
TESCO	The Eastern Specialty Company

EXECUTIVE SUMMARY

The Narragansett Electric Company d/b/a National Grid (National Grid or the Company) proposes to perform a pilot study to evaluate current metering technology for its compatibility with street lighting applications. Presently, the Company only offers street lighting as an unmetered service that relies on fixed operating schedules and identified industry standard light source wattage ratings to determine energy consumption.

The pilot will review the accuracy and capabilities of various metering technologies available for street lights. Metering technology for street lights may be helpful in providing municipalities and other street light customers with greater information for decision-making. The question is whether the added information is valuable for customers and accurate from a metering perspective. The pilot will provide experience that can inform the evaluation for value to street light customers.

The Company will test the capability of various metering technologies by comparing actual field measurements against a control group in a controlled environment. The Company intends to accomplish the following tasks with the metering pilot:

1. Evaluate the meter manufacturer's laboratory test results;
2. Confirm the claims of the meter manufacturers through testing by National Grid in a controlled environment using sample sizes of each meter to provide a statistically significant result;
3. During the testing referred to in No. 2 above, National Grid will also evaluate the technical and communication capabilities of each meter;
4. Successful meter candidates will be selected for field testing with communications in a sample selected to provide statistically significant results.

Field testing of meters will include individual applications of Company-standard Itron encoder receiver transmitter (ERT) meters. The pilot will test the various meter technologies on high pressure sodium (HPS) and light emitting diode (LED) outdoor lighting. The tests will establish a baseline of energy consumption data relative to recognized operating schedules. Laboratory and field testing of remote-controlled integrated circuitry (IC) meter technology will determine meter accuracy and reliability during both laboratory simulations and actual field operating conditions. The laboratory and field testing will use a communications network to gauge the opportunities and complexities from the use of this infrastructure to manage street light meter/controls remotely. The Company will assess information systems capabilities to determine the potential changes that would be required to integrate this technology with the Company's existing computer systems.

In addition, the Company will conduct a comparison of meter data from the field pilot and the Company's present unmetered tariff energy consumption calculation model. This evaluation will provide findings necessary for the Company to determine the relative accuracy of the unmetered energy calculation approach. A simulated billing calculation will provide the comparative analysis. The Company's billing system will not be altered during the pilot because one of the purposes of the pilot is to determine what changes the Company would have to make to its billing system to accommodate metering.

The Company will collaborate with municipalities to identify municipal customers that meet specific criteria to participate in the field pilot. Based upon the feedback the Company receives in response to a questionnaire it circulated to each municipality in the Company's Rhode Island service territory, the Company will select four municipalities to participate in the pilot.

In conjunction with the Company's pilot, the Company will encourage the participating municipalities to perform a lighting quality study. This study will provide the opportunity for analytic and human factor feedback based upon specific performance characteristics and operating conditions of different street lighting equipment. This information will be valuable to many municipalities within the state as they consider whether to acquire the existing street lighting systems and convert to more energy efficient lighting technologies.

The Company expects that the metering pilot project, including the laboratory testing and field trial application, will extend over a 12-month period. The field trial testing portion of the pilot is scheduled to last for approximately six months following the laboratory controlled vetting process to determine the successful candidates to participate in the field trial pilot. Through the pilot, the Company will evaluate whether the equipment should remain in service at the end of this 12-month period. A longer test could help the Company understand the potential reliability of metering and control equipment in service. Continuation of the pilot would be subject to the Rhode Island Public Utility Commission's (PUC) approval and agreement by participating municipalities. Equipment associated with the field pilot will be removed and replaced with equipment originally in service prior to the pilot at the request of the municipality or if the PUC does not approve extension of the pilot beyond 12 months. The Company will seek PUC approval to recover all costs incurred in the performance of the metering pilot project.

1. Introduction

In Docket No. 4513, the PUC ordered the Company to perform a metering pilot associated with street lighting to assess, among other things, the accuracy of metering for street lights. The Company proposes to use several meter devices, operating on individual control schedule platforms, to assess the quality and reliability of the metered energy consumption measurements and the means by which the meter read information is communicated and received for billing application.

In conducting the metering pilot, the Company will assess and compare network communications technology and its associated interface requirements with existing meter data management and billing information systems. The Company will use the meter data obtained through the field testing phase of the pilot to analyze existing unmetered energy consumption calculation models that are currently used for street light billing.

The Company will collaborate with the municipal customers that participate in the metering pilot on the installation of the meters. When working with the municipal customers that are selected for the pilot project, the Company will have the benefit of their responses to the questionnaire that the Company distributed to municipal customers in the Company's Rhode Island service territory. The questionnaire responses will also reflect whether the municipal customers wish to perform an independent lighting quality assessment in conjunction with the metering pilot. The Company will obtain additional information from the metering pilot participants through interviews and continued discussions with the participants in efforts to obtain a mutual understanding of the roles and responsibilities of all involved parties throughout all phases of the pilot. In addition, the municipal customers selected for the pilot will sign a mandatory Memorandum of Understanding (MOU). Performing an independent lighting study in conjunction with the metering pilot will enable the Company to test meter devices under unique, real-world conditions; it will also enable the participating customers to assess actual lighting characteristics. The independent lighting study will promote a greater awareness and understanding of the capabilities of the new lighting equipment and its related human response factors.

2. Scope

The pilot will include three principal studies: (a) meter testing, (b) assessment of information system impacts, and (c) comparative analysis of metered and unmetered energy consumption computations. As noted above, the Company expects that the pilot project will last for approximately 12 months.

The Company will use the first few months of the pilot to obtain the materials and equipment required for the pilot and finalize the required agreements with vendors, consultants, and the municipalities selected to participate in the pilot. Once the Company receives the meter

equipment, it will begin testing several meter devices and will conduct a technical evaluation of those devices. After the Company tests and evaluates meter devices, it will conduct laboratory testing to determine meter accuracy and reliability in compliance with industry standards. This testing will include an examination of whether the meter devices are equipped for network communications and readiness for field trials. During this laboratory meter testing period, the Company will complete the field application design work in collaboration with the participating municipalities. In parallel, the Company will make modifications to the communication network so that it can accommodate the meter field testing design. After the Company tests the meter devices and examines the network infrastructure, it will conduct field trial tests to evaluate the performance of the meters. During the field trial, the municipal customer will have the opportunity to use the network capabilities of the remote-control technology to alter the operating schedule and light output characteristics of the luminaires in alignment with their lighting quality study analysis. The Company will use the meter data that it acquires during the field trial to assess the reliability and accuracy of the meters during actual usage conditions. The Company will also compare this meter data to the Company's existing unmetered energy consumption billing models. The Company will use the information it obtains from the field testing to identify the requirements necessary to scope the information system interfaces so that they are compatible with the appropriate data management and billing systems. At the conclusion of the pilot, the Company will need approximately three months to prepare a final report of the results of the metering pilot.

Once this pilot proposal is final (after review and comments from the PUC and parties in this docket), the Company will provide the PUC with a detailed cost estimate and revised schedule based upon the specified requirements of the approved pilot. The Company proposes that all costs associated with this pilot will be recovered through a fully reconcilable mechanism from customers receiving service under the Company's outdoor lighting Rates S-05, S-06, S-10 and S-14.

3. Meter Technology Overview

3.1. Company Standard Meters

Currently, the Company uses solid state integrated circuit (IC) electricity meters that are equipped with ERT radio transmitters for automated meter reading (AMR). The ERT produces a modulated radio signal that operates in an unlicensed band to transmit utility meter data over a short range. This data is then collected by a meter data collection device in a utility vehicle. The protocol uses a multiple access methods to avoid interference with other nearby meters and issues data in standard consumption message (SCM) format. SCM messaging contains single, cumulative meter reading values with the ERT ID, checksum, and tamper flags.

The Company uses both new manufactured solid state meters and older electromechanical retrofit meters. Therefore, the Company works with four meter manufacturers that have ERT modules. Although some models of these ERT's support Interval Data Message (IDM) transmission, a fix network is required to use such models. As such, the Company does not collect Interval Data from an AMR meter.

3.2 Network-Controlled Meter Nodes

The meter nodes the Company will use in this pilot provide the means to apply a solid state IC energy meter at a location immediately preceding the device that consumes the electrical energy. This meter technology is integrated within the street light control device, which includes a wireless IPv6, IEEE 802.15.4g communication platform and all the supplemental components required to facilitate ancillary control of the lighting equipment in a single operational solution.

The single phase multifunction IC meter that is utilized within the available network controlled nodes (and which are compatible with the proposed network provider) may be unique to a specific manufacturer. Therefore, the Company proposes to use and test several compatible nodes that include IC meter devices from different manufacturers. All IC metering applications the Company receives from manufacturers must be compliant with applicable industry standards, including but not limited to ANSI C12.20-20101. In addition, applicants will be required to submit supplemental qualifying independent laboratory test reports.

These network-ready street light controls use Direct Current (DC) voltage to operate the light sensor and provide secure wireless communications to the network. Additionally, these devices are capable of electric system diagnostics and independent lighting management applications such as standard dusk-to-dawn operations, variable dimming, and override commands. Below the Company has identified the individual node products that it plans to use during this pilot. The Company has considered a third node product that will likely be certified prior to the anticipated start date of the pilot.

3.2.1 Sunrise Technology OpenGrid Light Control Node

Technical specifications are provided in Figure 1

3.2.2 SELC External CMS Module

Technical specifications are provided in Figure 2.

[1] American National Standards Institute, Electricity Meters; 0.2 and 0.5 Accuracy Classes.

4. Network Application Overview

For the purpose of this pilot, the Company will use Silver Spring Networks, Inc. (SSN) as a single network provider. This predetermined service provider will expedite the technology selection process so that the Company can meet the anticipated schedule constraints and deployment parameters associated with this pilot. The SSN network provides an open protocol that utilizes various end-point network meter-control device manufacturers. SSN's network will enable the Company to test several network IC meter devices. The SSN network will also provide the Company with the ability the tools necessary to manage and assess the meter data management and associated billing processes. The Company has provided a summary of technical specifications of SSN's network in Figure 3.

The SSN network provides a high performance wireless mesh communication technology. Utilizing true mesh architecture, each device can act as a relay for the other, resulting in a radio frequency (RF) mesh that is self-forming and self-healing. This network approach simplifies installation, improves network resilience, and reduces maintenance relating to communication issues.

A mesh architecture significantly reduces the volume of additional "infrastructure devices" required to enable two-way communication to all lighting meter points. The SSN network uses Access Points to support the collection and management of data from up to 5,000 nodes per Access Point. These Access Points are strategically located on utility infrastructure to communicate with the Head End software through the most appropriate backhaul communication channel – usually cellular or Ethernet. Unlike concentrators utilized in other networks, these are IPv6 routers that reduce response time and the likelihood of configuration errors and improve overall network reliability.

The installation of each node automatically establishes the two best mesh communication routes and validates these routes on a regular basis. This multi-signal routing reinforces the mesh network by automatically reconfiguring during incidents of localized power outages, individual damaged poles or other obstruction interference.

The SSN network is an open Ipv6 platform that is standards-compatible across the communication network solution, based on the layered approach to networking defined by the Open Systems Interconnection (OSI) model. Vendors offer various network-compatible products that leverage the value of the system while adding to the sustainability of the mesh application. The ANSI standards-based control nodes can be used universally with the majority of luminaire manufacturers.

During the pilot, the Company proposes to contract with SSN to provide and deploy a network that is complete with all hardware, software, and support services. This solution will support approximately 2,000 company-provided street light control nodes with integrated SSN

communication technology. SSN will own, deploy and manage the end-to-end network, including all professional services related to project management, field design, field network deployment support, network acceptance testing, and end-user training. The StreetLight Vision Central Management System (CMS) and the SSN Software Suite will support the network. These solutions will provide endpoint monitoring, management and reporting, network management, and remote firmware upgrades. Municipalities that participate in the lighting quality study will have certain access and secure privileges to the CMS to manage and monitor the network-controlled street lights in their communities.

4.1 Network Security

Due to issues relating to security breaches, networks are often subject to security threats that include malicious operation of interconnected remote devices and/or data transmission or storage corruption. As such, all pilot participants must recognize that security is a moving target. As new products are introduced to the market, people who seek to breach security are offered new and more powerful tools to exploit weaknesses. The proposed SSN network has taken an architectural approach to security and embedded it throughout its hardware, software, and transactions processing.

National Grid will provide both a reliable and secure solution by carefully choosing diverse technologies, processes, and approaches with adequate security measures. However, National Grid recognizes that it may face challenges with choosing a solution that is effective, efficient, and easy to adopt in the context of this pilot. Therefore, National Grid will place great emphasis on technologies that demonstrate best practices and a high degree of architectural discipline.

A key element to the Company's implementation of the pilot and maintenance of Information Systems' (IS) security is the existing IS Security Policies and Standards at National Grid. These standards are based on many factors, including current and planned network structures, information and control flows, potential security risks, and available technical security solutions. During the pilot, the Company will evaluate the following security issues:

- Availability: avoid denial of service
- Integrity: avoid unauthorized modification
- Confidentiality: avoid disclosure
- Authenticity: avoid spoofing/forgery
- Access control: avoid unauthorized usage
- Audit ability: avoid hiding
- Accountability: avoid denial of responsibility
- Third- party protection: avoid attacks on others
- Segmentation: limiting the scope of attacks on the solution
- Quality of Service: Maintaining a reasonable latency and throughput

National Grid's approach to IS security is the onion approach, also known as "defense in depth." The inner layers, or zones, of a network, where communication interactions have been designed to flow freely between nodes, are referred to as trusted. Trusted network zones are kept small and independent. They are physically protected by limiting physical access to computers, network equipment, and network cables. In addition, through physical means, trusted network zones are limited to authorized persons. As a practice, when connecting a trusted network zone to an outer network zones, additional layers of security measures are applied, isolating the network zones from each other and providing additional security for the network as a whole.

National Grid uses firewalls, gateways, and proxies to control network traffic between zones of different security levels and filter out any undesirable or dangerous material. Traffic that is allowed to pass between zones are limited to what is absolutely necessary because each type of service call or information exchange translates into a possible route that an intruder may exploit.

These security mechanisms not only include defensive and preventive means, but are also used as a means for detection and reaction. By continuously monitoring a system for intrusion attempts, security personnel are alerted to potential threats and take suitable actions, such as isolating an inner network zone from outer zones. Additionally, the network leverages standard IP-based security technologies, which have been developed collectively by the best security firms across the globe and proven to be highly scalable and hardened over decades of worldwide use against a broad range of attacks.

The proposed network's baseline security capabilities include all functions to authenticate (who and what is allowed onto the system), authorize (given your role, what can you do), and encrypt (prevent snooping of content) communications across the mesh system, and maintain the highest level of availability. These capabilities span from the applications in the back office to each device in the field. Hardware-based mechanisms are leveraged to promote the security and acceleration of these functions including the use of Public Key Infrastructure (PKI) for its security certificates.

5. Metering Pilot Logistics

5.1 Municipal Questionnaire

The Company has developed and issued an 18-question survey that focuses on key, high level municipal street lighting issues. *See* Attachment A. The purpose of the questionnaire was to obtain a better understanding of each municipality's preferences concerning street lights and metering, and their future plans relating to the street light service they currently received from the Company. On October 6, 2014, the Company sent the questionnaire to various municipal leaders and critical services personnel. In providing the cover letter to the survey, the Company explained the potential benefits of the street light metering pilot. The main goal of the survey

was for the Company to identify the potential municipalities that will participate in the pilot. The Company's subsequent follow-up with municipalities will provide the Company with a clearer understanding of the municipalities' expected level of participation and the expectations. To that end, the Company will execute an MOU with each participating municipality to confirm the understanding and responsibilities of each party during the pilot.

5.2 Municipal Qualifications

The requirements for municipal participation in the survey are interdependent, and the Company will evaluate these requirements accordingly. In addition, the Company will consider other logistical factors such as geography, topography, and varied street lighting applications. The municipality's availability and commitment of resources to perform a street lighting quality study in conjunction with the metering pilot is also important.

5.3 Test Location Orientation

The Company expects that the pilot will cover areas within four municipalities with a deployment of approximately 500 network-controlled IC meter nodes in each area. The specific area(s) in each municipality will be determined based on municipal input relative to their lighting quality study and desired test conditions associated with the network design.

5.4 Testing Plan

The Company will manage the laboratory testing of the network IC meter devices in compliance with established industry standards and protocols. A statistically significant population sample of each manufacturer's IC meter device will be tested to ensure compliance with ANSI C12. The Company will not perform laboratory testing of the standard AMR meters used for this pilot. These meters will have been prequalified as part of the Company's established meter commissioning process. In addition, as part of the Company's "Pick for Test" sampling program, the Company has annually reported these meter families to the PUC. Following assurance of ANSI C12 compliance, a "meter farm" controlled testing model will be used to test the network and interoperability of the IC meters and related Company meter data collection and billing systems. Finally for the duration of the pilot, the successful candidate technologies will be field trial tested in a real world environment.

6. Methodology

6.1 Laboratory Testing

Industry standard testing of IC meter devices will occur in controlled environments to determine meter accuracy, reliability, and interoperability with Company collection and billing systems.

6.2 Standard Company Meter Application

A limited quantity of standard AMR meters will be installed at specific locations having discrete lighting assembly configurations and operational schedules to establish baseline energy consumption values. These applications will include existing HPS lamp technology and new LED light source technology as the energy consuming equipment. The operating schedules will conform to existing tariff schedules of continuous, dusk-to-dawn and part-night. Following the determination of standard baseline energy values, these applications can be managed through the municipality's lighting quality study to provide meter data from both standard AMR meters and networked IC meter devices associated with variable operating schedules.

6.3 Network Controlled IC Meter Application

The IC meter devices will be deployed in designated areas that correspond with the individual municipality's lighting quality study. The Company proposes that these IC meter devices be installed on various light source technologies that are strategically located to address specific street lighting illumination needs. In general, these areas will include high volume traffic / high conflict areas, high speed / low conflict areas, commercial business districts, general urban areas, general suburban residential, and rural (intersection) applications. These locations have unique illumination requirements that allow the municipalities to utilize the network controlled operating device to independently manage the operating schedule.

6.4 Independent Consultant Partnership

The Company proposes to partner with several consultants to provide expertise and neutral, independent oversight of key elements of the pilot program. The Company plans to use the services of The Eastern Specialty Company (TESCO) to provide consultation on meter test program development and oversight. TESCO is a recognized industry leader in meter test equipment for metering systems. In addition, TESCO provides expert consultation services since 1904. Additionally, the Company proposes to use the technical knowledge and capabilities of the Pacific Northwest National Laboratory (PNNL) to provide independent consultation, supervision, and oversight of the pilot field study activities in conjunction with the municipalities lighting quality studies. PNNL will serve as a technical resource for the participating

municipalities and will assist with milestone progress reporting and a verification review of the final project report.

7. Meter Testing

7.1 Revenue Grade Meter Accuracy

As a minimum, the acceptable revenue grade meter accuracy will be compliant with the Rules Prescribing Standards for Electric Utilities issued by the Rhode Island Division of Public Utilities and Carriers (Division) (Division Standards). *See* Attachment B. In general, minimum meter accuracy will be established at 98.0% (2.0% error), as defined in the Division Standards. Acceptable Company standards for revenue grade meter accuracy of these devices shall be 99.5% (0.5% error). The Company will test all units to achieve the manufacturers' established accuracy levels as referenced with current independent laboratory reports of each product in addition to what is published within product specification literature.

7.2 Industry Testing Standards

The meters will be tested in accordance with industry accepted ANSI C12.20 standards and as additionally defined in the Division Standards. Although specific testing and quality standards for this form of revenue grade IC meter device continue to be developed, the referenced ANSI standards and testing protocols used for existing revenue grade metering will be utilized to best accommodate the devices and the anticipated applications.

7.3 Sample Population

The minimum quantity of network accessed meter nodes to be tested will be compliant with Division Standards or as otherwise specified in ANSI Z1.9 (Acceptance by Accuracy) standards defining the minimum acceptable testing population, whichever is more rigorous. At this time, the Company plans to use two (2) node vendors to provide the products for this pilot. However, the Company may use additional compatible nodes by different vendors.

7.4 Existing Company Meters

Selective testing of existing company standard AMR meters will not be performed as part of this pilot. The Company will use tested meters from existing inventories in planned applications to establish baseline energy consumption values. These meters will be installed in parallel with network accessed meter nodes to provide a direct comparison of energy consumption measurements based on the individual luminaire load during its defined functional operation.

8. Monitoring Plan

8.1 Meter Read Retrieval

During the pilot, the Company will conduct meter reads using the preferred transmission and data capture methodology. The Company will use the communication channels of the standard AMR and IC meter devices. The Company will obtain AMR meter data at designated times to meet during the course of the pilot. The IC meter device data will be obtained through the SSN network and provided as requested through the use of the SSN metering head-end system (UtilityIQ).

8.2 Node Failure Modes

Various node failure modes will be simulated to experience the automation and/or timeliness of the resolution. Failure modes that impact the meter data information will be assessed for the appropriate identification and/or resolution during data transmission.

8.3 Application Software

The Company proposes to facilitate the municipality's use of the SSN's StreetlightVision software to manage the independent operation of the street lights having the network meter/control device that are within the lighting quality studies. Access to the control software will be through a secure, proprietary channel. The Company will monitor and assess all the functional control applications provided by this software.

8.4 Network and Billing Interface Assessment

One requirement of the pilot will be to evaluate the application of network capabilities for street lighting control and metering. In addition, the Company will assess the information system compatibility and interface requirements. The purpose of these studies is to provide the technical detail estimated costs and development timelines necessary to support the adoption, deployment, and integration of a street lighting network-control system, independent of street light and network component ownership. During the pilot, SSN network solution architects will work with the Company's information system (IS) resources to scope the integration efforts required to fully integrate the metering head end system to the Company back-office applications.

Based on (a) the nature, scope and limited time requirements of the pilot, (b) the undefined long-term ownership strategy and (c) cost associated with information system integration applications, the Company is not planning to integrate information systems during the pilot program. A full deployment of a network system would require the integration of the

metering head-end system to a Meter Data Management System (MDMS) in addition to various other back-office applications for the purpose of work order management and customer billing.

During the pilot, the SSN metering head-end system will provide a periodic file export detailing the metering data, which will allow the Company to have the ability to work with that data for testing and shadow billing purposes. The SSN metering head-end system has been successfully integrated with many MDM systems including the Company's standard AMR meter applications. SSN's typical integration method is via Web Services for control and retrieving small data sets. Large data sets (meter reads as an example) are normally delivered via JMS or other standard file transfer protocols (FTP, SCP and SFTP are some examples).

8.5 Network System – Functional Assessment Summary

The automation of data transfer from the network CMS will require an assessment of interface requirements during the pilot. The Company will study the following information systems:

8.5.1 Meter Data Services (MDS) Interface
Evaluate the requirements necessary to facilitate the meter data and asset data alignment of accumulated meter data with the correct billing account and individual location based facilities.

8.5.2 Geospatial Information System (GIS) Interface
If the nodes that are deployed for field trials have available Global Positioning System (GPS) coordinates, the information system requirements to automate the use of the individual node GPS coordinates will be assessed. These coordinates support the quality assurance location verification information on land based mapping.

8.5.3 Meter Inventory System interface
Develop the requirements to facilitate the recording of unique meter identification for the compliance of meter testing requirements.

8.5.4 Customer Service System – Outdoor Lighting

8.5.4.1 Inventory record interface – Meter/GPS information
Identify the modifications necessary to adopt a meter data repository to the existing asset inventory model. Identify the requirements necessary to facilitate the transfer of meter identification information and GPS coordinates to the location record repository.

8.5.4.2 Investigation Order interface - Operation Problems (Outage)
Evaluate the interface requirements necessary to automate operational diagnostic information to initiate Investigation Order creation. Develop requirements for the retention of the diagnostic report in the History file.

8.5.5 Customer Service System – Billing

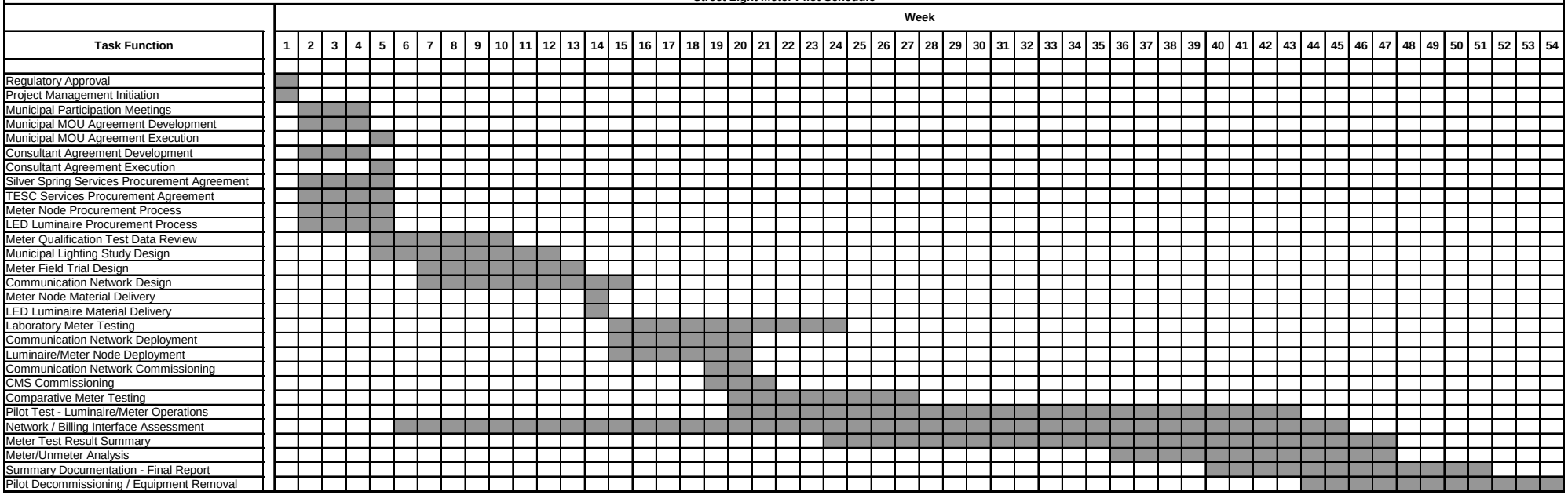
8.5.5.1 Identify requirements to interface meter data information from the MDS to a new repository for a new service class billing application.

8.5.5.2 Develop default meter data estimation functionality to address data gaps, missed reads, dropped reads, etc.

8.5.6 Ancillary Control Functionality
Identify and explore the additional functionality and benefits provided by a wireless network control sensor including outage detection, under/over voltage detection, stray voltage detection, asset management and the various maintenance functions including end of lamp life prediction and lamp outage notification.

9. Pilot Schedule

The Narragansett Electric Company
Docket 4513
Street Light Meter Pilot Schedule



10. Pilot Cost Estimate

The following table provides an estimate of costs to implement the pilot as identified in this proposal.

The Narragansett Electric Company Street Light Metering Pilot Proposal Docket No. 4513 Cost Estimate		
Task Function	Cost Estimate Company Luminaire Equipment	Cost Estimate Municipal Luminaire Equipment
Project Management	$200,000	$200,000
Laboratory Testing Services	$100,000	$100,000
Communications Network (SSN)	$300,000	$300,000
Materials - Control Device Nodes	$150,000	$150,000
Materials - LED Luminaires	$360,000	$0
Materials – Ancillary Equipment	$20,000	$20,000
Equipment Installation	$800,000	$180,000
Equipment Removal	$1,000,000	$20,000
Information Systems Studies	$100,000	$100,000
Administrative & General	$50,000	$50,000
Pilot Project Total[2] (Estimate)	$3,080,000	$1,120,000

[2] Cost estimate values include applicable Company adders and overhead.

Attachments

Attachment A – Municipal Survey Questionnaire – October 2014

Attachment B – Division Rules Prescribing Standard for Electric Utilities

Attachment A – Municipal Survey Questionnaire

Streetlight Metering Pilot Questionnaire – October 2014

Narragansett Electric Company[3] is requesting that you complete a brief questionnaire by clicking on the link below.

Completion of the survey will allow the Company to gather data concerning your community's interest in the metering pilot and metering technology described below. **Please complete this survey no later than Friday, October 10th**, so your responses may be used in formation of the pilot.

The Rhode Island Public Utilities Commission ("PUC") recently approved the Company's tariff for Customer-Owned Street and Area Lighting – S-05 (the "Tariff").The Tariff was filed in compliance with the Municipal Streetlights Investment Act, R.I.G.L. § 39-30-1, which allows a city or town to purchase the streetlight system from the Company.

After approving the Tariff, the PUC opened Docket No. 4513 for the Company to perform a pilot for the metering of streetlights owned either by the Company or a municipality. Therefore, National Grid will propose a limited pilot to assess the application and accuracy of metering technologies associated with street lighting energy consumption ("metering pilot"). This metering pilot will provide relevant data for all parties to determine whether the use of meters for streetlights is appropriate at this time. The metering pilot will also help the Company develop strategies for the use of meters for streetlights in the future.

Although the majority of streetlight installations have historically been unmetered and billed on a fixed calculation, there is new technology available that may make the use of meters now viable for streetlights. The metering pilot will propose that testing of the technology utilized in the metering pilot take place in both a controlled laboratory condition and in various physical environments.

In general, the metering pilot will propose the installation of various meter technologies on existing and high efficiency street lighting equipment, operated under controlled conditions and schedules. The pilot will use existing industry, and regulatory-approved revenue-grade meter technology (such as the meter used for your residence) to establish baseline energy consumption information. Representative samples of the newer metering technology, including any associated networking and communication requirements, will be deployed and tested under the same operating conditions as the standard meter technology. The results will be compared against the baseline information and provide additional comparison to the conventional and approved

[3]The Narragansett Electric Company d/b/a National Grid ("National Grid" or the "Company").

Attachment A – Municipal Survey Questionnaire

unmetered bill calculation model. Further testing of the advanced meter technologies will analyze the accuracy, reliability, quality, and security of the meter data collection, and transmission of the metered data to the Company's billing systems.

Thank you in advance for your time and attention. Please contact your National Grid Community Manager for any additional information regarding this matter.
A list of Community Managers is included for your convenience.

Attachment A – Municipal Survey Questionnaire

1. Would you like for your municipality to be considered for participation in National Grid's metering pilot project?

___ Yes
___ No
___ Don't know

2. National Grid's metering pilot provides the opportunity for municipalities to assess both the quality of newer lighting technologies and the application of varied operating schedules and conditions. Would you like your municipality to participate in a lighting quality study?

___ Yes
___ No
___ Don't know

3. Would you be willing to have your municipality participate in a lighting quality study connected to the metering pilot with municipal contribution for labor, product and/or financial resource support?

___ Yes
___ No
___ Don't know

4. If you purchase your lights, you may have more options in managing your lighting system than have previously been available. Please select the 3 most important factors when you make decisions about outdoor lighting issues for your municipality:

___ Public welfare (safety / security)
___ Liability (risk avoidance)
___ Actual energy consumption (metered)
___ Energy efficiency
___ Light performance (design)
___ Compliance with industry codes/standards
___ Product options/procurement
___ Cost
___ Aesthetics
___ Maintenance
___ Outage reporting

Attachment A – Municipal Survey Questionnaire

___ Technology
___ Lighting controls
___ Dark Sky compliance
___ Other, please specify:

5. How familiar are you regarding the following electric street lighting system issues? Please use the following scale: 1-Very Familiar; 2-Somewhat Familiar; 3-Neither Familiar, Nor Unfamiliar; 4-Somewhat Unfamiliar; 5-Not Familiar At All

___ Safety requirements
___ Industry and utility codes &standards
___ Lighting design criteria
___ Present lighting technologies
___ Electrical lighting system components
___ Lighting operation and maintenance
___ Lighting infrastructure construction and maintenance

6. How familiar are you regarding the following new lighting sources and control technologies associated with street lighting? Please use the following scale: 1-Very Familiar; 2-Somewhat Familiar; 3-Neither Familiar Nor Unfamiliar; 4-Somewhat Unfamiliar; 5-Not Familiar At All

___ Solid State Lighting (such as Light Emitting Diode, (LED))
___ Lighting metric standards
___ Human health effects of lighting
___ Physiological and vision effects
___ Adaptive operating controls and schedules
___ Communication networks
___ Meter standards and testing

7. How likely would you be to reduce light output or turn off streetlights during the night in your municipality if it resulted in overall cost savings?

___ Very likely
___ Somewhat likely
___ Neither likely nor unlikely
___ Not very likely
___ Not at all likely

Attachment A – Municipal Survey Questionnaire

8. Does your municipality currently have customer-owned street lights attached to a conventional electric meter (similar to that on a residential or commercial building)?

___ Yes
___ No
___ Don't know

9. Approximately how many metered streetlights do you have in your municipality?

10. Are you familiar with the Rhode Island General Law § 39-30-1, the Municipal Streetlights Investment Act, which allows a city or town to purchase the streetlight system from the electric utility?

___ Very familiar
___ Somewhat familiar
___ Neither familiar nor unfamiliar
___ Somewhat unfamiliar
___ Not familiar at all

11. What is your municipality's plan regarding purchasing the utility street lighting system as allowed under R.I.G.L. § 39-30-1?

___ Planning to purchase the system within a year
___ Planning to purchase the system within the next two (2) years
___ Planning to purchase the system within the next three (3) years
___ Evaluating the opportunity to purchase
___ Not planning to purchase the system within the next 3 years

12. *Programmer note: Only ask of those who plan to purchase utility streetlight system.* Which technology do you intend to install when you purchase the utility streetlight system? (Select all that apply.)

___ LED
___ Induction
___ Plasma
___ Other technology (specify)
___ I will evaluate all appropriate technologies

Attachment A – Municipal Survey Questionnaire

___ I do not plan to change the existing lighting equipment

13. *Programmer note: Only ask of those who plan to purchase utility streetlight system.* How soon after the transfer of ownership do you expect the conversion to be completed?

___ Months

14. *Programmer note: Only ask of those who plan to purchase utility streetlight system.* Many of the new street lighting technologies can accommodate dimming, with some having instant on/off capability. How likely are you to use these features in your municipality to save energy?

___ Very likely
___Somewhat likely
___ Neither likely nor unlikely
___ Somewhat unlikely
___ Not at all likely

15. *Programmer note: Only ask of those interested in a lighting quality study.* Which of the following would you like to have included in a lighting quality study? (Select all that apply)

___ Part-Night operation (on/off)
___ Dimming operation
___ Motion Sensor operation
___ Illumination level monitoring
___ Illumination pattern monitoring
___ Lighting layout design
___ Color temperature assessment
___ Drive current evaluation
___ Public feedback instruments
___ Visual assessment

16. *Programmer note: Only ask of those that chose to include Visual assessment in lighting quality study.* Which of the following visual assessment aspects would you like to have included in a lighting quality study? (Select all that apply)

___ Light level - visual acuity
___ Clear condition
___ Wet condition

Attachment A – Municipal Survey Questionnaire

___ Snow condition
___ Glare assessment
___ Shadow assessment
___ Color recognition
___ Contrast assessment
___ Physiological assessment (safety/security)

17. Is there another subject or issue that your municipality would like included in the metering pilot not mentioned in the questionnaire?

COMPLETED BY:

Name:
Title:
Municipality:
Email address:

Attachment B – Division Rules Prescribing Standard for Electric Utilities

Rules Prescribing Standards for Electric Utilities

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DIVISION OF PUBLIC UTILITIES AND CARRIERS

RULES PRESCRIBING STANDARDS FOR ELECTRIC UTILITIES

Date of Public Notice: June 18, 2004

Date of Public Hearing: July 26, 2004

Effective Date: September 21, 2004

The following rules and regulations, after due notice and an opportunity for hearing, are hereby adopted and filed with the Secretary of State this 1st day of September, 2004, to become effective twenty (20) days after filing, in accordance with the provisions of R.I.G.L. §42-35-4 and §39-3-33 (1990 Reenactment).

These rules and regulations supersede the Rules Prescribing Standards for Electric Utilities that have been in effect since May 1995.

Date September 1, 2004

Thomas F. Ahern, Administrator

Attachment B – Division Rules Prescribing Standard for Electric Utilities

RULES PRESCRIBING STANDARDS FOR ELECTRIC UTILITIES

I. APPLICATION OF RULES

A. These rules shall apply to every public utility as hereinafter defined doing business as such, or authorized to do so, within the State of Rhode Island.
B. These rules shall be amended or repealed, and applications therefore shall be made, in accordance with provisions of Title 42, Chapter 35 of the General Laws of 1956 entitled "Administrative Procedures".

II. DEFINITIONS

A. The term "Division" means the Rhode Island Division of Public Utilities and Carriers.
B. The term "Administrator" means Public Utility Administrator of the Division of Public Utilities and Carriers.
C. The term "public utility" shall mean and apply to every corporation, company, person, association of persons, their lessees, trustees, or receivers appointed to any court whatsoever, that now or hereafter may own, lease, operate, manage or control any electric plant or equipment or any part of any electric plant or equipment, within this State, for the production, transmission, delivery or furnishing of electricity, light, heat or power, either directly or indirectly, to or for the public.
D. The term "electric plant" shall mean all real estate, fixtures, equipment and personal property owned, controlled, operated or managed in connection with or to facilitate the production, generation, transmission, delivery or furnishing of electric energy.
E. The term "customer" shall mean and apply to every corporation, company, person, association of persons, their lessees, trustees or receivers appointed by any court whatsoever, that now or hereafter may be supplied with electric service by any public utility as herein defined.
F. The term "service" shall mean, in its broadest and most inclusive sense, the furnishing of electricity to a customer by a public utility.
G. The term "meter", without other qualification, shall mean a device or appliance for the measurement of electrical quantities to be used as a basis for determining charges by a public utility for furnishing or rendering electric service to a customer.
H. The term "creep" means the motion of the rotor of a meter with normal operating voltage applied and the load terminals open-circuited.

Attachment B – Division Rules Prescribing Standard for Electric Utilities

III. SERVICE PROVISIONS

A. Filing of Rates Schedules.

Schedules showing all rates, tolls and charges by a public utility shall be filed and kept open to public inspection in accordance with the provisions of Title 39, Chapter 3, Section 10 of the General Laws of 1956.

B. Application for Service.

An Applicant desiring service under a public utility's filed rate schedules may be required to make application in writing, in accordance with the forms prescribed by the public utility.

C. Information to Customers - Rate Selection.

1. Each public utility shall, upon request, provide a customer with such information and assistance as is necessary to enable the customer to secure the most advantageous rate or rates. Further, each utility shall inform the applicant of any service connection and/or installation charge to be applied to the bill. Each customer shall be responsible for selecting, and taking service at the most advantageous rate or rates.
2. Each public utility shall, upon request, explain to a customer the method of reading meters and how the billing is calculated.
3. Where special charges for construction, maintenance, replacement costs, expenses or overtime work are not specifically set forth in a utility's tariff, the utility shall, before performing non-emergency work, provide the applicant or customer with an estimate of charges to be levied, in writing if requested.
4. In addition, the utility shall make available free information concerning the utility's programs, services, rights and responsibilities, and complaint procedures for the general public.

D. Deposits.

1. A public utility, as security for prompt payment of a customer's indebtedness to it, may require a cash deposit or other collateral satisfactory to it before rendering, or as a condition of continuing to render service to such customer. This deposit shall not be more than the estimated bill for two times the normal billing period. Interest shall be paid on deposits held six (6) months or more in accordance with applicable rate schedules or the terms and conditions of the public utility. Deposits, plus accrued interest thereon, less any amount due the public utility, will be refunded upon termination of service. When a deposit is applied against an account that has been

Attachment B – Division Rules Prescribing Standard for Electric Utilities

terminated, interest shall cease to be accumulated on the balance at the date of termination.

E. Meter Reading and Bill Forms.

1. The metering equipment for each service shall be such as to register the number of kilowatt-hours (kwh) delivered during any period, and to the extent applicable, the number of Kilo-Var Hours (KvarH) and the Kilowatt (Kw) and Kilo-Volt Amperes (Kva) demand.
2. All service meters shall be read at regular intervals and on the corresponding day of each meter reading period insofar as practicable within regularly scheduled work days.
3. Bills shall be rendered at regular intervals and shall show the date of the current meter reading and the amount or quantity of service for the billing period; and shall also show any applicable discount or penalty date.
4. Each public utility shall keep an accurate account of all charges for service billed each customer and shall maintain records showing information from which each bill rendered may be readily computed.

F. Customer Complaints.

1. Each public utility shall make a full and prompt investigation of customer complaints made either directly or through the Division. A record of complaints received, other than those of a minor nature shall be kept for at least two years and shall show the name and address of the complainant, the date and character of the complaint and the disposition thereof.
2. Each public utility shall endeavor to keep its appointments. In the event cancellation of appointment is unavoidable, every reasonable effort should be made to promptly notify the customer.
3. During an abnormal service outage the utility shall make reasonable efforts to inform the general public about the areas affected, the progress of service restoration, and anticipated restoration schedules when available. Information for the general public shall be made through advisories to the news media. Business offices shall make similar information available to callers, using appropriate communications systems.

G. Change in Character of Service.

1. If a change in character of service to a customer is brought about for the convenience or benefit of the public utility, the public utility shall pay such part of the cost of changing the equipment of the customer affected as shall be

Attachment B – Division Rules Prescribing Standard for Electric Utilities

determined by mutual agreement. An equitable settlement would normally be on the following basis: Payment by the public utility to the customer of:
a) The cost of the customer's electrical utilization and equipment that is made obsolete, less proper allowance for depreciation.
b) The cost of installing the new equipment and removing the old, less the salvage value of such equipment as the customer retains.
c) The cost of making the necessary change in customer's wiring.

H. Discontinuance of Service

1. By Customer: A customer shall be required to give at least twenty four (24) hour notice of its intention to discontinue service in accordance with the provisions of the applicable rate or terms and conditions of service and shall be responsible for all charges until expiration of such notice period.
2. By the Public Utility:
a) Non-Payment of Bills. In accordance with the provisions of the applicable rate or terms and conditions of service, a public utility may require that bills be paid within a specified time after presentation. On and after thirty (30) days from the date of presentation service may be discontinued for non-payment provided written notice to the customer has been deposited in the U.S. mail at least ten (10) days prior to the date of discontinuance. In lieu of the discontinuance, or upon reconnection, the public utility may require payments at less than monthly intervals. If service is discontinued for non-payment, the public utility may make a reasonable charge for reconnection. Service must not be discontinued on a Friday, a Saturday, or the day before a holiday.

b) For Violation of Rules: No public utility shall discontinue service to a customer for violation of any rule unless it shall first have deposited in the U.S. mail written notice to the customer at least ten (10) days prior to the date of discontinuance advising the customer of the particular rule that has been violated, except that service may be discontinued immediately when continuance of the service would endanger life or property, or when ordered to do so by any governmental agency or official having jurisdiction.

c) For Fraudulent Use of Service: A public utility may discontinue service without notice whenever a fraudulent use of the service by the customer is detected.

Attachment B – Division Rules Prescribing Standard for Electric Utilities

IV. QUALITY OF ELECTRIC SERVICE

A. Standard Frequency - The standard frequency for alternating current distribution systems shall be sixty (60) Hertz, with permissible variations not exceeding maximum and minimum values of 60.3 and 59.7 Hertz.

B. Service Voltage - The following service voltage standards shall be maintained at the point where the electrical system of the supplier and the electrical system of the user are connected.

Table I [These values are ANSI C84.1 (1989). Values shall change if ANSI adopts new standards.] Established Standard Service Voltage	**Minimum Voltage**	**Maximum Voltage**	**Type of Service**
120	114	126	Single Phase
120/240	114/228	126/252	Single or Polyphase
208Y/120	197Y/114	218Y/126	Single or Polyphase
240	228	252	Single or Polyphase
480Y/277	456Y/263	504Y/291	Single or Polyphase
480	456	504	Single or Polyphase
600	570	630	Single or Polyphase
2400	2340	2520	Single or Polyphase
4160Y/2400	4050Y/2340	4370Y/2520	Single or Polyphase
12470Y/7200	12160Y/7020	13090Y/7560	Single or Polyphase

FIGURES

Figure 1

Sunrise Technology OpenGrid Light Control Node

Technical Specifications

Voltage input: 105 – 305 VAC
Load rating: 15,000 + operation at 1,000W/1800VA
Surge Protection: 380 Joule MOV
Housing: UV stabilized impact resistant polycarbonate
Operating temperature: -30°C to +70°C
Humidity: 0% to 95%, non-condensing
Base: High temperature polycarbarbonate
Contact blades: Meets ANSI C136.10 (3-prong), ANSI C136.41 (Dimming)
Gasket: Cross linked polyethylene
Photosensor: Encapsulated phototransistor
Energy Metrology: 1% accuracy

FIGURES

Figure 2

SELC External CMS Module

Technical Specifications

Metering Accuracy: 1% VRMS, IRMS, Watts.
Metering Range: 90 - 320VAC , 10A RMS (48 – 62)Hz Standard Unit.
430 – 530VAC , 5A RMS (48 – 62)Hz High Voltage version.
Turn ON Light Level: 1.5fc (Other levels available on request)
Housing Material: UV Stabilized Polycarbonate
Enclosure Sealing: IP67
Dimensions: 3.54in (90mm) Diameter- 3.43in (87mm)
Switch Ratio (OFF:ON) Ratios: 1.5:1 (Also available - 1:1, 2:1, 0.5:1)
Guarantee: 5 years*
Rated Load: 1800VA 3 x 400W
Maximum Load Current: 10 Amps
Operating Temperature Range: -40˚C to +70˚C (-40˚F to +158˚F)
Circuit Power Consumption: <2Watts Avg Power @120 VAC
Manufacturing Standard: EN ISO 9001:2008
Photo Control designed to: Applicable parts of BS5972;
Satisfy the following standards: EMC EN55015, EN61547 EN61000-3-2,EN61000-3-3, UL773 ,CSA C22.2
Operating Voltage: 105 – 305V (50/60Hz) Standard Unit, 480VAC high voltage version will also be available to special order
Options for controlling LED driver: DALI or 0-10VDC
Energy metrology: 1% accuracy, with per day, per hour, or per minute records and robust utility billing integration

FIGURES

Figure 3

Technical Specifications

Silver Spring Network

General:
IPv6 transport

50 to 300 kbps data rates

Full, two-way communications

One-watt transmitter

Frequency Hopping Spread Spectrum (FHSS)

Multi-layer security policy enforcement and monitoring

Automatic data routing with self-configuration, auto-healing and redundant uplinks

Dynamic network discovery and self healing

Continuous neighbor monitoring and route calculation

Over-the-air configuration and firmware upgrades

Platform Processor: ARM 7

RAM: 8 MB

Flash: 16 MB

NAN Network Data rate: 50 to 300 kbps

Frequency range: 902 – 928 MHz

Spread spectrum: Frequency hopping

Transmitter output: 27 – 30 dBm (1 W)

Receiver sensitivity: -98 dBm for 10% PER

Protocol: IEEE 802.15.4g

Security Addressing: IPv6

Encryption: Advanced Encryption Standard (AES-128 or AES-256)

Security: Secure Hash Algorithm 256-bit (SHA-256) and RSA-1024 or ECC-256

Key storage: Secure NVRAM with tamper detection and key erasure