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Our Energy...Your Power

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PA PUBLIC UTILITY COMMISSION
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December 30, 2010

VIA OVERNIGHT MAIL

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

Re: Duquesne Light Company Petition for Approval of Smart Meter Procurement and Installation Plan
Docket No: M-2009-2123948

Dear Secretary Chiavetta:

Enclosed for filing and approval please find one (1) original and three (3) copies of Duquesne Light Company's Advanced Metering Infrastructure ("AMI") Assessment of Needs, Technology Solutions and Vendor Selection ("Assessment" or "Report"), being filed as contemplated pursuant to Duquesne Light's Smart Meter Procurement and Installation Plan, approved by the Commission on May 11, 2010. Duquesne is also providing the Commission with a CD containing this complete filing in PDF format.

Sincerely yours,

Gary A. Jack
Assistant General Counsel

Enclosures

cc: Service List (via Email and United States First Class Mail)

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Duquesne Light Company	:	
Smart Meter Procurement	:	**Docket No. M-2009-2123948**
And Installation Program	:	

APPLICATION FOR APPROVAL OF DUQUESNE LIGHT'S ASSESSMENT OF NEEDS, TECHNOLOGY SOLUTIONS AND VENDOR SELECTION

Duquesne Light Company ("Duquesne" or "Duquesne Light" or "Company") hereby files this Application seeking approval of its Advanced Metering Infrastructure ("AMI") Assessment of Needs, Technology Solutions and Vendor Selection, pursuant to its Smart Meter Procurement and Installation Plan ("SMPI Plan") filed on August 14, 2009, which was approved as detailed in a Commission Order dated May 11, 2010. In support of this Application, Duquesne states as follows:

Introduction

1. Duquesne is a public utility as that term is defined under Section 102 of the Public Utility Code, 66 Pa.C.S. § 102. Duquesne is also an electric distribution company ("EDC") as that term is defined under the Restructuring Act, Section 2803 of the Public Utility Code, 66 Pa.C.S. § 2803, and a default service provider ("DSP") per Section 2803 of the Public Utility Code. Duquesne is certified by the Pennsylvania Public Utility Commission ("Commission or "PUC") and provides electric service to approximately 579,000 customers in the City of Pittsburgh, and in Allegheny and Beaver Counties, Pennsylvania.

2. Pursuant to Act 129 of 2008, signed into law by Governor Rendell on November 14, 2008, and the Smart Meter Procurement and Installation Implementation Order (Docket No. M-2009-2092655) issued on June 24, 2009 by the Commission, Duquesne Light submitted a Smart Meter Procurement and Installation Plan ("SMPI Plan" or "Plan") on August 14, 2009. See Duquesne Light Smart Meter Procurement and Installation Program, PUC Commission Docket No. M-2009-2123948, August 14, 2009. This Plan was approved by the Commission on May 11, 2010, and Duquesne Light subsequently submitted an amended Smart Meter Plan on June 10, 2010, to comply with the issues addressed in PUC's approval order. See Smart Meter Plan, Revision 1, Docket No. M-2009-2123948, June 10, 2010.

3. Pursuant to the approved Smart Meter Plan, Duquesne is required to provide the Commission with periodic updates and make filings for approvals on its Smart Meter Procurement and Installation Program, including an Assessment of Needs, Technological Solutions and Selection of Technologies and Vendors ("Assessment"), due on or about December 31, 2010, as presented herein. Duquesne worked jointly with its advisor, R.W. Beck Inc., to conduct this Assessment.

Duquesne Light's Assessment of Needs, Technology Solutions and Vendor Selection

4. Duquesne Light's Assessment determined the AMI features and functionality required to meet the requirements outlined in Act 129, PUC Orders, and Duquesne requirements due to its current systems. With the determination of these requirements, Duquesne Light conducted its RFP procurement and vendor evaluation process to select a primary AMI vendor that met the stated requirements pursuant to its

Smart Meter Procurement and Installation Plan. The Report detailing the technology assessment, requirements definition, RFP procurement procedure, technology and vendor evaluation and conclusions of the selected technology solution is submitted and attached hereto.

5. After analyzing various possible AMI solutions, Duquesne proposes to deploy a radio frequency ("RF") mesh solution. The mesh consists of meters connected to collectors located throughout the service territory whereby the data will be transferred to the head end system using Duquesne's existing leased fiber network. Duquesne plans to replace all existing Advanced Meter Reading ("AMR") meters with new smart meters that will provide two-way communication between each customer premise and the utility. All single phase meters will be equipped with an internal ZigBee chip to provide customers with direct access to interval usage data, and provide a platform for future home area network ("HAN") applications. The selected AMI solution is capable of providing 15-minute interval data for all meters, and single phase meters will be able to be equipped with an internal disconnect switch for remote connections/disconnections. Duquesne plans to utilize its existing leased fiber network for backhaul communication to deliver data from the collectors located at Duquesne's substation to the AMI head end system. An intermediate network will also be deployed to deliver data from the meters to the fiber take out points; however this solution is still being analyzed. The solution will meet the minimum requirements outlined in the Act, as well as, if determined to be cost justified and needed, the additional requirements outlined in the Commission's Implementation Order. Further, the solution will meet some additional requirements that

Duquesne deems to be important for a successful AMI solution, namely ease of integration with the Company's Oracle systems and fiber network.

6. The attached Assessment Report outlines Duquesne's analysis of the technical aspects and specifications of the chosen AMI solution. Vendor selection has not been completed at this time, as while technical review has been completed by Duquesne and R.W. Beck, the complete system costs are still fully being evaluated. Duquesne is seeking clarification and additional cost information from some of the vendors since disparate cost estimates and varying services were provided by bidders. Duquesne will supplement this filing by January 31, 2011 with system costs after the cost evaluation has been completed and, among other things, identify Duquesne's primary AMI vendor selection. The selected AMI vendor will be the prime contractor under agreement with Duquesne, and may elect to subcontract with an installation contractor or other subcontractors as necessary. All four vendors who submitted bids will be identified at that time and submitted confidentially with the Commission.

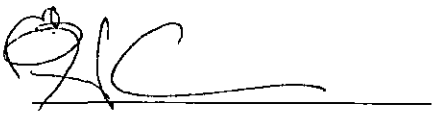
7. Duquesne seeks review by the Commission and parties of its Assessment of Needs, Technology Solution, and Selection of Vendor and Commission approval of its conclusions. Specifically, Duquesne Light Company requests that the Commission issue an Order approving: (1) the procedure used to evaluate and select a primary AMI vendor; (2) the Assessment of Needs shown in Section II of the Report attached hereto; (3) the Technology Solution of RF mesh and findings supported in Section IV of the Report; (4) the selection of its Primary AMI vendor; (5) updated costs range for the entire Smart Meter Project and Deployment; and (6) any other approvals that the Commission deems necessary or advisable.

It is understood that items 4 and 5 cannot be acted upon by the Commission until Duquesne supplements its filing with vendor selection and associated cost information on or before January 31, 2011.

WHEREFORE, Duquesne requests review and Commission approval of its Assessment of Needs, Technology Solution, and Selection of Vendor and such other relief as is appropriate.

Respectfully submitted,

Duquesne Light Company



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Dated: December 30, 2010

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Duquesne Light Company
Smart Meter Procurement and
Installation Plan- Assessment
of Needs, Technology Solutions
and Vendor Selection

Docket No. M-2009-2123948

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VERIFICATION

I, David Wolfe, state that I am authorized to make this Verification on behalf of Duquesne Light Company, being a Director, Technology, that the facts and information set forth in the Assessment of Needs, Technology Solutions and Vendor Selection are true and correct to the best of my knowledge, information and belief, and I expect to be able to prove the same at any hearing held in this matter. I understand that the statements herein are made subject to penalties relating to unsworn falsification.

12-30-2010

Date

David G. Wolfe

David G. Wolfe

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Duquesne Light Company's Smart Meter Procurement and Installation Plan,
Pennsylvania Public Utility Commission Docket No. M-2009-2123948:

Assessment of Needs, Technology Solutions and AMI Vendor Selection

December 30, 2010

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I. Introduction

Pursuant to Act 129 of 2008, signed into law by Governor Rendell on November 14, 2008, and the Smart Meter Procurement and Installation Implementation Order (Docket No. M-2009-2092655) issued on June 24, 2009 by the Pennsylvania Public Utility Commission ("PUC" or "Commission"), Duquesne Light Company ("Duquesne") submitted a Smart Meter Procurement and Installation Plan ("SMPI Plan" or "Plan") on August 14, 2009. See Duquesne Light Smart Meter Procurement and Installation Program, PUC Commission Docket No. M-2009-2123948, August 14, 2009. This Plan was approved by the Commission on May 11, 2010, and Duquesne Light subsequently submitted an amended Smart Meter Plan on June 10, 2010, to comply with the issues addressed in PUC's approval order. See Smart Meter Plan, Revision 1, Docket No. M-2009-2123948, June 10, 2010.

Pursuant to the approved Smart Meter Plan, Duquesne is required to provide the Commission with periodic updates on its Smart Meter Procurement and Installation Program, including an Assessment of Needs, Technological Solutions and Selection of Technologies and Vendors, due on or about December 31, 2010, as presented herein. Duquesne worked with its advisor, R.W. Beck Inc., to conduct this Assessment. This Assessment analyzes potential Advanced Metering Infrastructure ("AMI") solutions including radio frequency ("RF") mesh, RF tower, and power line carrier ("PLC") solutions. Please see Sections II through IV of this filing for further information on the technology solution selected. This Assessment analyzes the AMI communication and network infrastructure, the smart meters, the supporting hardware and software, including the AMI head-end and other ancillary components such as servers, routers, etc. that are required to operate the AMI system and provides a review of Duquesne's AMI procurement and vendor selection process. The conclusions of this Assessment, set forth herein, outline our analysis of the technical aspects and functionality of the AMI solution; vendor selection has not been completed at this time, as complete system costs are still fully being evaluated. Duquesne is seeking clarification and additional cost information from the vendors and will supplement this filing by January 31, 2011 with system costs after the cost evaluation has been completed and, among other things, identify Duquesne's primary AMI vendor selection. The selected AMI vendor will be the prime contractor under agreement with Duquesne, and may elect to subcontract with an installation contractor or other subcontractors as necessary. A portion of this subsequent filing will be filed confidentially with the Commission, so as to protect confidential information.

Executive Summary

Duquesne, per its approved Plan, committed to file its assessment of needs and technological solutions and selection of AMI technology and vendor on or about December 31, 2010. The Company completed a rigorous evaluation of AMI technologies and associated vendors, and selected its technology solution to be a RF mesh solution. Alternate AMI solutions such as RF tower and PLC solutions were evaluated; however, the RF mesh solution(s) ranked highest technically in meeting Duquesne's minimum stated AMI and back-office integration requirements as well as those outlined in the Act and Order. Additionally, the RF mesh solution(s) were the lowest cost solution(s).

Duquesne plans to replace all existing Advanced Meter Reading ("AMR") meters with new smart meters that will provide two-way communication between each customer premise and the utility. All single phase meters will be equipped with an internal ZigBee chip to provide customers direct access to interval usage data and provide a platform for future home area network ("HAN") applications. The selected solutions local area network ("LAN") will operate in the 900 megahertz ("MHz") communication band, and Duquesne will utilize its existing leased fiber network for backhaul communication. An intermediate network (from the AMI collection points to the fiber network take-out points) is still being analyzed, and has not been selected at this time. The selected AMI solution will provide the capability for 15 minute interval data for all meters and single phase meters will be able to be equipped with an internal disconnect switch for remote connections/disconnections.

Section II of this filing outlines the full set of AMI system requirements that were derived from our technology assessment. The requirements outlined therein are formed on the basis of the Act and the Implementation Order as well as industry standards and Duquesne's back-office integration needs. Section III of this filing outlines our vendor and technology selection process, followed by Section IV, which provides an overview of the specific AMI technology selected by Duquesne. Last, Section V outlines Duquesne's approach to offer smart meters on customer request during the 30-month Grace Period.

Background

Pursuant to the milestones detailed in its approved Plan, and outlined herein, this filing is Duquesne's assessment of AMI technology requirements, potential solutions and selection of technologies and vendors. There are future related milestones set forth in Duquesne's Plan that surround establishment of network designs, establishment of plans to design test and certify

electronic data interchange ("EDI") transactions, web access and direct access capability of AMI and customer usage data, technology and network installation, and associated costs of each; however, these will be the subject of subsequent filings.

Act 129

Act 129 sets forth the required capabilities for smart meter technology for Pennsylvania utilities, and provides for cost recovery of all prudent and reasonable costs. Act 129 outlines the following smart meter technology requirements:

- Bi-directional data communications.
- Records usage data on at least an hourly basis once per day.
- Provides customers with direct access to and use of price and consumption information.
- Provides customers with information on their hourly consumption.
- Enables time-of-use ("TOU") rates and real-time price programs.
- Supports the automatic control of the customer's electric consumption by either the customer, the customer's utility or a third party engaged by the customer or the customer's utility.

PUC Implementation Order

Following the passage of Act 129, the Commission adopted an Implementation Order regarding smart meters, outlining its guidance for an electric distribution company's ("EDC's") Smart Meter Procurement and Installation program pursuant to Act 129. The Order recognized that the requirements set forth in Act 129 are minimal requirements, and provided additional capabilities that the Commission believes should be included in smart meters, subject to a further cost-benefit review, including:

1. Ability to remotely disconnect and reconnect;
2. Ability to provide 15-minute or shorter interval data to customers, electric generation suppliers ("EGSs"), third-parties and a regional transmission operator ("RTO") on a daily basis, consistent with the data availability, transfer and security standards adopted by the RTO;
3. On-board meter storage of meter data that complies with nationally recognized non-proprietary standards such as ANSI C12.19 and C12.22 tables;

4. Open standards and protocols that comply with nationally recognized non-proprietary standards, such as IEEE 802.15.4;
5. Ability to upgrade these minimum capabilities as technology advances and becomes economically feasible;
6. Ability to monitor voltage at each meter and report data in a manner that allows an EDC to react to the information;
7. Ability to remotely reprogram the meter;
8. Ability to communicate outages and restorations; and
9. Ability to support net metering of customer-generators.

The Implementation Order allows EDCs to request waivers of the non-statutory smart meter requirements that are deemed not to be cost effective.

As outlined in Duquesne's Cost Benefit Analysis of Duquesne Light Company for Additional Smart Meter Capabilities, *Docket No. M-2009-2123948, filed July 1, 2010, Duquesne evaluated the* technical feasibility and cost justification of the non-statutory requirements outlined in the Order. Three of the non-statutory requirements are still under company scrutiny and evaluation to determine whether Duquesne can cost effectively implement the stated solutions. These requirements include:

1. Remote disconnection and reconnection.
2. Ability to monitor voltage at each meter and report data in a manner that allows EDC to react to the information.
3. Ability to communicate outages and restorations.

Duquesne is currently evaluating cost justification for the inclusion of a disconnect/reconnect switch in single phase smart meters. Additionally, because Duquesne does not currently have an Outage Management System ("OMS") and Distribution Management System ("DMS") and/or electrical model, the ability to monitor voltage at each meter and report data in a manner that allows Duquesne to react to the information or communicate such outages and restorations becomes a technical challenge without additional investments in such systems.

A fourth non-statutory requirement outlined in the Order related to the ability to upgrade the minimum capabilities as technology advances and becomes economically feasible. This has been scrutinized by Duquesne and it is apparent that the AMI system and solution selected will support

this requirement. Though Duquesne continues to study some of these additional requirements, to the extent that the Commission has not ruled on these matters by the end of 2011, Duquesne will offer a final cost benefit recommendation for the non-statutory requirements and include it in the December 31, 2011 filing.

Smart Meter Program Overview (Overview of Docket No. M-2009-2123948)

Duquesne's Plan was designed to meet the requirements of Act 129 and the Implementation Order. The Plan builds upon the Company's already Advanced Meter Reading ("AMR") system, which currently obtains interval reads on all large commercial and industrial ("C&I") customers, and daily reads on over 90% of residential and small commercial customers. The other 10% of residential and small commercial customers have billing reads picked up monthly via mobile drive by or with handhelds.

Duquesne's Plan sets forth a detailed framework for the analysis that is being conducted during the Grace Period to ultimately ensure a compliant, fully functioning, efficient and cost-effective smart meter network that benefits Duquesne's customers, EGS's and the electric grid as a whole.

Duquesne's Plan details its network development and installation plan within the 30-month Grace Period. For planning purposes, the scope of work for the Grace Period is comprised of two major components: Component 1 – Billing and Metering System Upgrades, and Component 2 – Smart Meter Technology Infrastructure.

In Component 1, Duquesne is focusing on an upgrade to its existing billing and metering systems required to comply with smart meter requirements, utilizing the Oracle Utility's project implementation methodology to address application functionality, pricing options mandated by the Act, business transformation, data conversion, deployment, interfaces, information technology ("IT") infrastructure, project management, quality management, testing and training. This proposed component was approved by the Commission in May of 2010, and work on this component began at that time, and is estimated to be completed in December of 2011.

With respect to Component 2, Duquesne is focusing on technical infrastructure, process and systems to support the roll out of smart meters by year end 2012, including an analysis of virtually all functions within the Company that will support smart meter operation and functionality. During this component, Duquesne is performing a gap analysis between the current meter environment and the future smart meter environment, and will develop and implement solutions to result in a

final functioning product. This current vendor and technology analysis and selection is a large part of Component 2.

As detailed in Duquesne's approved Plan, the Plan is broken down by milestones. Specifically, the remaining milestones include:

- The assessment of needs and technological solutions and selection of Technologies and Vendors (12/31/2010) – A filing to follow by January 31, 2010, which will include the cost evaluation performed for selecting a final primary vendor based upon the joint R. W. Beck/Duquesne evaluation of technical merit, costs, and other factors submitted and presented by the bidders. A portion of this filing concerning bids and costs will be filed confidentially with the Commission.
- Establishment of network designs (3/31/2011)
- Establishment of plans to design, test and certify EDI Transactions, Web Access and Direct Access capability consistent with order (06/30/2011)
- Installation, testing and rollout of support equipment and software (9/30/2011)
- Establishment of plans for installation of meters, outside communications and training (11/1/2011)
- Final Filing of the Smart Meter Plan with final expected Costs, Proposed Roll-out Schedule, and Final Plan (12/31/2011)

In addition to these milestones, Duquesne identified three filings in its Plan, designed to keep the Commission and stakeholders informed of its progress. First was the Cost Benefit Analysis, which analyzed the additional smart meter capabilities that were set forth in the Commission's Implementation Order to determine whether the capabilities were cost justifiable. This, as discussed above, was filed on July 1, 2010. See Cost Benefit Analysis of Duquesne Light Company for Additional Smart Meter Capabilities, Docket No. M-2009-2123948, July 1, 2010. The current filing is presented herein, which will include a subsequent filing by January 31, 2011. Finally, one additional filing will be made in December of 2011, and will include final costs, final plan, as well as the smart meter implementation schedule.[1] Further, Duquesne will likely file

[1] Duquesne is involved in a collaborative with FirstEnergy and Allegheny Power to ensure compliance with the Act 129 requirements and to further its position related to all requirements outlined in both in the Act and Order. This collaboration is not only an effort to ensure compliance with the Act 129 requirements, but to develop a broader range of goals focused solely on AMI and smart metering for the utilities.

updates associated with certain of the milestones set forth above, in order to keep the Commission informed of progress on this system.

II. AMI System Requirements

Pursuant to the approved Duquesne Light Smart Meter Plan, a technology needs assessment was performed to identify the necessary AMI requirements to minimally meet the Act 129 smart meter requirements, as well as those outlined in the Implementation Order. A requirements definition assessment was performed by outlining the current state of Duquesne's technology, including AMR and back-office supporting systems, either currently installed, or planned for installation, that would either directly or indirectly integrate with AMI during the deployment phase. By understanding the current technology installed, AMI requirements could be defined and outlined in the request for proposal ("RFP"). This process ensured that the AMI vendors proposed solutions to meet minimum requirements as outlined in both Act 129 and the Implementation Order.

The following section outlines the AMI technology domains and requirements needed for Duquesne to meet the provisions mandated in Act 129 and the Implementation Order. It should be noted that the Company's assessment of needs and technological solutions was based on meeting the minimum requirements outlined in the Act and Order; however there are a number of additional requirements outlined herein that are required, in Duquesne's opinion, for a fully functional AMI system and to integrate into Duquesne's existing back-office environment.

Communications and Network Infrastructure

AMI communications and network infrastructure consist of Local Area Networks ("LAN"), Wide Area Networks ("WAN") or Backhaul Communication networks and Home Area Networks ("HAN"). Because Duquesne has a Fiber Network already deployed throughout its service territory, and plans to utilize it to the greatest extent possible, an Intermediate Network is also discussed herein. The smart meter, LAN, WAN/Backhaul Communication solution and Intermediate Network described will meet the Act 129 requirement of bidirectional data communication. The HAN will provide customers with direct access to and use of price and consumption information and directly provide customers with information on their hourly consumption, as mandated in the Act. Duquesne's communication and network infrastructure is required to adhere to open standards and protocols that comply with nationally recognized nonproprietary standards. The communication and network infrastructure is required to be remotely upgradable via the network infrastructure, as technology advances and becomes economically feasible and shall support an Internet Protocol ("IP")-based communications and control platform. The AMI communication and network

infrastructure identified below will also enable remote programming capability and upgradability as outlined in both the Act and the Implementation Order.

Local Area Network

The LAN, also referred to as the meter area network, is where smart meters communicate to other meters and/or collection points (or towers) throughout the service territory. This network aggregates the data, and transmits data between meters and collectors/towers in a particular geographic area. During the Assessment, it was determined that both RF mesh and RF Tower were feasible AMI solutions for Duquesne's service territory and in meeting the requirements of the Act; however, Duquesne selected a private RF mesh communication technology for its LAN. This selection was made due to the RF mesh solution(s) provider's ability to easily and seamlessly integrate into Duquesne's existing back-office environment and into existing systems installed and those planned for installation, as well as being the lower cost solution. As further described in Section III, the RF tower solution evaluated did not score technically high compared to the RF mesh AMI solutions, even though it is a viable solution. PLC was another solution evaluated; however these solutions are well-suited for lower-density coverage of suburban and rural territories, however typically have lower bandwidth, are relatively more expensive and do not meet standards being adopted in the industry today.

Wide Area Network

The WAN, also referred to as the Backhaul Communication, is the communication pathway from the collector/towers located throughout the service territory to the AMI head-end system located at the utility. This can be provided by a number of technology solutions, including: RF communications, wireless (cellular) - both private and public, or direct fiber optic connection. In some cases, Broadband over Power Lines ("BPL") or WiMax solutions are used and the WAN directly connects the smart meter to the AMI head end, bypassing the intermediate LAN collection points. Duquesne plans to utilize its existing leased fiber network for backhaul communication. Utilizing the leased fiber network will ensure Duquesne maximizes its existing infrastructure assets, lowers the ongoing cost to utilize a 3rd party solution, such as AT&T or Verizon cellular solutions, and provides sufficient bandwidth. Additionally, Duquesne has control of the data transmission from the collection points to the head end system located at the utility.

Intermediate Network

The Intermediate Network is a wireless communications network, transferring the data from the meters or collection points/towers to Duquesne's substations, where Duquesne's Fiber Network is

located. From the fiber network connection takeout points, data would be transmitted to the AMI head end system. This intermediate network can also transmit data to distribution automation devices in the future. Because the LAN or last mile network is typically a communication pathway controlled by the AMI vendor or other third party, and may cover a very limited, targeted geographical area, the Intermediate Network delivers the data from the collection points/metes to the backhaul network (fiber optic) terminated at Duquesne's substations. Duquesne would then backhaul the AMI data on their own leased fiber network and control the transmission of the AMI data.

Options for intermediate backhaul can be grouped into two categories:

1. Private network solutions: suppliers who can plan, design, and build a utility-only communications network that is owned and operated by DLC and has single purpose for utility operations. (FM radio or other non –public wireless solution is preferred)
2. Public network solutions: suppliers who have or will have public wireless networks that can provide the coverage and network operations required that will allow DLC to utilize their data transport services.

The design, performance requirements, and cost for the Intermediate Network are currently being analyzed by Duquesne and will be included in a March 31, 2011 update filing. That update is to provide the design of the network and communication infrastructure required by the AMI system. This analysis will include a review of the following:

- Intermediate Communications Methods and Potential Vendors
- Solution Cost
- Expected Capacity, Bandwidth, Latency and Reliability
- Security Provisions
- Pros/Cons and Current/Future Limitations of Solution (e.g. not suitable for future Smart Grid use, distribution automation, capacitor control, etc.)
- Ease of interoperability with Duquesne's existing enterprise networks and systems

From the conclusions of the analysis performed, a comprehensive network design will be created that allows for the implementation of the AMI system. The design will be laid out incrementally, outlining the capability to add increasing functionality to fully utilize the smart meter technology in the future. As part of this task, Duquesne will:

- Establish the Network Architecture
- Integrate the network design, with the existing Meter Network, to allow for an incremental roll out
- Design the target Network after the complete roll out of Smart Meters

Home Area Network

The HAN is the communication pathway from the meters to devices located within the customer's premise. The HAN will utilize ZigBee 2.4 gigahertz ("GHz") RF communication (Smart Energy Profile ("SEP") 1.0), or newer versions as they become available, and will provide customers with direct access to and use of price and consumption information and directly provide customers with information on their hourly consumption, and aid in the support of TOU and real time pricing programs as outlined in Act 129.

DLC fully expects future deployment of customer premises devices for a variety of purposes including (but not limited to):

- Direct load control (i.e. HVAC, water heaters, pumps, etc.)
- Demand response
- Demand limiting
- Pre-paid service
- Sub-metering
- Supply management (i.e. Photovoltaic arrays, wind generators, PHEVs, etc.)

Duquesne's selected smart meters will be equipped with a standard ZigBee-based interface to in-home displays, load control devices, and smart thermostats, enabling true integration with in-premise load control. The ZigBee SEP provides a mechanism for communicating with sub-metering devices for integration of renewable and distributed resources. The HAN will be capable of supporting in-home devices such as smart thermostats, In-home Displays ("IHDs"), and device control units to support demand response programs. The smart meter will be capable of supporting multiple ZigBee compliant devices.

The communications architecture will use open standards, be interoperable, and adhere to ANSI C12.19 and C12.22 metering and communication standards and the ZigBee public wireless standard based on IEEE 802.15.4.

Network Coverage and Capacity

The AMI system will be designed with adequate redundancy for 100 percent coverage and with enough infrastructure to meet the minimum performance requirements specified. Duquesne understands this is an iterative process requiring inputs such as meter and infrastructure locations, terrain, network performance variables as well as expected performance and financial considerations to optimize the final design.

Hardware

AMI consists of a number of hardware components including the smart meters, collectors/towers, and the head-end system. Additional ancillary hardware components such as servers are also required for proper operation of the system. The Assessment and resulting hardware requirements required are discussed below.

Smart Meters

The smart meters consist of the actual meter end points that collect and transmit interval usage data and events, such as tamper and outage events to the collectors/tower and AMI head end system via the AMI communications network.

The Act requires that smart meters record interval usage data on at least an hourly basis once per day. The Implementation Order identifies the requirement, subject to a cost/benefit further review, that smart meters must provide 15-minute or shorter interval data to customers, EGSs, third parties and the RTO on a daily basis, consistent with the data availability, transfer and security standards adopted by the RTO. The Act also requires the AMI to enable TOU rates and real-time pricing programs, which can be a functionality of the smart meter selected.

Along with the smart meter requirements outlined in the Act and Order, all proposed AMI meters shall be intelligent, programmable, all electronic, revenue-grade, electric meters.

The AMI solution shall be provided for Duquesne's existing single and three phase meter service types, as outlined in Table 1.

Table 1 - Meter Forms, Services & Quantities

Form	Class	Voltage	Quantity	Notes
Single Phase Meters				
2S	200	240	4546	1,2
4S	20	240	3790	2
12S	200	120	38	1,2
1S	100	120	2562	1
2S	200	240	540892	1
3S	20	120	6	
3S	20	240	72	
4S	20	240	1558	
12S	200	120	35825	1
	Total 1-Phase Meters		**589,289**	
Three Phase Meters				
9S	20	120	7393	2,3
13S	200	240	3348	2,3
16S	200	120	3448	2,3
35S	20	240	7645	2,3
5S	20	120	42	3
5S	20	240	4	3
9S	20	120	5	3
13S	100	240	11	3
16S	100	120	7	3
16S	200	120	30	3
35S	20	120	2	3
35S	20	240	2	3
	Total 3-Phase Meters		**21,937**	
Total Single and Three Phase Meters			**611,226**	

Notes:
1. Denotes meters with integral 200 amp service switch
2. Current installed meters having at least two pulse outputs (Alpha Meters).
3. Supports voltage auto ranging.

The smart meters and AMI network will provide remote meter reading capability between the meter and the utility. Specific AMI and metering features shall include:

- Two way communications
- Recording 15-minute interval usage data once per day
- On Demand Readings
- Support TOU rates and real-time price programs.
- Power Outage Notification
- Tamper Detection Alerts
- Support of Open Standards and Protocols
- Support of Net Metering
- HAN Communications
- Voltage Monitoring and Recording
- Remote firmware/software upgradability
- Load Control
- Third-party accessibility with appropriate security measures
- Enhancement of customer service functions through presentment of near real-time data for customer use, and greater flexibility for customers through future prepaid service, selectable bill dates, and TOU rate options.

The AMI system that Duquesne desires to purchase should support additional functional requirements, in Duquesne's opinion, which include:

- Advanced outage management
- Power quality recording
- Ability to integrate to an MDMS to optimize the use of the data being collected from the smart meters.

Meter Features and Functions

Features and functions of the smart meters are listed below.

- All single-phase and network class 200 AMI meters will be able to be equipped with an internal service disconnect switch to provide remote disconnects and reconnects. The

service switch will also allow for surgical (selected individual customers rather than total feeders) rolling blackouts, load limiting capabilities, and future pre-payment services.

- Meters will support both ANSI C12.19 and ANSI C12.22
- Configurable load limiting capabilities
- Voltage measurement at all meters
- Voltage measurement and monitoring for billing and other distribution automation ("DA") applications
- Remote meter programming
- Remote firmware downloads for registers, display, communications and ZigBee chip
- Internal ZigBee communication
- Security
- Quantities that can be measured and recorded shall include delivered and received kilowatt-hours ("kWh"), delivered and received kilovolt-amp hours ("kVAh"), and average root mean square ("RMS") voltage.
- Measure and record at least 15-minute interval lengths
- Record and store at least 45 days of interval usage data
- Store total delivered energy and total received energy measurement data
- Support registration of TOU quantities in independent TOU registers with the ability to display each corresponding register, including energy and peak demands.
- Support independent peak demand registers (Peak demand quantities recorded shall include both delivered and received values for kilowatt ("kW"))
- Support sub-metered load/supply devices at each customer premise.
- Shall detect and record electric service continuity data sufficient to support utility-industry best practices for effective monitoring, analyses, and management of service voltage interruptions and restorations.
- Capable of detecting power quality, voltage interruption and tamper events

- Any radio-based provisions for local communication with the meter shall fully comply with all applicable Federal Communications Commission ("FCC") rules.

Metering Standards

The proposed AMI meters and network shall support the industry standards shown in Table 2.

Table 2 – Metering Standards

ANSI C12.1 - 2001	Code for Electricity Meters
ANSI C12.7 - 2005	Requirements for Watt-hour Meter Sockets
ANSI C12.10 - 2004	Watt-hour Meters
ANSI C12.18 - 2006	Protocol Specification for ANSI Type 2 Optical Port
ANSI C12.19 - 1997	DLC Industry End Device Data Tables
ANSI C12.20 - 2002	Electricity Meters - 0.2 and 0.5 Accuracy Class
ANSI MH10.8M - 1983	Specification for Bar Code
ANSI /ASQZ1.4 - 2003	Sampling Procedures and Tables for Inspection by Attributes
NEMA SG-AMI 1-2009	Requirements for AMI Meter Upgradeability
IEEE C37.90.1 - 2002	SWC Surge Testing
IEC 61000-4-2 - 2001	Electrostatic Discharge Requirements
IEC 61000-4-4 - 2002	Electrical Fast Transient/Burst Requirements
IEEE C65.42	Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and Less) AC Power Circuits
ANSI C12.22	Protocol for Interfacing to Data Communication Networks
IEEE 1159 - 1995	Recommended Practice for Monitoring Electric Power Quality
IEEE C65.42	Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and Less) AC Power Circuits

Collectors

AMI Collectors collect meter reading data via a wireless interface. The wireless connection is typically low bandwidth and highly reliable. Typically, a collector receives transmissions from multiple meters in the LAN and passes that information along the WAN back to the head end where it is compiled and used for billing and other back office functions. The AMI System must provide 100% coverage to all meters, utilizing sufficient number of collectors, to provide sufficient performance to meet all requirements outlined in this Assessment.

Head End System

The Head End System performs several important functions including managing the AMI communications network, scheduling and collecting meter readings, and coordinating routine customer and meter changes to ensure that all meters are read. The head end server platform runs

standard AMI software. The head end will serve as the final collection point of the meter reading data, gathers the data sent to it by the collectors over the WAN.

The AMI head end will have the capabilities to:

- Collect at least 15-minute interval meter consumption data for all single phase and three phase meters.
- Have a retention capacity sufficient for storing the amount of data generated for no less than 45 days.
- Support scheduled (automatic) and unscheduled (operator-initiated) meter reads.
- Remotely download (without a field visit to the meter) updates to meter settings, configuration, security settings, and firmware for all AMI devices.
- Obtain meter data, such as consumption and power status, on demand and with a short duration of time from request to meter and back.
- Communicate with groups of AMI meters and consumer owned control devices to enable load management.
- Collection and reporting of measurement data, control events, self-test data and alerts, service continuity data & alerts, power quality data & alerts (including tamper), programming events, configuration settings, etc.
- Utility-industry best practices for effective monitoring, analyses, and management of its customers' service continuity.
- Support and report service continuity and voltage interruptions.
- Support monitoring, analyses, and management of its customers' power quality.
- Support customer (scheduled and unscheduled) load control functions whereby load control commands and device data are conveyed between the AMI Master Station and load control devices by way of intermediate data/command routers.
- Collect sub-metering data from customers' premises.
- Automatic self-registration of AMI endpoints/meters.
- Support meter testing, system performance monitoring and reporting.

- Shall effectively employ service oriented architecture ("SOA") and/or enterprise service bus ("ESB") technologies for communication among its application modules and for interoperation of its system components with Duquesne's other information systems.

Software

AMI head end and AMI meter management software will interact with Duquesne's existing utility software applications.

The AMI head end software will:

- Integrate with Oracle's Customer Care and Billing ("CC&B"), Work and Asset Management ("WAM") and Mobile Workforce Management ("MWM").
- Database software shall run on Oracle.
- Be compatible with the Microsoft Windows XP operating systems.
- Provide AMI and meter program settings configuration.
- Security for software must run on Windows servers and interoperate with Active Directory and be in full compliance with Sarbanes-Oxley ("SOX") requirements for security management.

Data Warehousing

DLC employs an enterprise data storage architecture based on an Equi-Logic storage area network ("SAN") that is managed by Tivoli Storage Manager ("TSM").

The AMI head end shall:

- Support Duquesne's enterprise data storage
- Provide at least 45 days of meter data storage in the head end and at least 30 days in the meter.

Duquesne plans to purchase and install an Oracle MDMS. The MDMS will serve as the primary repository and pre-processor (i.e. validation estimation editing ("VEE"), outage data reduction, etc.) of all measurement, status, and event data collected by the AMI. The MDMS will also serve as the gateway for communications with the AMI supporting data requests, commands, and alert messages from/to Duquesne's other information systems (CC&B, load control, WAM, WFM, etc.).

Specific ancillary software, servers and other IT equipment have not yet been identified.

Disaster Recovery (DR)

The AMI head end can be damaged or destroyed by a variety of man-made and natural causes. The AMI shall include disaster recovery provisions for the AMI head end that will support Duquesne's recovery time objective of 24 hours and recovery point objective of the end of the previous business day. The head end shall also be certified/compliant with IBM's TSM system. The AMI network shall also support Duquesne's network recovery time objective of 24 hours.

Servers

All servers and other elements of the AMI Master Station shall utilize hardware that is commonly available on the open market and complies with the following criteria:

- Serviced by standard maintenance requiring no special procedures
- Covered by manufacturer warranty
- No proprietary or custom components or processes
- Database servers that run on AIX or Windows (2003 or later)

The number of servers required has not yet been identified and is dependent on the selected vendor's technology and the amount of data collected by the AMI system.

Networks

Duquesne's enterprise computer network employs all of the network technologies and protocols typically used in a large, integrated, utility computing environment comprising a mainframe, UNIX servers, Windows servers, and Wintel workstations. The AMI system will be compatible with Duquesne's existing network environment.

Additional network devices such as switches, edge routers, backbone switches, routing switches, firewalls and firewall enforcement points, and network monitoring and internet application/devices may be required however have not been determined as of the date of this filing.

HAN Devices

Duquesne fully expects future deployment of customer premises devices and anticipates their interaction in the HAN utilizing the ZigBee SEP. The AMI system will support the following devices:

- Intelligent programmable smart thermostats
- IHD devices
- Sensors, switches and motor controls

Cyber Security & Industry Standards

Duquesne's selected AMI system will meet industry standards and best practices, including Cyber Security.

There are many security concerns inherent in the deployment of an AMI system. Duquesne will adhere to all Department of Energy ("DOE") cyber security standards and the Institute of Electrical and Electronics Engineers ("IEEE") best practices when deploying the Smart Meter program. New controls will build off existing North American Electric Reliability Corporation ("NERC") Critical Infrastructure Protection ("CIP") security policies and procedures to secure cyber assets and critical cyber assets.

A high level overview of Duquesne's cyber security approach is outlined below. This approach will protect information from the smart meter to Duquesne internal enterprise systems and back to the customer via web presentment of data.

Meter to Collector Security

The AMI solution will rely on a 900 MHz wireless RF mesh solution running over the ANSI C12.22 protocol communicating between customer premises, meters, and collectors located throughout Duquesne's service area. This communications channel will be encrypted and require authentication between meter and collector that meets industry cyber security best practices. Duquesne will adhere to DOE and IEEE best practices for information security with regard to the selected smart meter and technology.

Collector to Substations Security

Duquesne will rely on an intermediate communications solution to transmit the data from the AMI collectors to Duquesne substations where the fiber network will be utilized for backhaul communication to the head end. This communications channel will be encrypted and require authentication between collector and fiber take out points that meets industry cyber security best practices.

Substation to Head End System Security

Duquesne's fiber network will provide a communications backbone connecting all substations to the AMI head-end system. This backbone will be used to transmit both customer smart meter data as well as grid and substation automation signals in the future and as necessary. A secure communications backbone is critical to ensuring a secure and reliable AMI network.

HAN Security

The HAN security will be based on AES 128 bit encryption, ZigBee SEP 1.0 standards, National Institute of Standards and Technology ("NIST") FIPS 197, NERC CIPS 001-009, and standard IT tools such as firewalls, VPNs, Authentication, Intrusion/Virus protection, logging and monitoring.

Overall Security Architecture

The relevant security components to be added as part of this project are noted above. Additionally, Duquesne will deploy firewall technology between the networks that restrict access to only what is necessary. Where possible, Duquesne's existing Microsoft Active Directory authentication infrastructure will be leveraged and may possibly extend to the AMI infrastructure if a suitable key management solution can be identified.

Applicable Cyber Security Standards and Regulations

While there are numerous cyber security standards available, the ones identified below from NIST and NERC CIP represent a collection of regulations, standards, and best practices that are most appropriate. The AMI system shall support the following standards:

- *NISTIR 7628 "Smart Grid Cyber Security Strategy and Requirements"*
- NIST SP 800-30 "Risk Management Guide for Information Technology Systems"
- NIST SP 800-50 "Building an Information Technology Security and Training Program"
- *NIST SP 800-53 "Recommended Security Controls for Federal Information Systems and Organizations"*
- NIST SP 800-53A "Guide for Assessing the Security Controls in Federal Information Systems"
- NIST SP 800-60 "Guide for Mapping Types of Information and Information Systems to Security Categories"
- NIST SP 800-61 "Computer Security Incident Handling Guide"
- SP 800-64 "Security Considerations in Federal Information Systems"
- *SP 800-70 "National Checklist Program for IT Products – Guidelines for Checklist Users and Developers"*
- SP 800-82 "Guide to Industrial Control Systems Security"

- SP 800-86 "Guide to Integrating Forensic Techniques into Incident Response"
- SP 800-1108 "NIST Framework and Roadmap for Smart Grid Interoperability Standards"
- NERC CIP 002-009 Reliability Standards (current and future versions)
- Cyber Security Procurement Language for Control Systems, Version 1.8, Department of Homeland Security, National Cyber Security Division, February 2008
- Catalog of Control Systems Security: Recommendations for Standards Developers, Department of Homeland Security, 2009

III. Selection of Technology and Vendors

Duquesne completed a rigorous, thorough and disciplined AMI RFP procurement and technology/vendor evaluation process, in light of the extensive requirements set forth in the Assessment of Needs and Technological Solutions in Section II above, leading to a shortlist of AMI technology/vendors that met the requirements outlined. It should be noted that while the technical review of the bids have been completed, costs are still being clarified and evaluated. Specifically, the vendors bids that were submitted for evaluation provided dissimilar services and further cost evaluation is warranted to determine the necessary and recommended services and to compare the bids on an equal basis, i.e., apples to apples comparison. The further cost data and evaluation will be continued and Duquesne will follow up with a confidential filing by January 31, 2011, outlining the evaluation of system costs and subsequent vendor selection.

Procurement Methodology

The Assessment of Needs and Technology Solutions outlined in Section II identified a number of AMI requirements which were formulated into a RFP, attached as Attachment A, and distributed to all AMI vendors that met the minimum requirements identified in the Act.

Duquesne recognizes that the design, procurement and installation of AMI are both complex and costly; therefore Duquesne has selected an approach to minimize risk to the project. The AMI RFP is for a turnkey AMI solution, indicating that Duquesne will contract with a single entity responsible for providing the AMI system, installation and project management. This approach helps Duquesne manage both cost and risk for the project easier than if there were multiple entities contracted to perform such tasks.

Procurement Timeline

Duquesne's RFP timeline used for the RFP is shown below in Table 3.

Table 3 – RFP Procurement Timeline

Time (EST)	Deadline	Project Milestone
5:00 pm	10-01-2010	RFP issued to Bidders
4:00 pm	10-30-2010	Bidders intent to respond to proposal due
4:00 pm	10-30-2010	Final questions to DLC on RFP
4:00 pm	11-05-2010	Bidders Submit proposal
4:00 pm	11-29-2010	Notify Bidder short list
Weeks of	12-06-2010 and 12-13-2010	Presentation by AMI bidders/providers at DLC

RFP packages were sent to all bidders who could potentially meet the Act requirements. A total of six (6) bidders expressed an intent to respond and file a bid. A total of four (4) bidders actually submitted a bid with accompanying description. The timeline identified above was met by all vendors who submitted proposals.

Evaluation Methodology

Duquesne conducted a closely controlled AMI proposal evaluation process of the four (4) bids received to determine rankings and a finalist. An evaluation scorecard tool was created to score each specification identified in the AMI RFP. Each requirement in the RFP was weighted based on its importance to the overall AMI solution for Duquesne and also on its ability to meet the requirements set forth in the Act and Order. The weights used in the Scorecard Workbook are shown below:

Weight	Description
1	Not a very important feature/element of the project
4	A moderately important feature/element of the project
7	A medium to high importance feature/element of the project
9	A very important feature/element of the project

Once the Vendor proposals were received, the AMI evaluation team utilized the following ranking criteria to score each RFP specification. Subject Matter Experts ("SMEs") were assigned from various departments within the utility, making up a core evaluation team, ultimately responsible for scoring the portion(s) of the proposal related to their respective area of expertise.

Score	Description
1	Doesn't exist, or doesn't currently meet minimal requirements but has been discussed and has potential, but we are not certain it will be available when it is needed.
4	Exists, and marginally meets requirements; or it doesn't exist yet, but has been discussed, is credible with no technical obstacles, and probably will be available
7	Exists, is proven, and meets requirements.
9	Provides some value beyond the requirements and perhaps not delivered by other solutions

Duquesne's AMI evaluation process not only reviewed the technical functionality of the AMI system and installation, but reviewed the AMI vendor's qualifications, including previous project successes/failures, and number of deployments performed to date at utilities of similar size to Duquesne, etc., to gain a complete understanding of a best fit solution.

The scorecard workbook grouped the RFP requirements in the following categorical domains and collectively weighted the domains at the percent allocations shown below in Table 4.

Table 4 – AMI Scorecard Workbook Weighting Criteria

AMI System Categorical Domain	% Allocation
Technical Requirements	60%
Electric Meter (15%)	
Service Switch (1%)	
Distribution Automation (2%)	
In-Premise Devices (2%)	
AMI Network (15%)	
Head-End Systems (15%)	
Security (10%)	
Installation Requirements	20%
Project Functions	10%
Vendor Qualifications	10%
Total	100%

Shortlist Vendors based on Technology Review

The AMI evaluation scorecard tool tallied each technical specification at the assigned weight and collaborative score. A summary of the results are shown below in Figure 1.

Results: Shown below, are drawn from subsequent pages of this Workbook.

	Score Allocation	Sub Allocation	Maximum Category Score	Maximum Scaled Score	Scaled Scores			
					Vendor A	Vendor B	Vendor C	Vendor D
AMI System Technical								
Technical Requirements	60%		29,961					
M Electric Meter		15%	14,148	150	103	105	101	105
SS Service Switch		1%	1,602	10	7	7	7	7
DA Distribution Automation		2%	126	20	18	9	18	16
H In-Premise Devices		2%	153	20	12	16	12	16
N AMI Network		15%	4,473	150	95	96	92	77
Y Head-End Systems		15%	9,153	150	96	97	89	72
Z Security		10%	306	100	60	60	60	42
Installation Requirements	20%		4,869	200	123	151	148	139
Project Functions	10%		2,484	100	54	69	60	61
Vendor Qualifications	10%		990	100	69	72	68	72
Totals:	100%		38,404	1,000	627	681	655	606

Figure 1 – AMI Scorecard Workbook Results

Each Vendor was provided an opportunity to provide Duquesne an on-site demonstration and presentation of their AMI system and answer any technical questions remaining from the AMI evaluation. Each of the four (4) vendors who bid took this opportunity and presented on-site presentations of their bid proposal. After the presentations, evaluation scoring was reviewed again to determine whether any modifications needed to be made to the evaluations performed based solely on the submittals. The post-presentation evaluations did result in some minor technical scoring modifications. The total scores shown above indicate Vendor B ranked highest technically (excluding system cost); however until further evaluation of system costs, a final vendor will not be selected.

Duquesne will continue evaluating system costs and expects to present those in a follow up filing to the PUC by January 31, 2011 as well as the identification of the final vendor selection. A portion of that filing will be submitted confidentially, particularly vendor identification and system cost. Duquesne will begin contract negotiations with the selected finalist in January 2011; however, execution of a final contract (the "Full Deployment Contract") will be contingent on the final PUC approval of the Duquesne December 31, 2011 filing on final expected costs and roll-out schedule, which such approval will hopefully be achieved around June 2012. An Interim Grace Period contract will be made with the selected vendor finalist during the 30-month Grace Period, prior to the Full Deployment Contract execution, for services to be performed during the Grace Period. In the event the selected finalist and Duquesne do not reach an amicable agreement on scope and cost

during contract negotiations, Duquesne will proceed with contract negotiations with the second shortlisted vendor.

IV. Overview of Technology Solution

The shortlisted AMI bidders have similar solutions (ranked exclusively on technical merit) and both meet the minimum requirements of Act 129 and the Implementation Order. An overview of the AMI technical solution is outlined in this section.

Communications and Network Infrastructure

The selected AMI is proposed to be a RF mesh solution. Other key AMI solutions evaluated included RF tower and PLC. The tower based solutions typically have the advantage of higher power and cleaner spectrum leading to fewer AMI backhaul locations and the ability to support hard to reach devices and low density applications (rural). Yet, the tower based solutions do require the creation of new towers (increased capital) or using existing commercial towers (increased O&M). The PLC based solution is typically lower bandwidth and provides limited functionality. Additionally, the RF tower solution did not meet Duquesne's back-office integration requirements. The mesh consists of meters connected to collectors located throughout the service territory whereby the data is transferred to the head end system using Duquesne's existing leased fiber network. Details on each communication layer are discussed below.

Local Area Network

The LAN consists of the transmission of data between meters and collectors. The LAN has the following features:

- IP based mesh solution
- Bi-directional communication
- Operates in the unlicensed 900 MHz band
- 902-928 MHz Bandwidth (with frequency hopping signaling)
- Supports 142-153 kilobits per second ("kbps") throughput
- Each collector supports up to approximately 2,000 meters
- Support of IP and native DNP protocols

WAN/Backhaul Communication/Intermediate Network

The AMI solution supports a number of public and private WAN solutions including IP protocols such as 1xRTT, GPRS, BPL, WiFi, WiMax, fiber, GE-MDS, GSM, private radio, public carrier networks such as Verizon or AT&T, or Ethernet. Duquesne plans to utilize its fiber network to deliver the AMI data to the head end system. An intermediate backhaul communication method will be required to transmit the AMI data from the meter collectors to the fiber take out points located at the substations. Duquesne has not yet decided on the appropriate intermediate backhaul communication method; however it is currently conducting a communication network analysis and will conclude on this portion of the AMI design in the March 31, 2011 filing. Two solutions may be required for data backhaul; however, both will comply with the ANSI C12.21 and C12.22 communications standards.

Home Area Network

Each smart meter is equipped with a ZigBee based interface to IHDs, load control devices, and smart thermostats, providing Duquesne in-premise load control. The smart meters are certified compliant with the ZigBee SEP supporting open standards and interoperability. The HAN can also be supported directly by the 900 MHz mesh solution. The HAN supports IEEE 802.15.4 with AES 128 bit encryption.

Smart Meters

The smart meter will include the following features:

- Integrated 900 MHz communication radio
- Support of the capability for 15-minute interval meter reads (Scheduled and unscheduled)
- Delivered, received and net registers within the meter
- Consumption measurements including delivered and received kWh, kW demand, kVAh, kVARh, and average RMS voltage.
- Available interval lengths of 15, 30, and 60 minutes.
- Support creation and storage of interval consumption data records in at least eight (8) independent meter data sequences for polyphase meters and four (4) sequences for single phase meters.
- Support TOU rate programming (4 independent TOU registers)

- Outage and voltage monitoring/ alarms
- Addressability and security utilizing multiple standards-based communication options
- Upgradable firmware via the network
- Include ZigBee chip for HAN communications
- Single phase meters will have an internal 200 Amp service switch to support remote disconnect and demand limiting
- Tamper detection
- ANSI C12.1, C12.19, C12.20 and C12.22 standards
- At least 45 days of data storage
- Support of more than one meter manufacturer
- Net Metering

The solution also supports the following AMI standards:

- ANSI C12.1 - 2001 Code for Electricity Meters
- ANSI C12.10 - 2004 Watt-hour Meters
- ANSI C12.18 - 2006 Protocol Specification for ANSI Type 2 Optical Port
- ANSI C12.19 - 1997 DLC Industry End Device Data Tables
- ANSI C12.20 - 2002 Electricity Meters - 0.2 and 0.5 Accuracy Class
- NEMA SG-AMI 1-2009 Requirements for AMI Meter Upgradeability
- IEEE C65.42 Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and Less) AC Power Circuits
- ANSI C12.22 Protocol for Interfacing to Data Communication Networks

Collectors

The AMI solution includes a number of collectors designed for adequate system coverage and redundancy. The AMI network is scalable with the addition of collectors.

Head End System

The head end system performs network management and coordinates data collection and operations. The head end system has the following characteristics:

- Collects at least 15-minute interval meter consumption data for all single phase and three phase meters.
- Has a retention capacity sufficient for storing the amount of data generated for no less than 45 days.
- Support scheduled (automatic) and unscheduled (operator-initiated) meter reads
- Remotely download updates to meter settings, configuration, security settings, and firmware for all AMI devices.
- Obtain meter data, such as consumption and power status, on demand
- Communicate with groups of AMI meters and consumer owned control devices to enable load management
- Collection and reporting of measurement data, control events, self-test data and alerts, service continuity data & alerts, power quality data & alerts (including tamper), programming events, configuration settings, etc.
- Monitors, analyzes, and manages service continuity.
- Support and report service continuity and voltage interruptions
- Support monitoring, analyses, and management of its customers' power quality
- Support customer (scheduled and unscheduled) load control functions
- Automatic self-registration of AMI endpoints/meters
- Support meter testing, system performance monitoring and reporting
- Shall effectively employ SOA and/or ESB technologies for communication among its application modules and for interoperation of its system components with Duquesne's other information systems

HAN Devices

The AMI solution provides ZigBee SEP-compliant communications to in-home displays, load control devices, and smart thermostats enabling demand response capabilities.

Cyber Security

The AMI solution will adhere to all cyber security standards outlined in Section II of this filing. Duquesne will provide additional solution details related to security in the January 31, 2011 follow up filing to the PUC when the finalist is selected.

Vendor Costs

The proposed AMI system costs fall within the range of estimated system costs, $162 million to $252 million, included in the original filing "Duquesne Light Company Petition for Approval of Smart Meter Procurement and Installation Plan" *Docket No. M-2009-2123948,* which was approved on May 11, 2010. Based on Duquesne analysis of the additional PUC requirements, a revised estimated cost range of $195 million to $325 million was provided in Duquesne's July 1, 2010 filing. Duquesne will provide a new estimated costs range in the January 31, 2011 update to this filing once an AMI vendor has been selected.

V. Evaluation of Meter Costs during the 30-Month Grace Period

Pursuant to the ALJ's Initial Decision, affirmed by the Commission's Final Order on May 10, 2010, Duquesne Light was required to "investigate whether there are smart meters available from vendors that would be less expensive to residential and small commercial and industrial customers, and to report to the Commission and all parties the results of its efforts to locate less costly meters for residential and small commercial and industrial customers." Initial Decision, p. 10. This analysis is due in conjunction with this December 31, 2010 filing.

Currently, when a customer requests a smart meter during the Grace Period, Duquesne installs an industrial grade interval meter. The incremental cost to be paid by the customer pursuant to the approved tariff is $1,305. One party in the proceeding expressed concern over the high incremental cost a customer had to pay to receive smart meter benefits during the Grace Period. Duquesne has analyzed this issue and has identified an alternate smart meter solution, manufactured by Itron, with dual functionality that can be used with Duquesne's existing AMR system prior to the full AMI deployment. This meter will only provide interval data and is not considered to be a fully functioning smart meter; however, this option would enable Duquesne to install a lower cost interval meter ($160 per meter) and provide customers direct access to interval usage data via some predetermined media (CD, web portal, IHD, etc.) during the Grace Period. The cost for an IHD is approximately $140 installed. Therefore, Duquesne will be able to offer this alternate smart meter solution to residential and small C & I customers requesting such service for $300. Though

all vendors provide some type of option for this one-off installation prior to the full AMI infrastructure rollout, the dual functioning smart meter mentioned above is the most cost competitive solution identified at this time. In the past 18 months, only one customer has requested to receive new interval usage data, so Duquesne does not believe this is a pressing issue with customers at this time.

Respectfully submitted,

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Dated: December 30, 2010

Attachment A: AMI RFP

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

Duquesne Light
Our Energy...Your Power

Advanced Metering Infrastructure

Request for Proposals

RFP # 206023

October 26, 2010

Prepared for: Duquesne Light Company
411 Seventh Avenue
Pittsburgh, PA 15219

Supported by: R .W. Beck, *an SAIC Company*
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R·W·BECK
An SAIC Company

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1 General Bidder Provisions

1.1 Introduction

Duquesne Light Company (Duquesne Light or Company or DLC) is soliciting proposals to replace its current AMR system with smart meter technology, consistent with the requirements of Act 129 of 2008, 66 Pa.C.S. § 2807(f), et seq. Pursuant to Act 129, signed into law by Governor Rendell on October 15, 2008, Duquesne Light was required to file a smart meter technology procurement and installation plan with the Pennsylvania Public Utility Commission. Act 129 sets forth the required capabilities for smart meter technology. Further, the Commission issued an Implementation Order in June of 2009, which addresses additional capabilities that the Commission requires as part of smart meter technology.

Duquesne Light filed its Smart Meter Procurement and Installation Plan (SMPI Plan) on August 14, 2009, and the Plan was subsequently approved by the Commission as detailed in an Order dated May 11, 2010. See Duquesne Light Smart Meter Procurement and Installation Prgroam, Pennsylvania Public Utility Commission Docket No. M-2009-2123948, August 14, 2009. Duquesne Light further filed a cost benefit analysis to analyze the additional smart meter capabilities that were set forth in the Commission's Implementation Order. See Cost Benefit Analysis of Duquesne Light Company for Additional Smart Meter Capabilities, Docket No. M-2009-2123948, July 1, 2010, Pursuant to the milestones as detailed in its approved Plan, Duquesne Light is required to make a report to the Commission which details its assessment of needs and technological solutions and selection of Technologies and vendors, on or before December 31, 2010. There are further related milestones set forth in Duquesne Light's Plan that surround establishment of network designs, establishment of plans to design test and certify EDI Transactions, Web Access and Direct Access capability, installation of the technology and network, as well as a filing related to costs.

This RFP is issued in order to identify the vendor and technology that will ultimately be selected as required by Duquesne Light's SMPI Plan. The details of Duquesne Light's required technology and capabilities,are set forth herein. For more information, please reference Duquesne Light's SMPI Plan documents at Docket No. M-2009-2123948.

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This RFP is strictly a proposal, and Duquesne Light is not obligated to enter into an agreement with any bidder. The information contained herein, along with attachments, is confidential to Duquesne Light and access to such information requires execution of a confidentiality agreement.

1.1.1 Description of DLC

DLC is an investor-owned public utility as that term is defined under Section 102 of the Public Utility code, 66 PaC.S. 102. DLC is also an electric energy distribution company as that term is defined under the Restructuring Act, Section 2801 of the Public Utility Code. DLC distributes electric energy to approximately 610,000 commercial, industrial, and residential customer meters, which account for approximately 579,000 service accounts, in the City of Pittsburgh and throughout Allegheny and Beaver counties in Pennsylvania, a service territory of approximately 817 square miles.

The Company's mission is to be a progressive, service-oriented utility offering reliable, competitively priced services for the benefit of its customers. Headquartered in Pittsburgh, DLC employs approximately 1,220 employees. DLC currently reads approximately 99.75% of its meters with automated technology including an Itron fixed network, mobile AMR or land line telephone system.

1.1.2 Project Scope

AMI will serve as the foundation to meet DLC's requirements under Act 129, and the Implementation Order, as detailed in Sections 1.1.2.4 and 1.1.2.5 below. DLC plans to deploy a bi-directional AMI system that will utilize DLC's fiber network for backhaul communication to enable two-way communication to the electric meter and enable customers to have direct access to usage, prices, and peak event information.

1.1.2.1 Expected AMI Capabilities

DLC envisions a proposal for the delivery of two-way communications network and meters equipped with AMI modules and internal service switches that will provide the capabilities listed below.

- Provide customers with access to usage information and pricing information;

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- Standards based architecture including the utilization of all applicable ANSI C12 metering standards
- Security protection from unauthorized access to any components and data within the AMI
- Daily delivery of metered consumption data to the AMI head-end
    - Hourly consumption data from all residential meters and storage of data within the meter for at least 45 days
    - 15 minute consumption data from all commercial meters and storage of data within the meter for at least 45 days
    - Time-of-use energy recording within predefined periods during the day
- Remote connection or disconnection of electric power to self-contained Class 200 single phase meters with load-limiting capability in circumstances where sustained disconnection is not desired
- Reporting of tamper, meter alarms, power outage and restoration
- Monitoring of power quality reporting: blink counts, phase, voltage, power factor, etc.
- Recording energy flow in both directions, in separate data channels, and calculating net usage for all residential meters to enable net billing for self-generators

1.1.2.2 Expected AMI Support Capabilities

DLC envisions a proposal for delivery and installation of head-end software, and AMI communications infrastructure and meters that will:

- Remotely download (without a field visit to the meter) updates to meter settings, configuration (i.e. hourly meters may be required to report 5 minute intervals for periods of time and then be reprogrammed to hourly or longer intervals), security settings, and firmware for all AMI devices
- Communicate with devices at the customer premise including programmable communicating thermostats (pct), appliances such as pool pumps, load control devices, HVAC and display devices

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- Obtain meter data, such as consumption and power status, on demand and with a short duration of time from request to meter and back
- Communicate with groups of AMI meters and consumer owned control devices to enable load management

1.1.2.3 Expected AMI Meter Installation Support Capabilities

DLC envisions replacement of its existing electric meters with AMI equipped electronic meters. DLC envisions a turnkey solution with installation provided by the vendor.

1.1.2.4 Act 129 Mandatory Requirements

- Bidirectional data communications.
- Recording usage data on at least an hourly basis once per day.
- Providing customers with direct access to and use of price and consumption information.
- Providing customers with information on their hourly consumption.
- Enabling time-of-use rates and real-time price programs.
- Supporting the automatic control of the customer's electric consumption.

1.1.2.5 PUC Additional Mandatory Requirements

- Ability to remotely disconnect and reconnect
- Ability to provide 15-minute or shorter interval data to customers, EGSs, third- parties and an RTO on a daily basis, consistent with the data availability, transfer and security standards adopted by the RTO
- On-board meter storage of meter data that compiles with nationally recognized non-proprietary standards such as ANSI C12.19 and C12.22 Tables
- Open standards and protocols that comply with nationally recognized non-proprietary standards, such as IEEE 802.15.4
- Ability to upgrade these minimum capabilities as technology advances and becomes economically feasible
- Ability to monitor voltage at each meter and report data in a manner that allows an EDC to react to the information
- Ability to remotely reprogram the meter

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- Ability to communicate outages and restorations
- Ability to support net metering of customer-generators

1.1.2.6 RFP and Project Schedule

Table 1 below identifies the RFP and project schedule.

Table 1. RFP and Project Schedule

Time (EST)	Deadline	Project Milestone
5:00 pm	10-01-2010	RFP issued to Bidders
4:00 pm	10-30-2010	Bidders intent to respond with proposal
4:00 pm	10-30-2010	Final questions to DLC on RFP
4:00 pm	11-05-2010	Submit proposal
4:00 pm	12-17-2010	Notify Bidder short list
Week of	12-20-2010	Presentation by short list AMI provider at DLC
5:00 pm	12-31-2010	AMI Technology Bidder selected
5:00 pm	12-31-2010	Present technology, Bidder selection and project update to PUC
	03-31-2011	AMI network designs created
	09-30-2011	Plans for testing, rollout are in place
	12-31-2011	SMPI Plan submitted to PUC
	07-01-2012	Anticipated PUC approval of SMPI Plan
	10-01-2012	AMI meter deployment begins

1.1.2.7 Intention to Bid

Recipients of this RFP are asked to inform DLC of their intention to bid (or not) by completing and returning Attachment A - Intent to Respond with Proposal for Advanced Metering Infrastructure, **no later than the date and time specified in Table 1**.

1.1.2.8 Pre-bid Questions

Vendors responding with intent to propose will be added to the list of Bidders. Questions regarding the content of this RFP or to gather additional data will be answered within 24 working hours of receipt. Responses will be uploaded to the FTP site.

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All questions are to be submitted by email to:

Patti Jordan, Contract Administrator at PJordan@duqlight.com

The deadline for questions is specified in Table 1.

Contact with DLC for purposes of discussing this RFP must be made to Patti Jordan via email. All correspondence related to the RFP must include the RFP #. Direct contact with other DLC employees may result in disqualification of the Bidder.

After submitting your proposal, please refrain from calling or writing with any questions related to the outcome of this process. DLC expects to contact each Bidder within four weeks after the submission deadline regarding the status of its proposal and to clarify issues. DLC anticipates certain selected Bidders will have the opportunity to present and discuss their proposals with DLC.

1.1.2.9 Project Economic Basis

DLC management approved this prospective AMI deployment based on a filing with the PUC. The acceptance of the cost of the AMI into rate base may require PUC acceptance of customer benefits enabled by AMI but not included in the DLC utility-oriented business case. If the PUC does not approve DLC's AMI investment into rate base DLC may not proceed with this project.

1.1.2.10 Project Regulatory Basis

DLC will file its Technical Selection, proposed solution and vendor assessment with the PUC on or around the end of 2010. DLC will file a full cost deployment on or about the end of 2011. The 2011 filing will contain more specific information, including costs, not available in 2010. DLC's full cost deployment plan will be filed by the end of 2011. Approval of this plan by the PUC is anticipated by July 1, 2012. Replacement of DLC's current AMR technology is not anticipated without PUC approval of the full cost deployment plan and appropriate recovery of cost through a rate surchrge.

It should be noted this AMI RFP and the Proposals submitted by the Bidder will be submitted to the PUC and interested parties for its review and as a part of the approval process of the technology and vendor selected by Duquesne.

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1.1.2.11 Procurement & Warrantor

DLC will accept joint proposals from AMI vendors and meter manufacturers where the AMI module is purchased separately by DLC for installation into the meter.

Required: The bidder shall be responsible for warranty of the meters, including service switch, and the AMI communication module.

1.1.2.12 Deployment

AMI meter installation is solicited in Section 8. DLC expects the AMI provider to provide the AMI system as well as installation. DLC may elect to install some meters at their discretion; however it should be assumed for the purposes of this RFP that the AMI provider will install 100% of the meters.

1.1.2.13 Acceptance

DLC will require the successful Bidder to conduct an Initial Acceptance Test of the AMI early in the deployment to confirm the adequacy of coverage, data collection performance, operation of the Master Station, and integration of the data flow into specified DLC legacy systems. Initial Acceptance Test failure may result in project delay. The purchase contract will define a time interval(s) in which the AMI provider may remedy such failure and re-execute the failed test. Repeated failures may result in contract cancellation. Acceptance Test details will be finalized with the selected Bidder(s) during contract negotiation. Bidders may assume that the Test will be as prescribed in Section 7, Acceptance Test, suitably adjusted for the type of AMI provided.

1.2 Instructions to Bidders

1.2.1 Submission of Bids

1.2.1.1 Number of Copies

Required: Bidder shall provide an electronic copy, an original hard copy proposal with all supporting data, and one support hardcopy. All Proposals will remain the property of DLC.

1.2.1.2 Sealed Bids

Required: The bids shall be submitted in a sealed envelope with the RFP title clearly marked.

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1.2.1.3 Electronic Submissions

Required: Electronic submissions received prior to the Deadline are acceptable but must be followed up by an original proposal and one support copy within two (2) business days.

1.2.1.4 Formats

Required: Bidder shall also provide DLC a CD of the original proposal. Proposal information shall be presented in Microsoft Office or Adobe Acrobat document format. DLC reserves the right to disregard proposals not reasonably compliant with the prescribed format.

1.2.1.5 Firm Quotes

Required: All quotes shall be firm for a period of 270 days.

1.2.2 Proposal Deadline

Required: Proposals must be received no later than the time and date specified in Table 1 at the address provided below:

DLC, Inc.
Attn: Patti Jordan, Contract Administration
2515 Preble Ave.
Pittsburgh, PA 15233
PJordan@duqlight.com (electronic submission)

1.2.2.1 Proposals Submitted Late

Proposals received after the due date shall remain unopened and will not be considered for selection. DLC does not currently plan to grant extensions of the proposal due date, but reserves the right to do so. In the unlikely case that an extension is granted, notice of such extension will be provided to all Bidders at least one week prior to due date.

1.2.2.2 Modifications or Withdrawals of Bids

A Bidder may modify or withdraw its bid by written declaration, provided that the declaration is received by DLC at the above postal or electronic address prior to the due date. Following

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withdrawal of its bid, a Bidder may submit a new bid, provided that such new bid also is received by DLC prior to the due date.

DLC may modify any provision of this Request for Proposal at any time prior to the due date. Such modifications may be made in the form of addenda, which will be issued simultaneously to all prospective bidders that have declared their intention to bid. If an addendum is issued within seven calendar days of the due date, a due date extension of at least seven days will be declared.DLC may request each bidder to visit the site of the work and familiarize itself with the conditions under which work is to be performed and all other conditions and factors, local and otherwise, which would affect the performance of the arrangement and conditions of existing or proposed structures affecting the contract work, procedures necessary for maintenance of uninterrupted operation, availability and cost of labor, and facilities for transportation, handling, and storage of materials and equipment as well as all applicable laws, regulations and ordinances.

The bidder represents that all such factors have been properly investigated and considered in the preparation of every proposal submitted and agrees to make no claim for additional compensation based upon lack of such prior information or its effect upon the cost of the work.

1.2.2.3 Award or Rejection

Issuance of this RFP does not constitute a commitment by DLC to award a winning bidder or purchase products or services offered in response to this RFP. DLC reserves the right to reject any or all bids. DLC will not reimburse Bidders' costs to respond to this RFP.

1.2.3 Form of Proposal

Bidder shall submit an original proposal in the form prescribed in this section.

1.2.3.1 Executive Summary

Required: Bidder shall provide an executive summary that, in a few pages, encapsulates the goods and services proposed. Pricing data shall not be included. The executive summary of AMI proposals shall contain a high level block diagram illustrating the major components of the proposed system.

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1.2.3.2 Project Schedule

Required: Bidder shall provide a preliminary AMI project schedule indicating major completion milestone events and interdependencies among events. Schedule shall clearly indicate tasks and milestones that depend on assumed performance by DLC, installation contractor or DLC's MDM provider.

1.2.3.3 Commercial Proposal

The DLC AMI Team will evaluate the technical and management aspects of proposals received in response to this RFP before reviewing cost and contract information. To support this evaluation approach, Bidders shall provide the cost and contract elements of their proposals in a hard copy document that is physically separate from the Management and Technical proposals.

1.2.3.3.1 Pricing

The Commercial Proposal shall contain all information related to proposed prices. Proposed pricing shall be provided by completing Attachment D – DLC AMI Pricing Table. In electronic submissions and on the CD, the Commercial Proposal and completed Pricing Table shall be in a separate file or multiple separate files.

1.2.3.3.2 Procurement Terms and Conditions

Contractual terms and conditions of DLC's AMI procurement will be negotiated with the selected supplier(s) after initial selection. The text referenced in Section 13, is provided with this RFP as an illustration of expected DLC contract terms and conditions. Attachment G – DLC Terms and Conditions should be referenced.

Required: Bidders will identify to DLC in their proposals any term or condition in Section 13 or the attached DLC General Terms and Conditions to which exception will be taken. Other terms and conditions may be included, as appropriate to the AMI and supplier(s) selected.

1.2.3.3.3 Non-Collusion Affidavit

Bidder is required to execute the Attachment C - Noncollusion Affidavit and include the affidavit in the Management Proposal Section of Bidder's proposal.

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1.2.3.4 Management Proposal

Bidders shall provide a Management Proposal responsive to Section 11, Bidder Qualifications of this RFP.

The Management Proposal shall address the following as a minimum:

- Organization chart showing organization structure and individuals by name from the president of the proposing firm down to the proposed manager of the proposed AMI project.
- Key personnel resumes.
- History of the company's AMI business describing the number of AMI endpoints sold per year and total number of AMI endpoints now operating in the field.
- Corporate experience providing and supporting AMI implementations comparable to the proposed type and size.
- Utilities now using and/or deploying the proposed AMI solution, including the quantity of AMI endpoints (planned and now deployed) at each utility.

1.2.3.5 AMI Technical Proposal

Bidder shall submit a complete technical description of the AMI proposed. The description shall cover each hardware and software subsystem and shall contain detailed descriptions, general drawings, photographs, diagrams, or illustrations of the components (hardware and software) that the Bidder proposes to furnish. Equipment shall be described in sufficient detail so the characteristics and suitability may be determined.

A complete bill of materials that lists all hardware, software, and documentation items included in the base bid and/or each option shall be provided. Proposed AMI components shall be described by manufacturer and model number.

Basic man/machine interface procedures shall be described.

A recommended list of spare parts shall be provided. If a maintenance contract is proposed, the price of this maintenance contract shall be included in the commercial proposal, and spare parts covered by the contract shall be itemized.

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1.2.3.6 Infrastructure Installation Proposal

Bidder shall propose firm costs for installing the AMI Network infrastructure, AMI Master Station software components and AMI meters necessary to support the proposed AMI solution, including necessary testing. Bidder shall submit a complete description of services to be performed to ensure end-to-end functionality and performance, from head-end to AMI devices and back, including testing of all required and valued capabilities proposed. Bidder shall provide a list of all AMI documentation and examples as deemed appropriate by the Bidder.

Bidder shall clearly specify the expectations and requirements of DLC support, if any, assumed and relied upon by the Bidder. DLC will require approval of, be involved in, and require its oversight of the scheduling and execution of the installations.

1.2.4 Commercial Availability

Unless Bidder explicitly states otherwise, all hardware and software elements of any proposed AMI solution are understood by DLC to be commercially available; that is, fully developed and tested, in commercial production, and in use at other utilities at the time of the proposal. Any elements of the proposed AMI that are planned but are not yet commercially available shall be identified, with a full discussion of the state of development and commercialization of the product, and the conservative schedule for such commercialization.

1.2.5 Compliance with Requirements

Required: Bidder shall provide a statement after each Required Requirement, Valued Requirement, or Required Information (preferably in a clearly visible text other than black) in this RFP that asserts the degree to which the requirement is met, or if the requirement is not met and an alternate has been provided.

Valued: DLC will carefully evaluate valued capabilities and attributes of this RFP. The bidder response shall clearly and briefly describe the compliance (or not) of the proposed AMI with each Valued or attribute. If more than a brief explanation is desired by the bidder such as a PDF brochure or document, bidder shall provide the lengthy explanation as an attachment that names the paragraph of the RFP for which the attachment describes the proposed AMI capability or attribute.

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1.2.6 Subcontractors and Suppliers

If Bidder plans to enter into contracts with subcontractors and suppliers to complete the proposed project, a list identifying the subcontractors with a comprehensive description of the proposed offerings shall be submitted with the bid. Additional information regarding the status of the business as a Small Business, Small Disadvantaged Business, Woman owned Small Business, Historically Underutilized Business Zone Small Business, or Veteran-owned Small Business shall also be included in the form of Attachment B – MBE Contracting Report.

Further, Bidder shall describe the location of each subcontractor and the portion of the proposed System for which said Subcontractor will be responsible. DLC reserves the right to reject any, or all, of the subcontractors submitted.

Bidder shall remain entirely responsible for the quality, completeness and timeliness of the work of its contractors and subcontractors. Bidder shall fully disclose existing legal relationships and/or litigation between its subcontractors and their clients or customers, and between Bidder and its clients or customers.

1.2.7 Future Applications

1.2.7.1 Smart Grid Features

DLC solicits AMI at this time to meet the requirements of Act 129 in support of its electric operations, but will value capabilities to support smart grid applications such as distribution system automation.

Valued: Bidder should describe the capacity, if any, of the proposed AMI to support smart grid application such as but not limited to distribution monitoring and control.

1.2.7.2 Backhaul Communications

DLC intends to select an AMI solution that best serves its overall needs as defined in this RFP. One element of an AMI is the "backhaul" data communication infrastructure. Bidders are invited to propose a backhaul communications solution that, at a minimum, supports the capabilities and attributes of the proposed AMI solution. Recent progress in development of the broadband wireless standards, and commercial deployment of compliant radio services, creates a new

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possibility for utilities: the broadband capacity not needed for AMI backhaul could serve other utility purposes such as data communication with field crews.

Required: AMI Bidder shall utilize the existing DLC fiber backhaul network infrastructure in its proposed design. DLC ensures there will be significant bandwidth necessary to backhaul the data and will work with the selected Bidder to define such requirements.

1.2.8 Safety Management

DLC has a goal to achieve an injury-free workplace. Bidder will adhere to the same safety procedures and practices as DLC employee for the appropriate classification of work. Attachment E- DLC safety manuals contains important requirements.

1.2.8.1 Safety Program

Required: Bidder shall describe its safety program and the processes in place to ensure a safe work environment.

1.2.8.2 Safety Reports

Required: Bidder shall describe what safety reports and statistics will be issued to DLC describing actual performance to safety requirements and the frequency of these reports.

1.2.8.3 Safety Equipment

Required: Bidder will provide and require use of protective equipment as described in DLC Safety Manuals included as Attachments.

1.2.9 Proposal Evaluation Criteria

DLC will evaluate proposals using an internal scoring method that weights various parameters to give the DLC AMI Team insight into the strengths of each proposal relative to DLC's needs. DLC's internal scoring method values the following proposal attributes (order of presentation does not reflect priority):

- Bidder Qualifications
    - Financial stability

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  - Business stability
  - Experience providing same or similar products & services
  - Perspectives expressed by reference utilities
- Proposal attributes
  - Organization and clarity
  - Responsiveness to stated DLC needs
- AMI attributes
  - Conformance to requirements
  - Technical maturity
  - Expandability
  - Quality of documentation
  - Compatibility with existing DLC IT resources
- Commercial proposal
  - System cost relative to long term operational value provided
  - Flexibility with contractual terms

Based on the DLC AMI Team's judgment, developed using the scoring method, DLC will select two or three "short-list" bidders for further discussion. DLC reserves the right to alter its internal scoring method and to exercise whatever judgment it deems in the best interests of DLC in selecting AMI supplier(s).

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2 Metering Requirements

This section describes DLC's requirements for the capabilities and attributes of the new solid state AMI meters that Bidder will provide with the proposed AMI. The proposed AMI meters shall be equipped with AMI control and communications components that fulfill the AMI requirements that are separately described in Section 6 of this RFP.

DLC reserves the right to purchase one meter type or more that one meter type based on negotiations with the Prime Contractor/AMI Vendor. DLC also reserves the right to purchase meters directly from the meter manufacturers.

2.1 Meter Technology

The AMI Meters shall be new and solid state with no moving parts except for the minimum number of moving parts required to support service switching, tamper detection, and "hard" demand reset, if available.

Functional features of the new meters shall be programmable. All programmable meter features shall be fully accessible to DLC staff both locally and remotely. Each meter's programmable features shall be programmed at the factory for function and display according to specifications that DLC will provide to the meter manufacturer at time of meter procurement.

Required: All proposed AMI meters shall be intelligent, programmable, all-electronic, revenue-grade, electric meters that contain the minimum number of moving parts required to support service switching, tamper detection, and "hard" demand reset.

2.2 Meter Sources

Required: Proposal shall include specific makes, models, warranties, and pricing for at least one primary AMI Meter and preferably one first alternate AMI Meter. Bidder will describe any stipulations or requirements within this RFP that the proposed AMI Meters cannot meet.

Proposal shall include the procurement method for each make/model. Bidder shall specify if the AMI Meter will be ordered as one unit or as a separate meter and AMI module. If the meter and module require assembly, Bidder shall specify how this will be accomplished. Warranty terms and bounds of responsibility for each of these scenarios shall be provided by Bidder.

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Information Request: Bidder shall provide a list of all other alternative AMI Meters, by make and model that currently work with the proposed AMI. Bidder must include a roadmap for future AMI Meter compatibility with its AMI system. Alternate meters shall also be priced.

Required: Prior to delivery from the factory, the meter manufacturer shall test each meter to certify the accuracy and proper operation of the meter. Any test device used to certify meter accuracy must itself have a clear and documented chain of calibration traceability that begins at an American National Standards Laboratory. A file with meter attribute information and test results shall be electronically provided to DLC prior to every shipment from the manufacturer.

Required: For each type of meter required, Bidder's proposal shall:

- Provide the specific make, model, warranties, and pricing for one primary AMI meter manufacturer and one first alternate AMI meter manufacturer
- Indicate whether the AMI meter will be ordered as one unit or as a separate meter and AMI module
- Describe how the AMI meter will be assembled if the meter and AMI module are acquired as separate components
- Describe the warranty terms and bounds of responsibility for each proposed meter sourcing scenario
- Provide a list of all meters, by make and model, that are currently fully interoperable with the proposed AMI
- Provide a list of all meters, by make and model that are on Bidder's roadmap for future interoperability with the proposed AMI

2.3 Meter Forms, Services and Quantities

For each type of electric service listed in Table 2 below, Bidder shall propose suitable meter products from at least two different meter manufacturers. The exact quantity for each meter type is unknown; however, the table shows estimated quantities that are sufficiently accurate for Bidders to determine their proposed prices for each meter type.

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Table 2. Meter Forms, Services & Quantities

Form	Class	Voltage	Quantity	Notes
Single Phase				
2S	200	240	4546	1,2
4S	20	240	3790	2
12S	200	120	38	1,2
1S	100	120	2562	1
2S	200	240	540892	1
3S	20	120	6	
3S	20	240	72	
4S	20	240	1558	
12S	200	120	35825	1
	Total 1-Phase Meters		**589,289**	
Three Phase				
9S	20	120	7393	2,3
13S	200	240	3348	2,3
16S	200	120	3448	2,3
35S	20	240	7645	2,3
5S	20	120	42	3
5S	20	240	4	3
9S	20	120	5	3
13S	100	240	11	3
16S	100	120	7	3
16S	200	120	30	3
35S	20	120	2	3
35S	20	240	2	3
	Total 3-Phase Meters		**21,937**	
Total Single and Three Phase Meters			**611,226**	

Notes:
Denotes meters with integral 200 amp service switch
Cuurent installed meters having at least two pulse outputs (Alpha Meters). Alternate/Optional pricing should be provided for pulse output meters; base price should be for meters without pulse outputs.
Supports voltage auto ranging

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2.4 Meter Locations

The premises street addresses for all meter locations are presented in Attachment H- DLC Meter Locations. Bidder shall use the meter locations presented in this file when developing their proposed network infrastructure costs.

Each record in the meter location file contains the following data, in this order:

- Address Line 1 (Alphanumeric, 49 Characters)
- Town/City (Alpha, 15 Characters)
- State (Alpha, 2 Characters)
- Zip Code + 4 (Alphanumeric, 9 Characters)
- Premises Number (Alphanumeric, 9 Characters)

2.5 Applicable Meter Standards

Required: Meter design, construction, operation, and performance shall conform to the applicable requirements established in the latest revisions of the industry standards shown below in Table 3.

Required Information: Bidder shall note any cases where a proposed meter does not conform to a listed standard.

Table 3. Required Meter Standard Conformance

ANSI C12.1 – 2001	Code for Electricity Meters
ANSI C12.7 – 2005	Requirements for Watt-hour Meter Sockets
ANSI C12.10 – 2004	Watt-hour Meters
ANSI C12.18 – 2006	Protocol Specification for ANSI Type 2 Optical Port
ANSI C12.19 – 1997	DLC Industry End Device Data Tables
ANSI C12.20 – 2002	Electricity Meters – 0.2 and 0.5 Accuracy Class
ANSI MH10.8M – 1983	Specification for Bar Code
ANSI /ASQZ1.4 – 2003	Sampling Procedures and Tables for Inspection by Attributes
NEMA SG-AMI 1–2009	Requirements for AMI Meter Upgradeability
IEEE C37.90.1 – 2002	SWC Surge Testing
IEC 61000-4-2 – 2001	Electrostatic Discharge Requirements
IEC 61000-4-4 – 2002	Electrical Fast Transient/Burst Requirements
IEEE C65.42	Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and Less) AC Power Circuits

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Valued: The design, construction, and operation of each meter proposed shall conform to the requirements specified in the latest revisions of the applicable standards shown below in Table 4.

Required Information: Bidder shall note any cases where a proposed meter does not conform to a listed standard. Also, where applicable, Bidder shall clearly describe and price optional meter upgrades that support one or more of these standards.

Table 4. Valued Meter Standard Conformance

ANSI C12.22	Protocol for Interfacing to Data Communication Networks
IEEE 1159 – 1995	Recommended Practice for Monitoring Electric Power Quality
IEEE C65.42	Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and Less) AC Power Circuits

2.6 Consumption Measurements

All electric revenue meters proposed shall measure and store in meter memory the measurement and event data specified in this section for subsequent presentation on the meter display; local collection through the meter's local communications portal; or remote collection by the AMI.

Required: All AMI Meters shall measure and store in the meter memory in the appropriate ANSI C12.19 Tables (Proposer shall define specific table(s) in each section) the measurement and event data specified in this section for subsequent presentation on the meter display or via local or remote collection by the AMI. Bidder will describe all consumption intervals available and whether this is configurable by DLC.

Required: All measurements shall allow programming control to determine if measures are done based on "Standard Time" or "Daylight Savings Time."

Required: All measurements shall allow programming to control the correlation of timestamps across all interval-channels and registers so that "point-in-time" alignment can be accomplished.

Required: All errors and event that can cause read integrity to be called into questioned must be delivered to the MDM so that the impact of the errors and events can be available before VEE of the related register or interval channel data.

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Required: Bidder shall describe the proposed meters' capabilities for measuring and recording interval consumption in intervals including delivered versus received (positive versus negative).

2.6.1 Total kWh Registers

Required: All meters shall store total delivered energy and total received energy measurement data in separate, dedicated registers. The measured energy shall be recorded in kWh units and the value stored in each register shall be a cumulative quantity that continuously increases.

Required: Quantities that can be recorded shall include delivered and received kWh, delivered and received kW demand, delivered and received kVAh, delivered and received kVARh including some approach for differentiating between "Leading and Lagging" VARs (Note that positive and negative PF – Power Factors may be an acceptable substitute.) , and average RMS voltage.

Valued: Proposer shall specify if the proposed AMI Meters can record the delivered less received energy (that is, net energy delivered) measurement in a dedicated register.

2.6.2 Interval Consumption Data

Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data channel.

2.6.2.1 Polyphase Meters

Required: All polyphase meters shall support creation and storage of interval consumption data records in at least eight (8) independent meter data sequences (aka "channels").

Required: Quantities that can be recorded by each proposed polyphase meter shall include delivered and received kWh, delivered and received kVAh, leading and lagging kVARh, and average RMS voltage.

Required: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available interval lengths shall include 15, 30, and 60 minutes.

Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available interval lengths shall include 1, 5, and 10 minutes and 24 hours.

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Information Request: Proposer shall describe the options to upgrade the AMI system to collect data in smaller intervals.

2.6.2.2 Single Phase Meters – Residential Accounts

Required: Single phase meters serving residential accounts shall be capable of creating and storing interval consumption data records in at least four (4) independent meter data sequences.

Valued: Quantities that can be measured and recorded shall include delivered and received kWh, delivered and received kVAh, and average RMS voltage.

Valued: DLC will value single phase residential account meters that can measure and record leading and lagging kVARh.

Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available intervals in all single phase residential meters shall include 15, 30, and 60 minutes.

Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available intervals in all single phase residential meters shall include 1, 5, and 10 minutes and 24 hours.

Information Request: Proposer shall describe the options to upgrade the AMI system to collect data in smaller intervals.

2.6.2.3 Single Phase Meters – Small Commercial Accounts

Required: Single phase meters serving small commercial accounts shall be capable of creating and storing interval consumption data records in at least four (4) independent meter data sequences.

Required: Quantities that can be measured and recorded shall include delivered and received kWh, delivered and received kVAh, and average RMS voltage.

Valued: DLC will value single phase residential account meters that can measure and record leading and lagging kVARh.

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Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available intervals in all single phase residential meters shall include 15, 30, and 60 minutes.

Valued: The interval lengths and recorded quantities shall be programmable separately for each meter data sequence. Available intervals in all single phase residential meters shall include 1, 5, and 10 minutes and 24 hours.

Information Request: Proposer shall describe the options to upgrade the AMI system to collect data in smaller intervals.

2.6.3 Time-of-Use (TOU) Data

Required: All meters proposed shall support registration of time-of-use data in accordance with the requirements described in the following subsections. TOU registers shall record continuously increasing total consumption.

Required: All meters proposed shall support registration of TOU quantities in at least four (4) independent TOU registers with the ability to display each corresponding register, including energy and peak demands. TOU registers shall record continuously increasing total consumption.

Required: Separate daily interval schedules shall be programmable in at least four (4) yearly TOU seasons. The start and end dates of the TOU seasons shall be programmable with a resolution of one (1) day. The start and end times of the daily TOU intervals shall be programmable with a resolution of one (1) minute, or better.

Required: All meters shall support programming of separate daily TOU interval schedules for weekdays, weekend days, and holidays. This requirement applies to each recorded TOU quantity.

Required: Bidder shall describe the proposed meters' capabilities for recording Time-of-Use (TOU) data including TOU consumption or TOU demand.

Valued: Meters shall support concurrent TOU recording of both delivered and received quantities for:

- kWh, kVAh, kVARh, kW demand, and kVA demand for three phase meters

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- kWh, kVAh, kVARh , kW demand, and kVA demand for two phase meters
- kWh, kW demand for single phase meters and also
- kVAh, kVA demand, kVARh, and kVAR demand

Information Request: The Proposer shall describe methods supported by the proposed AMI that will give customers prompt access to their consumption data, with attention to explaining how quickly the data will be accessible to the customer.

2.6.3.1 Daily TOU Interval Schedules - By Day type

Required: All meters shall support programming of separate daily TOU interval schedules for weekdays, weekend days, and holidays. This requirement applies to each recorded TOU quantity.

2.6.4 Reactive Energy Measurements

Required: Proposer's polyphase transformer rated AMI Meter shall be capable of measuring reactive energy quantities, including reactive interval data.

Information Request: Proposer shall also describe the ability of other proposed meter forms, single phase and polyphase, to measure reactive energy.

2.6.5 Transformer Loss Compensation

Some DLC customers receive primary service and are metered on the secondary, that is, at customer voltage. For these accounts, DLC needs to perform transformer loss compensation to include the losses incurred by the customer's power transformer in the billed energy.

Valued: For ANSI Forms 5S, 6S, and 8S/9S, DLC will value polyphase meters that are optionally configurable to perform transformer loss compensation when metering the secondary of primary service accounts. If offered, Bidder should show the incremental price of this optional capability, over and above the quoted price of meters that do not perform this compensation.

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2.7 Demand Measurements

Required: Proposer's responses to the following subsections shall describe the proposed meter capabilities for measuring and recording demand data in the meter's appropriate ANSI C12.19 Tables. Proposer shall define the specific table(s) in each section.

Required: Meters shall store all demand data in dedicated registers and dedicated interval data sequences. DLC programming of the meters shall include the option to record either "rolling" or "block" interval demand values. Values stored in demand registers shall continuously increase until they are reset by an authorized AMI user or process.

2.7.1 Peak Demand Registers

2.7.1.1 Polyphase Meters

Required: All polyphase meters shall support at least six (6) independent peak demand registers.

Required: Peak demand quantities that can be recorded shall include both delivered and received values for kW and kVA, and leading and lagging values for kVAR.

Required: The meter shall update a demand register value only when the present demand measurement is greater than the present register value.

Required: The type of demand quantity recorded in each register shall be utility-configurable through programmable meter settings.

2.7.1.2 Single Phase Meters

Valued: All single phase meters shall support at least four (4) independent peak demand registers.

Required: All AMI Meters must be capable of supporting at least two (2) registers for both delivered and received values for kW for single phase meters.

Valued: Peak demand quantities that can be recorded shall include both delivered and received values for kW and kVA.

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Required: The meter shall update a demand register value only when the current demand measurement is greater than the current register value.

Required: The types of demand quantities recorded shall be utility-configurable through programmable meter settings.

2.7.1.3 Local Demand Register Reset

Required: All meters registering peak demand shall support local resetting of the value (to zero) in any demand register. The meter shall feature sufficient security provisions to prevent local demand register resets by anyone other than authorized personnel.

Required Information: Bidder shall describe the means by which local demand reset is supported in each proposed meter type. The bidder shall also describe provisions, if any, for supporting demand data and demand reset during periods of AMI communications outages which might span a billing period or billing event such as account changes ("Break Points".)

DLC's requirements for remote demand register reset capabilities are specified as AMI requirements in Section 6.3.

2.7.1.4 Demand Intervals

Required: Programming of the meters shall include the option to record either "rolling" or "block" interval demand values. Block demand shall be measured in 15 minute, 30 minute or 1 hour intervals. Rolling demand subintervals shall include resolution of five (5) minutes or less.

Valued: Rolling demand subintervals of 3, 2, and 1 minute(s).

2.7.2 Demand Thresholds

Valued: Each meter proposed should support independent demand thresholds for kW, kVA, and kVAR.

2.7.2.1 Configure Demand Thresholds

Valued: For all meters with a demand threshold capability, the types of demand thresholds monitored, and their respective threshold quantities, should be utility-configurable through programmable meter settings.

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2.7.2.2 Detect Above-Threshold Demand Events

Valued: All meters with a demand threshold capability should detect an above-threshold demand event when a measured demand quantity increases above the quantity's respective demand threshold. The meter should not detect a subsequent above-threshold demand event until after it first detects a below-threshold demand event.

2.7.2.3 Detect Below-Threshold Events

Valued: All meters with a demand threshold capability should detect a below-threshold demand event when a measured demand quantity decreases below the quantity's respective demand threshold by a utility-configurable below-threshold quantity. The purpose of the below-threshold quantity is to provide a margin that prevents excess event records when a measured demand quantity fluctuates around the quantity's respective above-demand threshold.

2.7.2.4 Record Demand Threshold Events

Valued: All meters with a demand threshold capability should create and store in meter memory a record of each detected demand threshold event. As a minimum, the information in each record should include:

- the type of demand quantity
- the value of the quantity's respective demand threshold setting
- indication that the demand quantity either increased above or decreased below its threshold
- the date & time when the event occurred

The recorded event time shall have a resolution of one second or better.

The meter's memory shall support retention of at least 100 demand threshold event records. If the allocated memory is full, the meter will add each new demand threshold event record by overwriting the oldest stored demand threshold record.

2.8 Sub-Metering

Sub-metering at a customer premises comprises measuring and recording the power flow, energy consumption, and energy production of discrete customer loads and supply sources,

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including: water heaters, air conditioners, pool/spa pumps, irrigation pumps, wind generators, plug-in hybrid electric vehicles (PHEVs), and solar photovoltaic arrays.

If and when DLC utilizes sub-metering at a customer premises, the sub-metered data should be conveyed between the sub-metering devices and the AMI Master Station by way of intermediate data/command routers. The intermediate router may be implemented as a function of an AMI meter, a non-meter AMI end-point device, or some other element of the AMI Network.

DLC's specifications for AMI capabilities supporting sub-metering are described in Section 6.8.

Valued: AMI meters and/or other AMI elements should be capable of collecting and recording sub-metering data from customer load/supply sub-metering devices. Once recorded, the sub-metering data should be immediately accessible for either local collection by utility personnel or remote collection by the AMI.

Required Information: If Bidder's proposed AMI solution can support sub-metering, then Bidder's proposal shall clearly and fully describe the capabilities that will support collection and intermediate storage of sub-metering data records.

Regardless of the means and methods of implementation, DLC will value the sub-metering capabilities described in each of the following subsections:

2.8.1 Sub-Metering

Valued: Ability to record at least four individual sub-metered load/supply devices at each customer premise.

2.8.2 Sub-Metered Data

Valued: Data recorded should be as specified for single phase meters in Section 2.6.2.2.

2.9 Service Continuity Functions

Electric service continuity is characterized by the presence or absence of supply voltage (on each phase for polyphase services) that is within a utility-defined range of acceptable variance from the nominal supply voltage.

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Required: All electric meters proposed shall detect and record electric service continuity data sufficient to support utility-industry best practices for effective monitoring, analyses, and management of service voltage interruptions and restorations. The recorded data shall be accessible for local collection through the meter's local communications portal and for immediate and/or subsequent remote collection by the AMI.

2.9.1 Support for Recommended Practices

Valued: Meters with capabilities sufficient to support the service continuity monitoring practices recommended in the most recent version of IEEE Std. 1159-1995 (*IEEE Recommended Practice for Monitoring Electric Power Quality*).

Required Information: For each meter type proposed, Bidder shall describe the extent to which the meter supports the service continuity monitoring practices recommended in the most recent version of IEEE Std. 1159-1995.

2.9.2 Detect Supply Voltage Interruption

For the purposes of this RFP, a supply voltage interruption occurs when the voltage sensed on the service side of the meter drops below a programmed voltage threshold.

Required: Meters capable of detecting a supply voltage interruption.

Valued: Authorized DLC personnel should be able to either locally or remotely configure a desired voltage threshold value in the meter's program.

Valued: Polyphase meters should differentiate phase-to-phase versus phase-to-ground conditions.

Required Information: For each proposed meter type that includes utility-configurable interruption detection, Bidder shall describe the means and methods that enable authorized utility personnel to configure the meter's programmed criteria for detecting supply voltage interruptions.

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2.9.3 Sustained Supply Voltage Interruptions

For the purposes of this RFP, a supply voltage interruption is classified as "sustained" when its duration exceeds a time threshold that qualifies the interruption for immediate notification to the AMI.

Required: Meters capable of detecting, recording, and immediately reporting sustained supply voltage interruptions. DLC's requirements for AMI reporting of sustained supply voltage interruptions are specified in Section 6.5.1.

Valued: Authorized DLC personnel should be able to either locally or remotely configure a desired interruption duration threshold value in the meter's program.

Required Information: Bidder shall describe the method of detecting, recording, and reporting sustained supply voltage interruptions in each proposed meter type. Bidder's description should include information regarding the following:

- The configurability of an interruption duration threshold (for example, configurable from 1 second to 3600 seconds)
- The meter's ability to detect and characterize a sustained interruption
- The means and method used by the meter to immediately notify the AMI.

2.9.4 Momentary Supply Voltage Interruptions

For the purposes of this RFP, a detected supply voltage interruption is classified as "momentary" when its duration does not exceed a time threshold for identifying "sustained" interruptions (see above).

Required: Meters capable of detecting and recording momentary supply voltage interruptions.

Valued: Authorized DLC personnel should be able to either locally or remotely configure a desired interruption duration threshold value in the meter's program.

Required Information: Please describe the means and method of detecting, characterizing, and recording momentary supply voltage interruptions in each proposed meter type.

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2.9.5 Excessive Momentary Interruptions

For the purposes of this RFP, a series of momentary supply voltage interruptions is classified as "excessive" when the number of momentary interruptions detected within a utility-configurable evaluation period exceeds a utility-configurable count threshold.

Valued: Meters capable of detecting, recording, and immediately reporting excessive momentary supply voltage interruptions. DLC's requirements for AMI reporting of excessive supply voltage interruptions are described in Section 6.5.2.

Required Information: If proposed as a capability, Bidder shall describe the means and method of detecting, *recording*, and reporting excessive supply voltage interruptions in each meter type that provides the capability. Bidder's description shall *include* information regarding the following:

- configurability of a threshold count (for example, configurable to any number between 2 and 100)
- configurability of the evaluation period (for example, configurable from 1 minute to 1440 minutes)
- the meter's ability to detect and characterize a excessive momentary interruptions
- management of evaluation period status (open, closed) with respect to restoration durations (momentary vs. sustained)

2.9.6 Record Supply Voltage Interruptions

Required: Meters capable of creating and storing supply voltage interruption records that log the date-time of the beginning and end of each supply voltage interruption detected.

Required Information: If proposed as a capability, Bidder shall describe the means and method of recording supply voltage interruptions in each proposed meter type that provides the capability. Bidder's description should include information regarding the following:

- the reference source and format of recorded time data (for example, Coordinated Universal Time)
- the accuracy and precision of recorded date-time data
- treatment of local time zones and daylight savings time

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- the amount of meter memory allocated for storing interruption records
- the method of handling interruption records when the allocated memory is full

2.9.7 Detect Supply Voltage Restoration

For the purposes of this RFP, a supply voltage restoration occurs when the voltage sensed on the service side of the meter rises above a programmed voltage threshold.

Required: All proposed meters shall be capable of detecting a supply voltage restoration.

Valued: *Authorized DLC personnel should be able to either locally or remotely configure a* desired voltage threshold value in the meter's program.

Required Information: For each meter type proposed, Bidder shall describe the means and methods, if any, that enable utility personnel to configure the meter's programmed criteria for detecting supply voltage restorations.

2.9.8 Sustained Supply Voltage Restorations

For the purposes of this RFP, a supply voltage restoration is classified as "sustained" when its duration exceeds a time threshold that qualifies the restoration for immediate notification to the AMI.

Required: All proposed meters shall be capable of detecting, recording, and immediately reporting sustained supply voltage restorations. DLC's requirements for AMI reporting of sustained supply voltage restorations are specified in Section 6.5.3.

Valued: All proposed meters should be capable of distinguishing a sustained supply voltage restoration from a momentary restoration.

Valued: Authorized DLC personnel should be able to either locally or remotely configure a desired sustained restoration time threshold value in the meter's program.

Required Information: Bidder shall describe the means and method for detecting sustained supply voltage restorations in each proposed meter type. Bidder's description should include information regarding the following:

- the configurability of a restoration duration threshold (for example, configurable from 1 second to 3600 seconds)

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- the meter's ability to detect and characterize a sustained restoration
- the means and method used by the meter to immediately initiate AMI notification

2.9.9 Record Notifications of Sustained Supply Voltage Restorations

Valued: Meters capable of creating and storing records that log the date-time when sustained restoration notifications are presented to the AMI.

Required Information: Bidder shall describe the means and method, if any, of recording sustained restoration notifications in each proposed meter type. Bidder's description should include information regarding the following:

- the reference source and format of recorded time data (for example, Coordinated Universal Time)
- the accuracy and precision of recorded date-time data
- treatment of local time zones and daylight savings time
- the amount of meter memory allocated for storing interruption records
- the method of handling interruption records when the allocated memory is full

2.10 Power Quality Functions

Power quality is characterized by the presence or absence of deviations from nominal AC voltage, frequency, and waveform at the distribution end-point where the electric meter is connected. Deviations affecting power quality include:

- voltage variations (sag, swell, undervoltage, overvoltage)
- voltage imbalance (on polyphase services)
- transients (impulsive, oscillatory)
- frequency variations
- waveform distortion (DC offset, harmonics, interharmonics, notching)

Valued: All meters should detect and record power quality data sufficient to support utility-industry best practices for effective monitoring, analysis, and management of end-point power

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quality. The recorded data shall be accessible for local collection through the meter's local communications portal and for immediate and/or subsequent remote collection by the AMI.

Required Information: Bidder shall clearly and fully describe the provisions in its proposed meters supporting this capability.

2.10.1 Support for Recommended Practices

Valued: To the extent that it is practical and relevant to end-point power quality, the proposed meters should have capabilities sufficient to support the power quality monitoring practices recommended in the most recent version of IEEE Std. 1159-1995 (*IEEE Recommended Practice for Monitoring Electric Power Quality*).

2.10.2 Detect Power Quality Exceptions

Valued: Meters capable of detecting both the beginning and ending of power quality exceptions when power quality deviations meet utility-defined exception criteria. The utility's criteria for the beginning and ending of an exception should be separately configurable for each type of deviation. Meters should monitor the following types of power quality deviations:

2.10.2.1 Low Voltage

Valued: Meters capable of detecting at least two levels of low voltage when the supply voltage (RMS) for any phase decreases below a set low voltage threshold for a period exceeding a set elapsed-time threshold.

2.10.2.2 High Voltage

Valued: Meters capable of detecting at least two levels of high voltage when the supply voltage (RMS) for any phase increases above a set high voltage threshold for a period exceeding a set elapsed-time threshold.

2.10.2.3 Voltage Imbalance

Valued: Polyphase meters capable of detecting a voltage imbalance when the supply voltage (RMS) for any phase deviates from the average of the phase voltages by an amount exceeding a set imbalance threshold for a period exceeding a set elapsed-time threshold.

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2.10.3 Impulsive Transients

Paraphrasing IEEE Std.1159-1995, impulsive transients are 'sudden, non-power-frequency changes in the steady-state condition of voltage, current, or both, that are unidirectional in polarity (either positive or negative)'. Impulsive transients are most commonly caused by nearby lightning strikes.

Valued: Meters capable of detecting impulsive transients that exceed utility-configurable energy thresholds down to 2 p.u. (that is, 2 per unit).

2.10.3.1 Low-Frequency Oscillatory Transients

As defined in IEEE Std.1159-1995, an oscillatory transient "consists of a voltage or current whose instantaneous value changes polarity rapidly. It is described by its spectral content (predominant frequency), duration, and magnitude." Further, an oscillatory transient is considered to be a low-frequency transient when its primary frequency component is less than 5 kHz, and its duration is between 0.3 ms and 50 ms. Low-frequency oscillatory transients in distribution systems are typically caused by capacitor bank energization, transformer energization, and transformer ferroresonance.

Valued: Meters capable of detecting low-frequency oscillatory transients that exceed utility-configurable energy thresholds down to 2 p.u. (that is, 2 per unit).

2.10.3.2 Frequency Deviations

Valued: Meters capable of detecting a deviation from the nominal service frequency (60 Hz) when the frequency decreases below a low frequency threshold or increases above a high frequency threshold for a period exceeding a corresponding elapsed-time threshold.

2.10.3.3 Waveform Distortion

While it is difficult to accurately predict the future of customer power use, DLC believes it is reasonable to expect a potentially significant increase in waveform distortion resulting from the addition of new types of customer load and various types of customer-owned power assets (i.e. photovoltaics, PHEVs, fuel cells, generators, etc.). As noted previously, there are several types of waveform distortion that represent significantly degraded power quality. The types of

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waveform distortion found at distribution end-points could include DC offset, harmonics, interharmonics, and notching.

Valued: Meters capable of detecting the types of waveform distortion most likely to occur at significant numbers of distribution end-points within the next 10-15 years. As a minimum, meters should be capable of detecting and recording occurrences of DC offset and excessive total harmonic distortion (THD). If proposed by Bidder, each type of distortion detected should have a corresponding set of technically appropriate measurement and temporal thresholds that should be independently configurable by the utility.

2.10.4 Record Power Quality Exceptions

Valued: Meters capable of creating and storing records documenting the beginning date & time, ending date & time, and appropriate descriptive information for each type of detected quality exception, by phase for polyphase meters.

2.10.5 Detect Sustained Power Quality Exceptions

For the purposes of this RFP, a power quality exception is defined as "sustained" when its duration reaches a point where DLC requires the meter to immediately report the exception to the AMI Master Station. DLC's requirements for AMI reporting of sustained power quality exceptions are specified in Section 6.6.1.

Valued: Meters capable of detecting a sustained power quality exception. If proposed by Bidder:

2.10.6 Detect Excessive Power Quality Exceptions

For the purposes of this RFP, a set of consecutive power quality exceptions of a particular type is defined as "excessive" when the number of exceptions recorded within a set evaluation period reaches a threshold where DLC requires the meter to immediately report the excessive exceptions to the AMI Master Station. DLC's specifications for AMI reporting of excessive power quality exceptions are described in Section 6.6.2.

Valued: Meters capable of detecting excessive occurrences for each type of detected power quality exception.

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2.11 Other Measurements & Data

All AMI meters shall detect and store in meter memory the following measurement & event data for immediate and/or subsequent presentation on the meter display; local collection through the meter's local communications portal; or remote collection by the AMI.

2.11.1 Tamper Functions

2.11.1.1 Detect Supply Interruption

Required: As described above, meters shall detect and store information on energy supply interruptions that could result from meter or service tampering. DLC's requirements for detecting and recording supply interruption and restoration events are specified above in Section 2.9.

2.11.1.2 Detect Tamper Conditions

Required Information: Bidder shall describe the forms of meter tamper detection that can be provided in the proposed meters (i.e. meter removal, meter inversion, magnetic field, unauthorized demand reset, unauthorized local or remote access attempt, etc.) and the means by which each form of tampering is detected.

2.11.1.3 Record Tamper Conditions

Required: Meters shall create and store tamper detection records that log the beginning and ending of each tamper condition. As a minimum, the information in each stored tamper record shall include:

- the type of tamper condition detected
- indication that the record represents either the beginning, ending, or instance of the tamper condition
- the date & time when the detected tamper condition began/ended/occurred

The logged beginning/ending/occurrence time shall have a resolution of one second or better.

2.11.2 Record Other Meter Events

Required: In addition to supporting the event recording requirements described in other sections of this RFP, all meters shall, as a minimum, be programmable to create and store in

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meter memory records that include the date, time, and applicable descriptive data for the following meter events:

- Register data cleared
- Date change
- Time change
- Demand reset
- Pulse overflow
- Load profile error
- Low power reserve
- Power reserve restored
- Meter program change
- Rate change
- Forward energy flow begins
- Reverse energy flow begins
- Security fail
- Security pass
- Test mode entered
- Test mode exited
- TOU season change
- TOU interval change
- TOU schedule error
- Self-test pass
- Self-test fail
- "Watchdog" program alert

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2.12 Support Pre-Paid Service

Valued: All AMI meters equipped with service switches (see Section 3) should be locally and remotely configurable by the utility to interoperate with the AMI Master Station for the purpose of supporting the following pre-paid service capabilities at customer premises:

- The meter should be utility-configurable to be either in or out of pre-payment mode.
- When a switch-equipped meter is in pre-payment mode, the meter should monitor the customer's post-payment energy consumption and open the switch when the customer's consumption exceeds a system-configured kWh consumption threshold setting.
- In response to each customer pre-payment received by the utility, the AMI will update the meter's kWh consumption threshold setting and, if the meter's service switch is open, command the meter to close the switch.
- Following each operation of its service switch for the purpose pre-paid service, the meter should create and store a record logging the date & time of the operation, the type of operation (open/close), and the present values in the meter's delivered and received kWh registers.

DLC's specifications for AMI capabilities supporting pre-paid service are described in Section 6.9.

2.13 Load Limiting Function

Valued: All AMI meters equipped with service switches (see Section 3) should be locally and remotely configurable by the utility to interoperate with the AMI Master Station for the purpose of supporting the following "load limiting" capabilities at customer premises:

- The meter should have utility-configurable threshold settings for maximum allowable kW, kVA, and kVAR demand
- The meter should be utility-configurable to be either in or out of load limiting mode
- When in load limiting mode, the meter should monitor demand and automatically open its service switch (without local or remote operator intervention) when the kW, kVA, or kVAR demand exceeds its respective threshold setting

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- After opening its service switch for the purpose of load limiting, the meter shall automatically reclose the switch (without local or remote operator intervention) following a utility-configurable time period
- After any closing of its service switch, the meter should delay opening the switch for the purpose of load limiting for a utility-configurable time period
- The meter should create and store a record logging the date, time, and demand type associated with each opening of its service switch for the purpose of load limiting

2.14 Meter Attributes

2.14.1 Meter Data Storage

Required: All proposed AMI meters shall store all recorded measurement and event data in the appropriate ANSI C12.19 tables in meter memory.

Required Information: Bidder's proposal shall fully and clearly describe how all meter measurement and event data are distributed across each proposed meter type's ANSI C12.19 tables.

2.14.2 Accuracy

Required: All meters shall meet or exceed the accuracy specifications contained in ANSI C12.20 and shall sustain calibration for the life of the meter.

2.14.2.1 Polyphase Meters

Required: All polyphase meters shall qualify for ANSI Class 0.2 Accuracy certification.

2.14.2.2 Single Phase Meters

Required: All single phase meters shall qualify for ANSI Class 0.5 Accuracy certification.

2.14.2.3 Creep

Required: As specified in applicable ANSI standards, no proposed meter shall generate pulses or register energy flow for any consumption or demand quantity that depends on current while the current circuit is open.

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2.14.3 Starting Watts

2.14.3.1 Class 20 Meters

Valued: Specify starting watts

2.14.3.2 Class 100 Meters

Valued: Specify starting watts

2.14.3.3 Class 200 Meters

Valued: Specify starting watts

2.14.4 Pulse Output

Duquesne currently has a number of pulse output meters installed. Bidder shall provide optional pricing for pulse output meters; however base price for all meters shown in Table 2, denoted with a Note 2, shall be provided at cost that does not inclue pulse ouputs.

Required: All proposed polyphase meters with pulse output capability shall be shop-configurable by DLC to produce at least two pulse outputs (Form C, KYZ) for collection of energy flow data by external pulse accumulators.

Valued: Optional pulse output meter pricing shall be provided as an option in Attachment D – DLC AMI Pricing Table. Base price should not include pulse outputs.

2.14.5 Voltage Auto-Range

Required: All new meters shall auto-range when connected to services in the range of 120-240 Volts RMS, ± 20%, with the following exceptions: Form 1S at 120 Volts and Form 2S meters at 240 Volts. (12S 120V meters are excluded)

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2.14.6 Meter Burden

2.14.6.1 Burden at Maximum Rated Load

Required: When operating at its maximum rated load, the meter's total power losses and power consumption associated with all metering and AMI functions shall not exceed 0.04 % of maximum rated load.

2.14.6.2 Burden at No-Load

Required: When operating without a load -- as when the meter's service switch is open -- meter power consumption associated with all metering and AMI functions shall not exceed 5 VA.

2.14.7 Meter Power Supply

The power supply capabilities specified in the following subsections apply only to the metering components of the proposed AMI meters. DLC's requirements for powering the AMI intelligence and communications components in the AMI meters are separately described in Section 6.18.3.

For the purposes of this RFP, a meter's primary power source provides all necessary electric power to the meter's metrology components at all times, unless disabled for maintenance or due to malfunction. The meter's secondary power source provides all necessary electric power to the meter's metrology components for more than a minimum duration when the primary power source is unavailable.

2.14.8 Primary Meter Power Source

2.14.8.1 Connection to AC Power Source

Required: The metrology in the proposed meters shall be provided with AC power from the line side of the meter. The connection to the AC power source shall pass through current limiting resistors and shall not be fused.

2.14.8.2 Tolerance of Frequency Variation

Required: The meter's AC power supply shall support all metering requirements specified in this RFP when operating at 60 Hz ± 5% variation.

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2.14.8.3 Drop-Out Voltage

Required: The meter's AC power supply shall support all metering requirements specified in this RFP when operating above 80% of the meter's nominal service voltage.

2.14.9 Secondary Meter Power Source

The source of secondary power that sustains an AMI meter's metering capabilities can be either the same as, or separate from, the source of secondary power that sustains the critical AMI functions in the same AMI meter.

Required Information: Bidder shall describe the means for providing secondary meter power in each meter type proposed.

2.14.9.1 Capacity

Valued: The proposed AMI meters shall be equipped with a secondary power source that can sustain operation of the meter clock and other critical "keep-alive" functions of the meter's processor(s) for a minimum of 45 days.

2.14.9.2 Rapid Recharge

Valued: The meter shall begin recharging its secondary power source starting immediately after restoration of supply voltage.

Valued: A fully discharged secondary power source should completely recharge within a period of minutes rather than hours (a recharge period of less than one minute is preferred).

Required Information: Bidder shall describe the nominal time to recharge the secondary power source in each meter type proposed.

2.14.9.3 Use of Batteries in Meters

The use of batteries for providing a secondary power source in meters is a serious concern for DLC.

Required Information: Bidder shall clearly and fully describe, as applicable:

Each instance where a battery serves as the source of secondary power for a proposed AMI meter's metering functions:

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The expected service life of the battery used in each type of AMI meter and the relationship of that battery's service life to the operation of the AMI meter's metering functions

Bidder's recommended procedures for battery life management and battery replacement

2.14.10 Meter Clock(s)

Each AMI meter will contain at least one internal digital clock for support of calendar, time-of-day, and timing services required for its metering functions. The clock(s) provided with each meter shall perform the required services in accordance with the requirements described in the following subsections:

2.14.10.1 Calendar Days

Required: The meter calendar shall distinguish weekdays, weekend days, and holidays to support separate TOU schedules on those days. The calendar shall support not less than 12 holidays, programmable by DLC, and including all major U.S. national and religious holidays.

2.14.10.2 Calendar Range

Valued: Once daily, the meter shall recalculate and update its internal calendar to maintain a forward calendar range of at least 30 years.

2.14.10.3 Time Base

Required: Each meter clock shall track, record, and report date and time data on the basis of Coordinated Universal Time (UTC), without inclusion of a time-zone offset.

2.14.10.4 *Translation to Local Date & Time*

Required: The meter shall support translation of UTC to the local date and time, with adjustment to daylight savings time when applicable. The start and end dates of the daylight savings period shall be utility-configurable.

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2.14.10.5 Clock Synchronization

Required: Each meter clock's date & time settings shall be updated to match reference date & time data that shall be regularly provided to the meter via the AMI. In between AMI updates, the meter shall synchronize its internal clock(s) with the meter's internal time-base (oscillator).

2.14.10.6 Time Resolution

Valued: Each meter clock shall track, log, and report time down to 1/100 of a second, or better.

2.14.10.7 Maximum Drift

Valued: The meter's internal time-base (oscillator) shall have a maximum drift of ± 0.02%.

2.14.11 Meter Memory

2.14.11.1 Non-Volatile Storage

Required: Meter data and program memory shall be non-volatile such that all stored data are retained in the meter for the design service life of the meter, without utilization of internal meter reserve power or external power sources.

Information Request: Proposer shall describe the AMI Meter's internal memory. Proposer shall describe how the proposed AMI performs in the event of a communication failure and the AMI Meter's ability to store data until communication has been re-established.

Information Request: Proposer shall explain how the meter manages logs (events, errors, communication, HAN, etc.) during normal operation as well as during loss of power and power restoration.

2.14.11.2 Storage Capacity

Required: As a minimum, the meter's memory resource(s) shall have sufficient capacity to concurrently support the following:

- all program and configuration data
- reception, loading, and self-test of meter firmware upgrades with recovery of the pre-upgrade version in the event of a failed upgrade self-test

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- 100% expansion of capacity initially allocated to meter program storage
- utilization of all possible meter registers
- maximum utilization of data record storage for all event logs
- 45 days of 15 minute interval data in all possible interval data sequences

Required Information: For each type of meter proposed, Bidder shall fill in the table below to show the number of days of interval data that the meter's memory can store for each combination of interval length and channel count.

Interval Length in Minutes	Interval Data Sequences or Channels (1-N)						
	1	2	3	4	5	6	N
1							
5							
10							
15							
30							
60							

2.14.12 Meter Display

2.14.12.1 LCD Display

Required: The meter shall be equipped with an industrial-grade liquid crystal display (LCD) capable of presenting five (5) plus three (3) digits, along with status annunciators or ID code numbers.

2.14.12.2 Meter Display Visibility

Required: In normal daylight conditions, the digits displaying the consumption and demand quantities should be legible to an observer with typical eyesight from a distance of at least six (6) feet. As a minimum, the displayed digits shall be 7/16 of an inch high with a segment thickness of 1/64 of an inch.

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2.14.13 Displayed Meter Information

Bidder's proposal shall fully describe the information presentation capabilities of the displays provided with the proposed meters. As a minimum, the meter display shall clearly present the following information:

2.14.13.1 Information Identification Codes

Required: At least three (3) digits or characters for displaying information identification codes that identify each type of value displayed.

2.14.13.2 Register Values

Required: All values recorded in dedicated register(s) with a minimum of five (5) digits, excluding decimal places.

2.14.13.3 kW Magnitude & Direction

Required: An easily interpreted graphic representing the magnitude and direction of kW passing through the meter.

2.14.13.4 kVAR Magnitude & Direction

Valued: An easily interpreted graphic representing the magnitude and direction of kVAR passing through the meter.

2.14.13.5 Phase Potential – Supply Side

Required: An indicator showing the presence or absence of voltage for each phase on the supply side of the meter.

2.14.13.6 Phase Potential – Customer Side

Valued: If the meter is equipped with a service switch, then the meter display should include an indicator showing the presence or absence of voltage for each phase on the customer side of the service switch.

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2.14.13.7 Service Switch Status

Valued: If the meter is equipped with a service switch, then the meter display shall include an indicator that shows the current position of the switch (open or closed).

2.14.13.8 End of Interval

Required: An end-of-interval indicator showing the approach and the occurrence of the end of the active demand interval.

2.14.13.9 AMI Communications Status

Valued: An easily interpreted indicator showing the current status of the meter's AMI network connection. As a minimum, the indicator should show the following states:

- network detected - connected
- network detected – not connected
- network signal quality
- no network detected
- transmitting
- receiving

2.14.13.10 TOU Rate

Required: An indicator that shows the TOU rate that is governing current TOU consumption calculations in the meter.

2.14.13.11 Display Mode

Valued: An indicator that shows the current operating mode of the meter display (e.g. Normal, Alternate, or Test).

2.14.14 Programmable Display Operating Modes

Valued: The meter display shall have at least three (3) operating modes. The displayed information ID codes, the sequence of information displayed, and the timing for information scrolling shall be independently programmable for each mode.

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2.14.14.1 Normal Mode

Valued: In this mode the display shall scroll automatically through the programmed displays for normal visual meter reading. Upon power up, the meter display shall operate in the Normal Mode. While powered, the meter display shall operate in the Normal Mode unless either the Alternate Mode or the Test Mode is activated.

2.14.14.2 Alternate Mode

Valued: In this mode the display shall scroll automatically, scroll manually, or freeze for up to one minute for alternate programmed displays. Activating the Alternate Mode shall not require removal of the meter cover or utilization of the meter's local communications portal.

2.14.14.3 Test Mode

Valued: In this mode the display shall scroll automatically, scroll manually, or freeze for up to one minute for test quantity displays.

2.15 Local Meter Communication – DLC

Required: A local means of communication between the meter and authorized utility personnel who locally read and/or service the meter. The port shall be the meter's only external interface for all local meter data collection, programming, administration (including resetting of demand registers), and troubleshooting. DLC will consider local communications implemented with either a radio-based (RF) interface or an optically-isolated connection through the meter glass.

2.15.1 RF Port Attributes

The requirements described in the following sub-sections are applicable only if the proposed local communications capability is implemented via a radio-based interface.

2.15.1.1 FCC Compliance

Required: Any radio-based provisions for local communication with the meter shall fully comply with all applicable FCC rules.

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2.15.1.2 Range

Valued: The meter shall support reliable communication between the meter and the external, local device over a minimum of ten (10) feet of unobstructed free space.

2.15.1.3 RF Components

Required: All meter components supporting radio-based local communications shall be mounted inside the meter cover ("under-the-glass"). Further, there shall be no physical connection between the local communications components and the meter cover.

2.15.1.4 Internal Compatibility

Required: Utilization of the radio-based local communications interface shall not in any way interfere with the proper operation of any function of the integrated AMI meter.

2.15.2 Optical Port Attributes

The requirements described in the following sub-sections are applicable only if the proposed local communications capability is implemented via an optically isolated port.

2.15.2.1 Port Location

Required: The meter's optical communication port shall be located on the front of the meter and shall be operable without removing the meter cover.

2.15.2.2 Electrical Isolation

Required: There shall be no means of electrical conductivity between the meter's electronics and the port on the meter cover.

2.16 Meter Test

The following sub-sections describe DLC's requirements for testing the electric metering capabilities of the AMI meters:

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2.16.1 Test Equipment

Required: The meter shall not require any special equipment for shop or field-testing procedures. All standard test equipment currently used at DLC may be used for testing the meter in both the field and the shop.

2.16.2 Meter Test Mode

Valued: A Test Mode that suspends normal meter operation so that consumption and demand measurements from tests are not recorded in the billing registers and/or interval data. All energy measurements and other measurements stored in the meter shall be unaffected by the Test Mode.

Required Information: Bidder shall describe how the Test Mode is activated and suspended in each type of meter proposed.

2.16.3 Consumption Indicator

Required: All meters shall have an indicator, visible from the front, indicating the rate of kilowatt-hour consumption so that a sensor can be used to count the watt-hours being registered on the meter under field test conditions.

2.16.4 Post-Test Data Dump

Required Information: For each type of meter proposed, Bidder shall describe how all registers and logs in meter memory are cleared of unwanted data when shop testing has been completed.

2.16.5 Pre-Delivery Metering Tests

Required Certification: Before delivery from the factory to DLC, the supplier shall test each new meter to certify the accuracy and proper operation of the AMI meter's electric metering capabilities. Any test device used to certify meter accuracy must itself have a clear and fully documented chain of calibration traceability that begins at a national standards laboratory. DLC's requirements for pre-shipment tests verifying the AMI capabilities of each new AMI meter are specified in Section 6.24.

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Each meter test performed by the supplier shall fulfill all ANSI C12 requirements applicable to the test. All delivered AMI meters must have passed series tests at operating or nameplate voltage under the following three conditions:

2.16.5.1 Full Load Test (FL)

When operating at the meter Test Ampere (TA) rating and unity power factor, the meter shall perform all energy, demand, and voltage measurements with an error of no more than ± 0.2% for polyphase meters and no more than ± 0.5% for single phase meters.

2.16.5.2 Light Load Test (LL)

When operating at 10% of the meter TA rating and unity power factor, the meter shall perform all energy, demand, and voltage measurements with an error of no more than ± 0.2% for polyphase meters and no more than ± 0.5% for single phase meters.

2.16.5.3 Power Factor Test (PF)

When operating at the meter Test Ampere (TA) rating and 0.5 power factor lag, the meter shall perform all energy, demand, and voltage measurements with an error of no more than ± 0.5% for both polyphase meters and single phase meters.

2.16.5.4 Meter Test Documentation

Required: For all meter tests performed, the AMI supplier shall electronically provide to DLC a certified test report file with meter attribute information and test results. A test report file shall be provided in Automated Micro Systems (AMS2000) format prior to every shipment from the meter manufacturer. The provided meter test documentation must include proof that each test device used has a chain of traceability that begins at an American national standards laboratory. Bidder's proposal shall include a sample test document for each type of meter proposed.

2.17 Meter Self-Test

Valued: Each type of meter proposed shall be capable of self-testing the condition and validity of its internal functions, its internal components, and its connected electric service. The meter's self-test capabilities shall be operable regardless of whether the meter has been programmed

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for service. Operation of the meter's self-test functions shall be fully configurable by the utility and shall not interfere with any of the meter's normal measurement and recording functions.

As a minimum, the meter shall perform applicable self-test functions for the following meter elements and service attributes:

- Service type identification
- Cross-phasing of current or voltage circuits in polyphase meters
- Incorrect polarity of current or voltage circuits
- Reverse energy flow on one or more phases
- Phase voltage deviation
- Inactive phase current
- Phase angle displacement
- Current waveform distortion
- Harmonic distortion
- Faulty site wiring
- Phase voltage diagnostics including loss of a phase voltage, incorrect phase voltage, and applicable diagnostics for components proprietary to the meter
- Phase current diagnostics including detection of current diversion and applicable diagnostics for components proprietary to the meter
- Meter measurement functions
- Meter processor
- Meter memory
- Meter power reserve

Required Information: Bidder's proposal shall fully describe the self-test capabilities of the proposed meters.

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2.17.1 Test Initiation

2.17.1.1 By Operator

Valued: The meter shall support both local and remote initiation of its self-test function by authorized installation and service personnel. Initiating the meter's self-test function locally shall not require removal of the meter cover.

2.17.1.2 By The AMI

Valued: The meter shall support remote initiation of its self-test function by programmed processes operating in the AMI Master Station.

2.17.1.3 By the Meter

Required: The meter shall support self-initiation of its self-test function in accordance with a utility-programmed schedule, or, in response to meter detection of an extended service outage.

2.17.2 Record Self-Test Results

Required: Upon completion of each self-test, the meter shall create and store in meter memory a record logging the occurrence of the self-test and its respective results. Each self-test record shall include the date & time of the self-test, the initiator of the self-test (meter process, operator, or AMI process), the appropriate test result code(s), and all self-test result data. The meter memory allocated to the meter self-test log shall accommodate at least 50 self-test records. When the meter's self-test log is full, the meter shall add new self-test records by overwriting its oldest stored self-test records.

2.17.3 Display Self-Test Results

Required: The meter shall support presentation on its display of the appropriate self-test result code(s) needed to accurately communicate the results of its most recent self-test. The presentation mode for the self-test results shall be utility-configurable to one of the following choices:

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2.17.3.1 Freeze Mode

Valued: A presentation mode that freezes the self-test result on the meter display. In this mode, an installer or service person shall be able to step the display through a sequence of self-test results using local equipment to communicate with the meter.

2.17.3.2 Ignore Mode

Valued: A presentation mode that does not display the self-test result(s).

2.17.3.3 Sequential Mode

Valued: A presentation mode that displays the self-test results as part of the programmed information sequence associated with the meter's then-effective display mode (Normal, Alternate, or Test).

2.18 Software for Local Meter Management

Required: The successful bidder shall provide functionally comprehensive, PC-compatible software supporting meter maintenance, programming, and operation by installers and/or service personnel at the meter location. DLC's requirements for software supporting remote meter management are specified in Section 6.17.

Required: Local meter management software that is compatible with the Microsoft Windows XP operating systems.

2.19 Local Meter Programming Capabilities

Required: All meter firmware and all configurable meter program settings shall be both locally and remotely accessible for review, modification, and replacement by meter installers and/or service personnel. DLC's requirements for remote meter programming capabilities are specified in Section 6.18.

2.19.1 Configuration Programming

Required: For all meters. Utility-authorized meter installers and service personnel shall be able to locally program and modify all meter configuration parameters through the meter's local communications port.

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2.19.2 Firmware Programming

Required: For all meters. Utility-authorized meter service personnel shall be able to replace meter firmware through connection with the meter's local communications port.

2.20 Meter Security

The requirements described in the following subsections apply to security functions performed by the meter:

2.20.1 Program Security

Required: At least three (3) levels of security shall be fully configurable by the utility for interrogation and management of the meter. These levels will each provide their respective users with different combinations of meter programming capability and meter information access rights.

Required Information: Bidder shall clearly and fully describe the proposed provisions for multi-level protection of meter programming and information functions.

2.20.2 Record Program Access & Changes

Required: The meter shall create and store records logging all changes and attempted changes to the meter's programming.

2.20.2.1 Recorded Information

Required: At a minimum, the log records shall include the following information:

- The date & time of the operator sign-on attempt
- Indication that the operator sign-on was attempted locally or remotely
- Indication of sign-on success or failure
- The security credentials entered by the operator
- The program changes made by the operator

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2.20.2.2 Record Retention

Valued: The meter shall have the capacity to store at least 100 program log records in meter memory. Once the allocated memory is full, the meter should add new records to the log by overwriting the oldest stored records. The meter should not delete program log records for any reason other than to make room for new records.

2.20.3 Local Communication Security

Valued: Any local communication to and from the meter shall be encrypted.

Required Information: Bidder shall explain in detail the security provisions protecting local communication with the meter.

2.20.4 Conformance with NEMA SG-AMI 1-2009

Required Information: For each type of meter proposed, Bidder shall describe how the meter's conformance with the NEMA SG-AMI 1–2009 standard supports multi-level protection of locally accessed meter programming, information, and control functions.

2.21 Meter Mechanical & Environmental Requirements

The requirements in this section apply to all elements of the integrated meter assembly supporting metering functions, AMI functions, and service switching.

2.21.1 General

Required: The meter shall not pose any danger when operating under rated conditions in its normal working position. Particular attention shall be paid to the following:

- personnel protection against electric shock
- personnel and property protection against effects of excessive temperature
- protection against penetration of solid objects, dust or water
- protection against corrosion

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2.21.2 Mechanical Shock

Required: Meters shall remain fully functional and service-ready following a 4 foot drop to concrete.

Required Information: Bidder shall supply documentation of the shock tolerance of proposed meters.

2.21.3 Temperature/Humidity

Required: Meters shall operate reliably and accurately during coincident conditions of sustained maximum solar exposure and maximum rated load current over the following ambient temperature and humidity ranges:

- Temperature range: –20 to +85 ºC
- Relative Humidity: 0 to 95 % non-condensing

2.21.4 Drainage & Ventilation

Required: Meters shall include provisions for effective drainage and ventilation of the meter interior under all weather conditions typical in DLC's service area. Such provisions shall be implemented in a manner that prevents dirt, insects, or other potential contaminants from entering the meter interior.

2.21.5 Solar Radiation

Required: The functions and accuracy of the meter shall not be impaired; the appearance of the meter shall not be altered, and the legibility of the meter nameplate and other labels shall not be reduced due to daily exposure to direct solar radiation throughout the service life of the meter.

2.21.6 Meter Dimensions

Required: The meter's physical dimensions shall be in accordance with all current and applicable ANSI C.12 standards. In addition to ANSI C.12 compliance, the meter's depth shall not exceed six (6) inches.

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2.21.7 Meter Mounting

Required: The meter shall be designed for mounting outdoors in a meter socket that conforms to ANSI C12.7-2005.

2.21.8 Meter Cover

2.21.8.1 Meter Seal

Required: Meters shall be visibly sealed in such a way that the internal parts of the meter are accessible only after irreversibly breaking the seal.

2.21.8.2 Cover-Socket Attachment

Required: The method of securing the meter to the meter socket shall be with either a sealing ring or other high-security sealing device or method.

2.21.9 Meter Color & Finish

2.21.9.1 Opaque Housings & Structural Elements

Required: Opaque housings and structural elements of electric meters and/or devices or apparatus installed at or proximate to the electric meter shall be in matte or semi-gloss gray finish.

2.21.9.2 Meter Faces

Required: Electric meter faces will follow prevailing practice; white with clearly legible text, numbers, symbols, and barcode in black.

2.21.9.3 Visible Metal Components

Required: Visible metal components, such as stainless steel meter clamps or rings, may be supplied in a natural finish and need not be painted except where protection from the elements is necessary.

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2.21.10 Meter Nameplate & Labeling

Meters and associated AMI elements, if separable, shall each comply with the following labeling requirements:

2.21.10.1 Physical Durability

Required: Meter nameplates and other labeling shall remain clear and distinct for the life of the product in the environments stated.

2.21.10.2 ID Information

Required: The meter nameplate shall include all applicable meter identification information. This information shall include the manufacturer's serial number, manufacturing date, etc.

2.21.10.3 Nameplate Physical Attributes

Required: *The meter nameplate shall have the following physical attributes:*

- Located on the front of the meter
- No attachment to the removable meter cover
- Readable when the meter is installed in the meter socket

2.21.10.4 Bar Code

Required: Bar codes imprinted on meters shall comply with Code 39 standard (DLC shall provide the data layout for the bar code).

2.21.10.5 Meter Numbers

Required: Each meter shall have a unique meter number.

2.21.10.6 AMI Module Numbers – Congruent

Valued: Communication modules that are integral to a meter but have a separate identification number than the host meter should have the same number as the host meter.

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2.21.10.7 AMI Module Numbers – Different

Required: Communication modules that are integral to a meter and have a different identification number than the host meter shall be identified in a data file, provided by the AMI supplier, that establishes the correspondence of meter numbers to communication module numbers.

2.21.11 Demand Reset

Required: If the proposed meter features a device mounted on the meter cover for locally resetting the meter's demand register(s), then the demand reset device shall accommodate a standard utility seal and shall remain in place with friction if not sealed.

2.21.12 External Components

Required Information: Bidder shall describe in detail any proposed customer-site components that are external to the meter—such as antennas, gateways, switches, amplifiers, control devices, etc.—including any specification pertaining to their installation and use.

2.21.13 Packaging for Meter Shipment

Required: Bidder shall package meters for shipping in accordance with the following instructions:

- Meters shall be shipped in boxes of four on standard pallets for material handling equipment
- All pallets shall include a shipping label having a unique identifier code that is bar coded on the label (Code 39 format).
- Boxes of meters shall include a label having a unique box identifier code, individual meter numbers in the box, and pallet identifier code all of which is bar coded on the box label (Code 39 format).

3 Service Switch

The following sub-sections describe DLC's requirements for implementing and operating service connect/disconnect switches with its AMI meters.

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3.1 Switch States

Required: Service switches shall have two and only two valid states:

- Closed (service "on")
- Open (service "off")

3.1.1 Local Switch State Indicator

Required: An indicator of the service switch's current state (open or closed) shall be easily recognized, readily interpreted, and clearly visible to an observer viewing the front of the meter.

3.2 Customer-Side Voltage Sensing

Required: All meters equipped with a service switch shall continuously monitor the service voltage on the customer side of the switch. The customer-side voltage shall be monitored regardless of switch state.

3.3 Switch Control

3.3.1 AMI- Controlled Operation

Required: The proposed AMI shall support remote monitoring and control of meter-attached service switches. Remote switch control commands and switch status requests will be initiated by both process-driven and operator-initiated functions operating either in or through the AMI Master Station (i.e. CIS, MDMS, etc.).

3.3.1.1 On-Demand Customer-Side Voltage Reporting

Required: DLC operators and automated processes (operating in or through the AMI Master Station) at any time before or after switch operation shall be able to request and receive a real-time report of the voltage sensed on the customer side of a service switch.

3.3.1.2 Switch Control Protective Control Logic

Required: A switch closure command from any remote source shall cause protective control logic to check the voltage on the customer side of an open service switch. If voltage is detected, and the voltage exceeds a utility-configurable protection threshold setting, then the protective

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control logic shall block switch closure, record the event, and immediately send a message reporting the event to the AMI Master Station (and to the remote command source if it is other than the AMI Master Station). If no voltage is detected, or detected voltage does not exceed the protection threshold, then the protective control logic shall allow switch closure. The AMI operator shall be able to override the protective control logic in cases involving generation or other supply resources at customer premises.

Valued: DLC will value AMI meters featuring protective control logic that prevents an AMI-initiated service switch close operation when a dead short is detected on the load side of the service switch.

3.3.2 Meter-Controlled Operation

Required: Service switches shall be controllable by internal functions of the meter.

3.3.2.1 Load Limiting Function

Valued: Meters equipped with service switches should support a "load-limiting" function as specified in Section 2.12.

3.3.2.2 Pre-Payment Function

Valued: Meters equipped with service switches should support customer pre-payment functions as specified in Section 2.12.

3.3.2.3 Meter –Controlled Operation Protective Control Logic

Required: A meter-initiated switch closure command shall cause protective control logic to check the voltage on the customer side of an open service switch. If voltage is detected, and the voltage exceeds a utility configurable protection threshold setting, then the protective control logic shall block switch closure, record the event, and immediately send a message reporting the event to the AMI Master Station. If no voltage is detected, or detected voltage does not exceed the protection threshold, then the protective control logic shall allow switch closure.

Valued: DLC will value AMI meters featuring protective control logic that prevents a meter-initiated service switch close operation when a dead short is detected on the load side of the service switch.

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3.3.3 Local Control

3.3.3.1 By Installers and Service Personnel

Required: Means shall be provided for authorized meter installers and service personnel to locally open or close the service switch at will.

3.3.3.2 Local Control Protective Control Logic

Required: A local, operator-initiated, switch closure command shall cause protective control logic to check the voltage on the customer side of an open service switch. If voltage is detected, and the voltage exceeds a utility configurable protection threshold setting, then the protective control logic shall block switch closure, record the event, immediately send a message reporting the event to the AMI Master Station, and present a corresponding alert on the meter display. If no voltage is detected, or detected voltage does not exceed the protection threshold, then the protective control logic shall allow switch closure. The local operator shall be able to override the protective control logic in cases involving generation or other supply resources at customer premises.

Valued: DLC will value an AMI meter featuring protective control logic that prevents a manually-initiated service switch close operation when a dead short is detected on the load side of the service switch.

3.3.3.3 For Net Metered Accounts

Valued: For net-metered accounts, if the meter receives a command to close its open service switch, and if voltage is detected on the customer side of the service switch, then the meter should ensure that the line-side and customer-side voltages are in-phase prior to closing the service-switch. If not in phase, then the meter should block switch closure, record the event, and immediately send a message reporting the event to the AMI Master Station.

3.4 Record Switch Operation Events

valued: The meter shall create and store switch operation records for periodic collection by the AMI. Upon execution of each operation command, the meter shall record the following information:

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- The date & time of the operation with one second resolution
- The type of operation command (open/close)
- The identity of the operation initiator (meter process, operator, or AMI process)
- The detected switch state prior to execution of the operation command
- The detected switch state after execution of the operation command
- The customer-side voltage immediately prior to execution of the operation command
- The customer-side voltage immediately after execution of the operation command
- The total kWh register value immediately after an open operation
- The total kWh register value immediately before a close operation

The memory allocated to the meter's switch operation log shall accommodate at least 50 operation records. When the log is full, the meter shall add new records by overwriting its oldest stored records.

3.5 Report Switch Operation Events

Required: Immediately following execution of each switch operation command (open or close), the meter shall send to the AMI Master Station a message reporting the occurrence and results of the operation command. The switch operation report message shall include:

- The date & time of the operation with one second resolution
- The type of operation command (open/close)
- The identity of the operation command initiator (meter process, operator, or AMI process)
- Indication that execution of the operation was either successful or unsuccessful
- The detected switch state prior to execution of the operation command
- The detected switch state after execution of the operation command
- The detected customer-side voltage prior to execution of the operation command
- The detected customer-side voltage after execution of the operation command

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- The total kWh register value immediately after an open operation
- The total kWh register value immediately before a close operation

3.6 Prevent Uncontrolled Operation

Required Information: Bidder shall describe the provisions, if any, in the proposed AMI meters that prevent the service switch from repeatedly cycling open and closed.

3.7 Switch Location

Required: Service switches in single phase meters shall be integral to the meter, that is, located "under-glass". The complete AMI meter assembly, including the internal service switch, shall not exceed 6 inches from base to outer cover.

3.8 Switch Load Ratings

Required: Continuous operation of a service switch at its host meter's nameplate maximum load rating must be sustainable at the meter's maximum rated ambient temperature without causing damage to, or malfunction of, the service switch or any other part of the AMI meter.

3.9 Switch Operation Cycles Rating

Required Information: Bidder shall specify the number of operation cycles (open/close) that the proposed service switch is rated to perform at full rated load.

3.10 Arming Feature

Required Information: Bidder shall describe the available "arming" features, if any, for the service switches in the proposed AMI meters.

4 Customer Premises Devices

4.1 Device Functions

The scope of this solicitation does not include customer premises devices other than the AMI meters specified herein. Nonetheless, DLC fully expects future deployment of customer premises devices for a variety of purposes including (but not limited to):

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- direct load control (i.e. HVAC, water heaters, pumps, etc.)
- demand response
- demand limiting
- pre-paid service
- sub-metering
- supply management (i.e. Photovoltaic arrays, wind generators, PHEVs, etc.)

4.2 Device Types

The following types of customer premises devices (and others) will enable the above listed functions and will require some form of two-way communication supporting remote control and data collection by the AMI:

- intelligent thermostats
- display devices
- customer command and data entry devices
- electrical sensors
- environmental sensors
- mechanical sensors
- switches
- motor controls

4.3 Device Descriptions

Required Information: Bidder shall clearly and fully describe all existing and/or planned customer premises devices that will be fully compatible with the proposed AMI. Bidder's description for each type of device shall include:

- Communication method(s) and protocol(s)
- Physical configuration and appearance
- Installation requirements
- Physical specifications (dimensions, weight)

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- Environmental tolerances
- Electrical specifications
- Information display characteristics and operation, if any
- Means of customer control and data entry, if any
- Supported control logic alternatives, if any
- Functional configuration and management attributes
- Development status and schedule, if the device is not yet in production
- Optional pricing information

5 Distribution Devices

DLC is soliciting AMI at this time to support its metering and customer interaction objectives. Automation for managing electric distribution is a future objective.

Required: The proposed AMI shall enable DLC to readily implement remote monitoring and control of distribution capacitors, switches (reclosers, sectionalizers), transformer tap changers, and other similar devices that actively manage distribution infrastructure.

Required Information: Bidder shall list and describe in detail the capabilities of the proposed AMI to monitor and control distribution devices such as capacitors, switches (reclosers, sectionalizers, etc.), transformer tap changers, and other similar devices that actively manage distribution infrastructure, and to perform other smart grid functions. Bidder shall identify each such capability in one of two categories, as follows:

- Commercially available, that is, fully developed and tested, in commercial production, available for purchase, and in service at utilities at this time.
- Planned, that is, conceptual or preliminary designs are completed and implementation and testing are planned or commenced, but not yet in production or in commercial use by utilities.

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6 AMI Requirements

This section describes DLC's requirements for the capabilities and attributes of the proposed AMI Network and AMI Master Station.

6.1 Communicate and Interact With Endpoint Devices

For the purposes of this RFP, AMI endpoints shall encompass electric AMI meters/service-switches, customer premises devices, and distribution automation devices. Communication between the AMI Master Station and an AMI endpoint may be accomplished via any element or combination of elements of the proposed AMI plus communications networks or media provided by DLC or a 3rd party.

Required: The AMI System must provide 100% coverage to all meters, with performance sufficient to meet all requirements of this RFP. Each vendor bidder shall provide a detailed description of their propagation analysis tools/applications used to determine the adequate infrastructure required to meet this requirement with an adequate amount of infrastructure redundancy. Additionally, the following must also be provided as backup information and will be evaluated by the Duquesne Light AMI proposal evaluation team:

- All propagation study parameters
- Expected network load model used
- Capacity model used
- Coverage/topology model used
- Propagation model and the infrastructure locations/map

Required: The Bidders AMI system design shall be based on all available data provided to them by DLC and Bidder shall explicitly guarantee that the proposed AMI system, provided at the proposed cost, will meet the performance requirements stated in this RFP and serve 100% of Duquesne Light customer meters. This Requirement will be heavily weighted in the proposal evaluation process.

Required Information: Bidder shall clearly and fully describe any reliance on DLC or 3rd party communication networks or media needed to reach an AMI endpoint device.

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Required Information: DLC is required to provide AMI metering to customers that chose to install such a meter at their home, whether 100% infrastructure is in place or not. Bidder shall describe how their proposed solution will enable this one-off installation to be connected to the AMI network.

6.1.1 Customer Premise Device

The range of functions and types of customer premises devices supported are described in Section 4, titled "Customer Premises Devices".

Required: The proposed AMI shall readily support two-way communications between the AMI Master Station and ZigBee-enabled customer premises devices. At the time of implementation, the proposed AMI's capabilities for communicating with ZigBee-enabled devices must fully support the then-current versions of the ZigBee standard and the Smart Energy Profile.

Required: If Bidder proposes to employ the AMI meters for communicating with customer premises devices, then all ANSI Form 1S, 2S, and 12S meters proposed must be ZigBee-enabled.

Valued: If Bidder proposes to employ the AMI meters for communicating with customer premises devices, then DLC will value ZigBee support in AMI meters provided in other ANSI meter forms (i.e. other than Forms 1S, 2S, and 12S).

Required Information: Bidder shall clearly and fully describe the proposed AMI's means and methods for supporting two communications between the AMI Master Station and ZigBee-enabled customer premises devices. Bidder shall accurately portray the degree of conformance to applicable standards, and the conditions under which the meters will be interoperable with available devices that customers may acquire for their own purposes.

6.1.2 Endpoint Group Support

An endpoint group is a utility-configured set of two or more endpoint devices that are logically grouped together for one or more functional purposes.

Valued: The AMI Network shall quickly and efficiently convey a group command message (data request, control initiation, device management) from the AMI Master Station to all AMI endpoints (meters and/or other device types) in a predefined endpoint group. Likewise, the AMI Network

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shall be able to convey a response message from each group endpoint to the command initiator. The supported sizes of configurable endpoint groups shall range from a group of two endpoints up to all of the endpoints in the system. Further, each endpoint device shall be configurable for concurrent membership in multiple endpoint groups.

Required Information: Bidder shall clearly and fully describe the provisions in the proposed AMI supporting configuration of, and interoperation with, predefined endpoint groups.

6.2 Collect Meter Data

For the purposes of this RFP, meter data collection comprises organizing and moving real-time and/or stored data from AMI meters to the AMI Master Station. All capabilities proposed shall apply to all proposed single-phase and polyphase AMI meters.

DLC's requirements for data recording by AMI meters are specified in Section 2 titled "Metering Requirements". DLC's requirements for timely delivery of all types of meter data are specified in Section 6.23.2 titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the required meter data collection capabilities described in the following subsections.

6.2.1 Support for All Data Types

Required: The proposed AMI shall support timely and reliable collection at the AMI Master Station of all types of meter data from all meters provided (measurements, control events, self-test data & alerts, service continuity data & alerts, power quality data & alerts, programming events, configuration settings, etc.).

6.2.2 Scheduled & Unscheduled Data Collection

Required: All forms of required meter data shall be available for collection in response to both scheduled (automatic) and unscheduled (operator-initiated) processes operating in the meter, the AMI Network, or the AMI Master Station.

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6.2.3 Collect All Data or Unread Data

Required: For each type of meter data collected, the proposed AMI shall allow utility-configurable collection of all the data currently stored in the meter, or, the previously uncollected data only.

6.3 Remote Demand Register Reset

Required: All electric meters registering demand data shall support both scheduled and unscheduled remote reset (to zero) of the registered demand values.

6.4 Service Switch Support

Required: The proposed AMI shall support all AMI functions specified in Section 33, titled "Service Switch". Formatte

6.5 Service Continuity Functions

Required: The proposed AMI shall support utility-industry best practices for effective monitoring, analyses, and management of its customers' service continuity. All capabilities proposed shall apply to all proposed single-phase and polyphase meters.

DLC's requirements for service continuity monitoring by AMI meters are specified in Section 2.9, titled "Service Continuity Functions". DLC's requirements for timely delivery of all data types, including service continuity report messages, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the required and valued service continuity capabilities described in the following subsections.

6.5.1 Report Sustained Supply Voltage Interruptions

Required: For each sustained supply voltage interruption detected, the AMI meter shall immediately transmit a message reporting the sustained interruption to the AMI Master Station. As a minimum, each message reporting a sustained supply voltage interruption shall include the following information:

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- The meter's identification number
- The message type
- The date & time when the interruption began

Valued: DLC will value the following additional information in each message reporting a sustained supply voltage interruption:

- The interrupted phase(s) (for polyphase meters)
- The date & time when the meter sent the message

6.5.2 Report Excessive Supply Voltage Interruptions

Valued: For each detected occurrence of excessive supply voltage interruptions, the AMI meter should immediately transmit a message reporting the excessive interruptions to the AMI Master Station. As a minimum, each message reporting excessive supply voltage interruptions should include the following information:

- The meter's identification number
- The message type
- The date & time when the meter sent the message

6.5.3 Report Sustained Supply Voltage Restorations

Required: For each sustained supply voltage restoration detected, the AMI meter shall immediately transmit a message reporting the restoration to the AMI Master Station. As a minimum, each message reporting a sustained restoration shall include the following information:

- The meter's identification number
- The message type
- The date & time when the restoration began

Valued: DLC will value the following additional information in each message reporting a sustained supply voltage restoration:

- The restored phase(s) (for polyphase meters)
- The date & time when the meter sent the message

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6.5.4 Record Service Continuity Report Messages

Required: The AMI Master Station shall create and store a record of each service continuity report message received. The record of each received message shall contain all of the information delivered in the message plus the date & time when the message was received.

6.5.5 Scheduled Service Continuity Data Collection

Required: DLC operators and automated processes (operating in or through the AMI Master Station) shall be able to configure and initiate scheduled collection of stored and/or real-time service continuity data from AMI meters. Proposed provisions shall support independent scheduling of both one-time and recurring collection events from both individual AMI meters and groups of AMI meters.

6.5.6 Unscheduled Service Continuity Data Collection

Required: DLC operators and automated processes (operating in or through the AMI Master Station) shall be able to configure and initiate unscheduled (on-demand) collection of stored and/or real-time service continuity data (i.e. supply voltage interruption records, etc.) from both individual AMI meters and groups of AMI meters.

6.5.7 Remotely Administer Service Continuity Functions

Required: DLC operators and automated processes (operating in or through the AMI Master Station) shall be able to remotely administer the meter program settings that govern the AMI meters' service continuity functions (i.e. supply voltage thresholds, time thresholds, group memberships, etc.).

6.5.8 Test Service Continuity Reporting

Valued: DLC will value a proposed AMI that supports configurable simulations of service continuity reporting over the AMI Network. DLC operators and automated processes (operating in or through the AMI Master Station) should be able to configure and initiate scheduled transmission of simulated interruption and restoration report messages from AMI meters. Proposed provisions should support independent scheduling of both one-time and recurring simulation events both individually for single meters and concurrently for one or more groups of

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AMI meter endpoints. At the time of a scheduled simulation, each AMI meter involved in the simulation should transmit a test message reporting a simulated interruption or restoration to the AMI Master Station.

As a minimum, each test message reporting a simulated interruption should include the following information:

- The meter's identification number
- The message type – in this case, a simulated interruption report
- The date & time when the meter sent the test message

Similarly, each test message reporting a simulated restoration should include the following information:

- The meter's identification number
- The message type – in this case, a simulated restoration report
- The date & time when the meter sent the test message

6.5.9 Record Service Continuity Test Report Messages

Valued: The AMI meter should create and store a record of each service continuity test report message that it sends to the AMI Master Station (see Section 6.5.8 above). The record of each test message sent should contain all of the information sent in the message, including the date & time when the meter sent the message.

Likewise, the AMI Master Station should create and store a record of each service continuity test report message received (see Section 6.5.8 above). The record of each received test message should contain all of the information received in the message plus the date & time when the message was received.

6.6 Power Quality Functions

Valued: The proposed AMI shall support utility-industry best practices for effective monitoring, analyses, and management of its customers' power quality. All capabilities proposed shall apply to all proposed single-phase and polyphase meters. DLC's requirements for power quality monitoring by AMI meters are specified in Section 2.10, titled "Power Quality Functions". DLC's

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requirements for timely delivery of all data types, including power quality report messages, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the required and valued power quality function described in the following subsections.

6.6.1 Report Sustained Power Quality Exceptions

Valued: For each sustained power quality exception detected, the AMI meter should immediately transmit a message reporting the power quality exception to the AMI Master Station. As a minimum, each message reporting a sustained power quality exception should include the following information:

- The meter's identification number
- The type of power quality exception (low voltage, transient, frequency deviation, harmonic distortion, etc.)
- The date & time when the power quality exception began
- The phase(s) affected (for polyphase meters)
- The date & time when the message was sent.

6.6.2 Report Excessive Power Quality Exceptions

Valued: For each detected occurrence of excessive power quality exceptions, the AMI meter should immediately transmit a message reporting the excessive power quality exceptions to the AMI Master Station. As a minimum, each message reporting excessive power quality exceptions should include the following information:

- The meter's identification number
- The type of power quality exception (low voltage, transient, frequency deviation, harmonic distortion, etc.)
- The date & time when the power quality exception first occurred
- The phase(s) affected (for polyphase meters)
- The date & time when the message was sent

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6.6.3 Record Power Quality Report Messages

Valued: The AMI Master Station should create and store a record of each power quality report message received. The record of each received message should contain all of the information delivered in the message plus the date & time when the message was received.

6.6.4 Scheduled Power Quality Data Collection

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to configure and initiate scheduled collection of stored and/or real-time power quality data from AMI meters. Proposed provisions should support the following:

Data collection schedules that are separately configurable by the utility for each type of power quality measurement performed by the AMI meter (i.e. voltage, frequency, power factor, harmonics, etc.)

Configuration of individual schedules that each concurrently collect recorded and/or real-time data from multiple types of power quality measurement performed by the AMI meter

Independent scheduling of both one-time and recurring collection events

6.6.5 Unscheduled Power Quality Data Collection

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to configure and initiate unscheduled (on-demand) collection of stored and/or real-time power quality data from AMI meters. Proposed provisions should support the following:

- Unscheduled collection events that are separately configurable for each type of power quality measurement performed by the AMI meters
- Configuration and initiation of single collection events that each concurrently collect recorded and/or real-time data from multiple types of power quality measurement performed by the AMI meter

6.6.6 Remotely Administer Power Quality Functions

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to remotely administer the meter program settings that govern the power

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quality monitoring functions performed by AMI meters (i.e. types of measurement, exception thresholds, time thresholds, group memberships, etc.).

6.7 Load Control Functions

Required: An AMI capable of supporting customer load control functions whereby load control commands and device data are conveyed between the AMI Master Station and load control devices by way of intermediate data/command routers. The intermediate router may be an AMI meter, or it may be some other non-meter element of the AMI Network.

DLC's requirements for customer premises devices supporting load control are specified in Section 4, titled "Customer Premise Device". DLC's requirements for timely delivery of all data types, including load control data and command messages, are specified in Section 6.23.2.7.

Required Information: Clearly and fully describe the means and methods employed by the proposed AMI for supporting the required and valued load control capabilities described in the following subsections. For each load control capability proposed, Bidder shall describe:

- the communicating load control device(s) employed
- the communication path(s) used
- the communication protocol(s)
- the standard(s) applied
- the information provided
- the latency of that information

6.7.1 Interoperate with Load Control Devices

Required: The proposed AMI shall readily interoperate with various types of customer premises load control devices, including but not limited to the devices described in Section 4, titled "Customer Premises Devices".

The device functions supported by the proposed AMI shall, at a minimum include:

- On/off operations
- Report on/off status
- Report measurement data (i.e. kW, temperature)

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Valued: DLC will value AMI support for the following additional device functions:

- Increase/decrease/reset control level settings
- Report control level settings
- Increase/decrease/reset control threshold settings
- Report control threshold settings

6.7.2 Scheduled Load Control Functions

Required: *DLC operators and automated processes (operating in or through the AMI Master* Station) shall be able to configure and initiate scheduled load control device functions and scheduled collection of stored and/or real-time load control data from load control devices. Proposed AMI provisions shall support the following:

- Device operation and data collection schedules that are separately configurable by the utility for each controlled load at a premise
- Configuration of individual schedules that can each concurrently control loads and collect recorded and/or real-time data from multiple load control devices at a premise
- Independent scheduling of both one-time and recurring control and/or data collection events

6.7.3 Unscheduled Load Control Functions

Required: DLC operators and automated processes (operating in or through the AMI Master Station) shall be able to configure and initiate unscheduled (on-demand) load control device functions and unscheduled collection of stored and/or real-time load control data from load control accounts. Proposed provisions shall support the following:

- Unscheduled collection events that are separately configurable by the utility for each controlled load at a premises
- Configuration and initiation of one-time processes that can concurrently control loads and collect stored and/or real-time data from multiple load control devices at a premises

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6.7.4 Record Load Control Operations

Required: Following operation of a load control function, the AMI shall record the following information for each control action:

- Load identification
- Type of control function (on, off, increase setting, decrease setting, reset to default setting, measure controlled quantity, etc.)
- The date & time of the control event (one second resolution)

Valued: DLC will value a proposed AMI that is capable of recording the following information following operation of a load control function

- The total premises kW demand immediately prior to the function
- The total premises kW demand immediately after the function

6.7.5 Remotely Administer Load Control Functions

Required: DLC operators and automated processes (operating in or through the AMI Master Station) shall be able to remotely administer the AMI device program settings that govern the load control functions at load control premises (i.e. device types, device identification, operating times, level settings, measurement times, etc.).

6.8 Sub-Metering Support

DLC's requirements for metering capabilities supporting sub-metering are specified in Section 2.8, titled "Sub-Metering". As described in Section 2.8, sub-metering at customer premises comprises measuring and recording the power flow, energy consumption, and energy production of discrete customer loads and supply sources, including: water heaters, air conditioners, pool/spa pumps, irrigation pumps, wind generators, plug-in hybrid electric vehicles (PHEVs), and solar photovoltaic arrays.

Valued: An AMI capable of collecting sub-metering data from customers' premises and of supporting remote administration of the customer premises sub-metering capabilities.

If and when DLC utilizes sub-metering, the associated control messages and measurement data should be conveyed between the AMI Master Station and sub-metering devices by way of

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intermediate data/command routers. The intermediate router may be implemented as a function of the AMI meter, or it may be implemented as a function of some other, non-meter element of the AMI Network. DLC's requirements for timely delivery of all data types, including sub-metering data, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Clearly and fully describe the means and methods employed by the proposed AMI for supporting the sub-metering capabilities described in the following subsections. For each sub-metering capability proposed, Bidder shall describe:

- The communicating load control device(s) employed
- The communication path(s) used
- The communication protocol(s)
- The standard(s) applied
- The information provided
- The latency of that information

6.8.1 Scheduled Sub-Metering Data Collection

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to configure and initiate scheduled collection of stored and/or real-time sub-metering data from one or more sub-metered premises. If proposed, AMI provisions for sub-metering should support the following:

- Data collection schedules that are separately configurable by the utility for each sub-metered device at a sub-metered premise
- Configuration of individual schedules that each concurrently collect recorded and/or real-time data from multiple devices at a sub-metered premise
- Independent scheduling of both one-time and recurring collection events

6.8.2 Unscheduled Sub-Metering Data Collection

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to configure and initiate unscheduled (on-demand) collection of stored

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and/or real-time sub-metering data from one or more sub-metered premises. If proposed, AMI provisions for sub-metering should support the following:

- Unscheduled collection events that are separately configurable by the utility for each sub-metered device at a sub-metered premise
- Configuration and initiation of single collection events that each concurrently collect recorded and/or real-time data from multiple devices at a sub-metered premise

6.8.3 Remotely Administer Sub-Metering Functions

Valued: DLC operators and automated processes (operating in or through the AMI Master Station) should be able to remotely administer the AMI device program settings that govern the sub-metering functions at sub-metered premises (i.e. device types, device identification, measured quantities, intervals, etc.).

6.9 Pre-Payment Support

Valued: DLC does not currently plan to implement pre-paid electric service for any of its residential or small commercial electric customers. Nonetheless, all AMI meters equipped with a service switch (see Section 3 titled "Service Switch") should be provided with AMI capabilities sufficient to support pre-paid electric service. Meter capabilities valued by DLC for pre-payment support are described in Section 2.12, titled "Support Pre-Paid Service".

If implemented by DLC in the future, the pre-paid service will utilize the AMI meter's service switch, a customer display device that can reside within the customer premise, and several means of energy sales that can be readily accessed by customers. The display shall be capable of showing consumption and account value information (both in terms of kWh and cost) typical of the current generation of prepayment systems.

Required Information: Please clearly and fully describe the proposed AMI's capabilities for supporting pre-paid electric services. Bidder's description should include:

- The means used for customer communications
- Measurement and event data collection
- Service configuration and management capabilities

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- The method used for pre-paid energy sales
- The infrastructure supporting pre-paid energy sales

6.10 Automated Load Limiting Support

Valued: DLC does not currently plan to implement automated load limiting for any of its residential or small commercial electric customers. Nonetheless, all AMI meters equipped with a service switch (see Section 3, titled "Service Switch") should be provided with capabilities sufficient to support limiting total customer premises load. Meter capabilities valued by DLC for load limiting support are described in Section 2.12 titled "Support Pre-Paid Service".

If implemented by DLC in the future, the load limiting function shall employ the meter's service switch and, possibly, a customer display device that can reside within the customer premise. The display device shall be capable of presenting the customer's total premise load and the customer's load limit.

Required Information: Please clearly and fully describe the proposed AMI's capabilities for supporting load limiting. Bidder's description should include:

- The means used for customer communications
- Measurement and event data collection
- Load limiting function configuration and management capabilities

6.11 Consumption Information Service to Customers

Required: An AMI capable of delivering and presenting customer-specific information (consumption, demand, cost, and pricing) to customers via communicating display devices in the customers' premises.

Required Information: Clearly and fully describe the means and methods employed by the proposed AMI for providing consumption information to customers. Bidder's description shall include:

- the communicating display device(s) employed
- the communication path(s) used
- the communication protocol(s)

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- the standard(s) applied
- the information provided
- the latency of that information

6.12 Automatic Self-Registration by Endpoint Devices

Required: Automatic self-registration by endpoint devices. When installed in the field, each AMI endpoint device shall automatically attempt to establish a connection to the AMI Network, and, if a connection is achieved, register its presence, identity, and status with the AMI Network and AMI Master Station. This "registration" must be based on proper security credentials to ensure that "foreign devices" or malicious hackers cannot cause exceptions or false conditions.

Required Information: Bidder shall clearly and fully describe the means and methods used for automatically registering AMI end-point devices.

6.13 Meter Self-Test Reporting

Valued: The AMI should support timely delivery of messages from AMI meters to the AMI Master Station reporting the occurrence and results of meter self-tests. DLC's specifications for self-testing by AMI meters are described in Section 2.17, titled "Meter Self-Test". DLC's requirements for timely delivery of all data types, including meter self-test data, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the meter self-test capabilities described in the following subsections.

6.13.1 Operator-Initiated Tests

Valued: Immediately following completion of an operator-initiated self-test, the meter should send to the AMI Master Station a test report message describing the meter's identification, the date & time of the test, the identity of the operator who initiated the test, the appropriate test result code(s), and all test result data.

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6.13.2 AMI-Initiated Tests

Valued: Immediately following completion of an AMI-initiated self-test, the meter should send to the AMI Master Station a test report message describing the meter's identification, the date & time of the test, the identity of the AMI process that initiated the test, the appropriate test result code(s), and all test result data.

6.13.3 Meter-Initiated Tests

Valued: In the event when a meter-initiated self-test detects a meter or service problem, the meter should immediately send to the AMI Master Station a test report message describing the meter's identification, the date & time of the test, the identity of the AMI process that initiated the test, the appropriate test result code(s), and all test result data.

6.14 Manage and Report Tamper Conditions

DLC's specifications for tamper detection and recording by AMI meters are described in Section 2.11.1, titled "Tamper Functions". DLC's requirements for timely delivery of all data types, including meter tamper messages, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the tamper reporting capabilities described in the following subsections.

6.14.1 Remotely Manage Configurable Tamper Functions

Valued: Authorized DLC personnel and/or processes operating in the AMI Master Station should be able to remotely configure the AMI meters' programmable settings for detecting and reporting tamper conditions. Upon completion of the configuration change, the meter should immediately transmit a message reporting the configuration change to the AMI Master Station. As a minimum, the information contained in change report message should include:

- the meter's identification number
- the type of configuration change
- the date & time when the change was implemented
- the identity of the user or process that implemented the change

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6.14.2 Deliver Tamper Notification Messages

Valued: Upon the beginning or ending of each tamper condition detected, the meter should immediately transmit a message reporting the beginning/ending of the tamper condition to the AMI Master Station. As a minimum, the information contained in each tamper report message should include:

- the meter's identification number
- the type of tamper condition (tilt, inversion, magnetic field, etc.)
- the phase(s) affected (for polyphase meters)
- indication that the message represents either the beginning or ending of the tamper condition
- the date & time when the detected tamper condition began or ended

6.15 Report Demand Threshold Events

DLC's specifications for demand threshold detection and recording by AMI meters are described in Section 2.7.2, titled "Demand Thresholds". DLC's requirements for timely delivery of all data types, including demand threshold messages, are specified in Section 6.23.2, titled "Data Latency".

Required Information: Please describe clearly and fully the means and methods employed by the proposed AMI for supporting the demand threshold management and reporting capabilities described in the following subsections.

6.15.1 Remotely Manage Configurable Demand Threshold Functions

Valued: Authorized DLC personnel and processes operating in the AMI Master Station should be able to remotely configure the AMI meters' programmable settings for detecting and reporting demand threshold conditions. Upon completion of the configuration change, the meter should immediately transmit a message reporting the configuration change to the AMI Master Station. As a minimum, the information contained in each change report message should include:

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- the meter's identification number
- the type of configuration change
- the date & time when the change was implemented
- the identity of the user or process that implemented the change

6.15.2 Deliver Demand Threshold Notification Messages

Valued: For each demand threshold event detected, the meter should immediately transmit a message reporting the event to the AMI Master Station. As a minimum, the information in each message should include:

- the meter's identification number
- the type of demand quantity
- the threshold value applied to the demand quantity
- indication that the demand quantity either increased above or decreased below its threshold
- and the date & time when the event occurred

6.16 Data Retention

Required: The AMI, whether at the meters or elsewhere in the system infrastructure, shall retain any meter data not yet collected and accepted at the AMI Master Station in accordance with utility-configured data collection schedules. This data retention shall be unaffected by power interruptions or failure of any element of the communications infrastructure.

The AMI's data retention capacity shall be sufficient for storing the amount of data generated by no less than 45 days of meter data recording. That is, regardless of storage location, the stored meter data shall not be overwritten by newly recorded data until at least 45 days after the stored data are recorded. This provides the ability to "re-acquire" data that may have been corrupted or incomplete when originally received at the AMI Master Station.

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6.17 Software for Remote Meter Management

Required: The successful bidder shall provide functionally comprehensive, PC-compatible software supporting AMI meter testing, programming, and operation by authorized utility personnel at locations that are remote from the meter. Detailed requirements for software supporting local meter management are specified in Section 2.18, titled "Software for Local Meter Management".

Software proposed by Bidder for remote meter management shall support the requirements described in the following subsections:

6.17.1 AMI Network Compatibility

Required: The software supporting remote meter management shall perform real-time communication with meters via the AMI network.

6.17.2 Group Management

Required: The remote meter management software shall enable simultaneous management of group attributes for groups of multiple meters (e.g. interval length changes for all meters associated with a particular rate program).

6.17.3 Integral to the AMI Master Station

Valued: Remote meter management software that is a part of the AMI Master Station software suite.

6.17.4 Compatibility with Windows XP

Required: If it is not part of the AMI Master Station software suite, then the remote meter management software must be compatible with the Microsoft Windows XP operating systems for as long as Microsoft supports XP.

6.18 Remote Programming Capabilities

All firmware and configurable program settings in any type of AMI endpoint device shall be remotely accessible for review, modification, and replacement by utility-authorized personnel.

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Detailed requirements for local meter programming capabilities are specified in Section 2.19, titled "Local Meter Programming Capabilities".

6.18.1 Configure AMI and Meter Program Settings

Required: For all AMI meters. Authorized meter service personnel shall be able to remotely set and modify all configurable AMI and meter program parameters via the AMI network. AMI meters shall be remotely configurable either through utilities provided in the AMI Master Station software or through meter management software running on a PC with access to the AMI Network.

6.18.2 Upgrade AMI and Meter Firmware

Required: For all AMI meters. Authorized meter service personnel shall be able to remotely replace AMI and meter firmware via the AMI network. Authorized personnel shall remotely replace meter firmware either by applying utilities provided in the AMI Master Station software, or, by using meter management software running on a PC that is suitably connected to the AMI Network. As a safeguard, AMI meters shall have program and hardware provisions sufficient to ensure successful detection and reversal of an unsuccessful firmware replacement attempt.

6.18.3 Upgrade Customer Premise Device

DLC is concerned about the durability of the protocol used for communicating with customer premises devices. It is currently popular to envision applying protocols developed and implemented for consumer applications to utility purposes, gaining advantages in low cost due to high production volume. But this raises uncertainty about the interoperability of AMI control with customer devices that are new 10 years from now, when public protocols surely will have evolved to newer versions.

Required: The communication protocol in the end device shall be remotely upgradable, via the AMI communication network, to ensure that the device's communications capability can be kept up to date as the protocol evolves over time.

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6.18.4 Conformance with NEMA SG-AMI 1-2009

Required Information: Bidder shall describe how the proposed AMI's conformance with the NEMA SG-AMI 1–2009 standard supports remote upgrades of the following:

a. Metrology firmware in AMI meters

b. AMI application firmware in AMI meters

c. AMI communications firmware in AMI meters

d. HAN application firmware in ZigBee-enabled AMI meters

e. HAN communications firmware in ZigBee-enabled AMI meters

f. Application firmware in ZigBee-enabled customer premises devices

g. Communications firmware in ZigBee-enabled customer premises devices

6.19 AMI Power Supply

The power supply capabilities specified in the following subsections apply to all AMI network devices, including the AMI intelligence and communications components in the AMI meters. DLC's requirements for meter power provisions are separately described in Section 2.14.7, titled "Meter Power Supply".

For the purposes of this RFP, the primary AMI power source for each AMI Network device provides all necessary electric power to the device at all times, unless disabled for maintenance or due to malfunction. The secondary power source for each AMI Network device provides all necessary electric power to the device for more than a minimum duration when the primary power source is unavailable.

Required Information: Please describe the means and methods employed for supporting the required and valued AMI power supply capabilities specified in the following subsections.

6.19.1 Primary AMI Power Source in Meters

6.19.1.1 Connection to AC Power Source

Required: The AMI components in the proposed meters shall be provided with AC power from the line side of the meter. The connection to the AC power source can be provided either

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through the meter's AC power circuitry or independent of the meter's circuits; shall pass through current limiting resistors; and, shall not be fused.

6.19.1.2 Tolerance of Frequency Variation

Required: The AMI components operating in each type of meter proposed shall support all AMI capabilities specified in this RFP when operating at 60 Hz ± 5% variation.

6.19.1.3 Drop-Out Voltage

Required: The AMI components operating in each type of meter proposed shall support all AMI capabilities specified in this RFP when operating above 80% of the meter's nominal service voltage.

6.19.2 Secondary AMI Power Source in Meters

The source of secondary power for sustaining the AMI capabilities in an AMI meter can be either the same as, or separate from, the source of secondary power for sustaining the critical meter functions in the same AMI meter.

Valued: DLC will value proposed AMI meters that can temporarily sustain their AMI capabilities when their primary AMI power source is unavailable. In the event when an AMI meter detects a sustained supply voltage interruption, the capacity of the secondary AMI power source should be sufficient to sustain the meter's AMI capabilities long enough to ensure high probability of successfully delivering a "last gasp" notification message from the meter to the AMI Master Station.

For the purpose of Bidder proposing this capability:

- DLC defines a high probability of message success (for each individual message) as exceeding 98% for a single-premise interruption and 90% for a large, multi-premise interruption
- DLC's definitions for timely message conveyance are specified in Section 6.23.2~~6.23.2~~, titled "Data Latency~~Data Latency~~"

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- DLC defines a large, sustained, multi-premise, supply voltage interruption as a single event that simultaneously affects more than 50% of all customers in an area serving more than 1000 customers

Required Information: If proposed, Bidder should clearly and fully explain how the proposed secondary power capacity for meters' AMI capabilities will be sufficient to ensure a high probability of successful message transmission and delivery.

6.19.2.1 Use of Batteries in Meters

The use of batteries for providing a secondary AMI power source in meters is a serious concern for DLC.

Required Information: Bidder shall clearly and fully describe, as applicable:

- Each instance where a battery serves as the source of secondary power for a proposed meter's AMI components
- The expected service life of the battery used in each type of AMI meter and the relationship of that battery's service life to the operation of the meter's AMI functions
- Bidder's recommended procedures for battery life management and battery replacement

6.19.3 Primary Power Source in AMI Network Devices

The capabilities described in the following subsections apply to all non-meter AMI Network devices that support communications between AMI endpoints and the AMI Master Station.

6.19.3.1 Connection to AC Power Source

Valued: Each AMI Network device should operate from a sufficiently sized 120 VAC power source that is connected through current limiting resistors and is not fused.

6.19.3.2 Tolerance of Frequency Variation

Required: The AMI Network devices proposed shall support all AMI capabilities specified in this RFP when operating at 60 Hz ± 5% variation.

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6.19.3.3 Drop-Out Voltage

Required: The AMI Network devices proposed shall support all AMI capabilities specified in this RFP when operating above 80% of the device's nominal service voltage.

6.19.4 Secondary Power Source in AMI Network Devices

Required: Each non-meter device in the AMI Network shall be equipped with a secondary power source that enables the device to sustain full support of communications between AMI endpoints and the AMI Master Station when its primary AMI power source is unavailable.

6.19.4.1 Capacity

Required: The capacity of each device's secondary power source shall be sufficient to sustain the device's AMI capabilities for a minimum of eight hours.

6.19.4.2 Secondary Power Notifications

Required: Each non-meter device in the AMI Network shall immediately send a notification message to the AMI Master Station for each of the following conditions:

- Loss of the primary power source
- Restoration of the primary power source
- Low remaining secondary power reserve
- No remaining secondary power reserve – device shutting down

6.19.4.3 Secondary Power Status Check

Valued: AMI operators and processes operating in the AMI Master Station should be able to remotely check the amount of secondary power capacity available in each non-meter device in the AMI Network.

6.19.4.4 Use of Batteries in AMI Network Devices

The use of batteries in AMI Network devices is a serious concern for DLC.

Required Information: Bidder shall clearly and fully describe, as applicable:

- All battery uses (if any) in AMI Network devices

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- The expected service life of each type of battery used and the relationship of that battery's service life to the operation of the device's AMI functions
- Bidder's recommended procedures for battery life management and battery replacement

6.20 Compliance with Regulations & Standards

Required: All AMI devices and network components shall comply with the latest revisions of all applicable rules and standards from the appropriate governing bodies (i.e. FCC, ANSI, etc.).

Required Information: Bidder shall explicitly identify the standard(s) supported by each AMI device and network component.

6.21 Utilization of DLC Network Resources

Attachment K - DLC Communications Map, illustrates DLC network resources that DLC can make available for use as part of the proposed AMI Network. Bidder is invited, but not required, to propose an AMI Network option that utilizes some or all of DLC's available network resources, if such use can be shown to have tangible technical and/or economic benefits for DLC.

Required Information: Bidder shall explicitly identify the DLC network resources to be employed in the proposed AMI Network.

6.22 Utilization of Public & Private Networks

Required: Bidders proposing any utilization of public and/or private networks shall clearly describe all technical and economic (i.e. one-time & recurring costs) details needed to fully characterize the proposed network service(s).

Proposed AMI Network solutions that utilize public and/or private network infrastructure for some or all AMI data communications shall support the requirements described in the following subsections.

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6.22.1.1 Certified Equipment Compatibility

Required Certifications: The selected AMI provider shall obtain network carrier(s) certification (where appropriate) of the technical compatibility between the carrier's network(s) and all applicable AMI end-point devices and AMI Network components.

6.22.1.2 Alternatives to Primary Solution

Required Information: Bidders proposing to use public and/or private wireless data infrastructure as their primary network solution shall describe alternative communication solutions (e.g. land line, cable, fixed base radio, Ethernet, power line communication, etc.) that will effectively support the technical and functional capabilities required by this RFP. The AMI Provider and DLC will collaborate to determine the appropriate alternate communication solutions on a case-by-case basis as the locations not supportable with the primary solution (if any) are discovered during deployment.

6.23 AMI Data Communication

For the purposes of this solicitation for an AMI deployment to DLC's electric service accounts, the "AMI Network" is defined as that hardware and software that supports AMI data and command communication between the AMI Master Station and the AMI end-points. The AMI Network may comprise any or all of the following:

- A communication network that transports data and commands between AMI end-points and their respective AMI data concentrators
- A communication network that transports data and commands between a wide area network (WAN) and AMI data concentrators (or the AMI end-points if no concentrators are used)
- A communication network that transports data and commands between the AMI Master Station and the WAN

Any of the above may be private networks provided by Bidder, or may utilize either or both public digital data networks or parts of the DLC corporate network.

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Required: The AMI Network shall provide data communications supporting all proposed AMI functions at all AMI end-points in accordance with the functional and performance requirements specified throughout this RFP.

Required Information: Bidder shall clearly and fully describe the proposed AMI Network provisions supporting AMI data communications for all AMI end-points.

6.23.1 Communication Planning Assumptions

Bidder shall assume the following baseline of system activity for the purpose of sizing and configuring the communication elements of the proposed AMI:

- All C&I account meters (single phase and polyphase) will each record 15-minute interval data for delivered kWh and kVARh (exclude single phase delivered and received kVARh). The AMI shall collect this data from each meter hourly.
- All C&I account meters (single phase and polyphase) will each record 15-minute interval data for received kWh and kVARh. The AMI shall collect this data from each meter hourly.
- All C&I account meters (single phase and polyphase) will each record 15-minute interval data for power quality measurements (voltage, frequency, transients, interruptions, harmonics, etc.). The AMI shall collect this data from each meter hourly.
- All residential account meters will each record 15-minute interval data for delivered kWh. The AMI shall collect this data from each meter once every 24 hours.
- 25 % of residential account meters in any given area (single phase and polyphase) will each record 15-minute interval data for received kWh. The AMI shall collect this data from each meter once every 24 hours.
- All residential account meters (single phase and polyphase) will each record 15-minute interval data for kW and kVAR demand. The AMI shall collect this data from each meter once every 24 hours.
- All residential account meters (single phase and polyphase) will each record 15-minute interval data for power quality measurements (voltage, frequency, spikes, interruptions, harmonics, etc.). The AMI shall collect this data from each meter once every 24 hours.
- 10,000 C&I load control program participants.

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- 10,000 C&I demand response program participants.
- 100,000 residential load control program participants.
- 100,000 residential demand response program participants.

6.23.2 Data Latency

Data latency is a system performance measure of the elapsed time from the moment when data or a message is created to the moment when the data or message is delivered to its intended destination: the user, device, or utility process that has a functional purpose for the data or message.

During periods of baseline system activity (described in the previous section), the proposed AMI shall deliver data and messages in compliance with the following latency criteria.

6.23.2.1 C&I Data – Hourly

Required: Complete consumption (registers and intervals) and demand data for at least 98.5% of C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within two hours of the time when the data was recorded at the meter.

Required: Complete consumption (registers and intervals) and demand data for at least 99.7% of C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to the MDMS by 4:00 AM on the following day when the data was recorded.

Valued: Complete consumption (registers and intervals) and demand data for at least 100% of C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within two hours of the time when the data was recorded at the meter.

Valued: Complete consumption (registers and intervals) and demand data for at least 100% of C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to the MDMS by 4:00 AM on the following day when the data was recorded.

Valued: Complete consumption (registers and intervals) and demand data for at least 100% of C&I customers shall be successfully collected by the AMI Master Station and subsequently

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exported to receiving systems within one hour of the time when the data was recorded at the meter.

Information Request: Bidder to explain the shortest time possible, with the infrastructure proposed, to obtain 100% (or some other percentage) of the reads.

6.23.2.2 C&I Power Quality Data

Required: Complete power quality data for at least 98.5% of DLC's C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within one hour of the time when the data was recorded at the meter. Complete power quality data for at least 99.7% of DLC's C&I customers shall be successfully collected and exported by 12:00 PM on the following day.

Valued: Complete power quality data for at least 100% of DLC's C&I customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within one hour of the time when the data was recorded at the meter. Complete power quality data for at least 100% of DLC's C&I customers shall be successfully collected and exported by 12:00 PM on the following day.

6.23.2.3 Residential Consumption and Demand Data

Required: Complete consumption (registers and intervals) and demand data for at least 98.5% of residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within two hours of the time when the data was recorded at the meter.

Valued: Complete consumption (registers and intervals) and demand data for at least 100% of residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems within two hours of the time when the data was recorded at the meter.

Required: Complete consumption data (registers and intervals) and demand data from at least 98% of DLC's residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems by 4:00 AM on the following day when the data was recorded.

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Valued: Complete consumption data (registers and intervals) and demand data from at least 100% of DLC's residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems by 4:00 AM on the following day when the data was recorded.

6.23.2.4 Residential Power Quality Data

Required: Complete power quality data from at least 98% of DLC's residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems by 4:00 AM on the first day following the day when the data was recorded. Complete power quality data from at least 99.5% of DLC's residential customers shall be successfully collected and exported by 4:00 AM on the following day.

Valued: Complete power quality data from at least 100% of DLC's residential customers shall be successfully collected by the AMI Master Station and subsequently exported to receiving systems by 4:00 AM on the first day following the day when the data was recorded. Complete power quality data from at least 100% of DLC's residential customers shall be successfully collected and exported by 4:00 AM on the following day.

6.23.2.5 Alert Messages

Required: Meter-originated alert messages pertaining to programmed measurement thresholds, tamper detection, error/failure conditions, etc. shall be delivered to the AMI Master Station within 5 minutes of the time when the message was transmitted by the meter.

6.23.2.6 Supply Voltage Interruption/Restoration Messages

Required: In the event of a sustained supply voltage interruption/restoration at a single premise, the meter-originated message reporting the interruption/restoration shall be delivered to the AMI Master Station within one minutes of the time when the interruption/restoration was detected by the meter.

For the purposes of this requirement, a large, sustained, multi-premise, supply voltage interruption/restoration is defined as a single interruption/restoration event that is simultaneously detected by more than 50% of all premises in an area serving more than 1000 customers.

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In the event of a large, sustained supply voltage interruption/restoration affecting multiple premises, the meter-originated message reporting each meter's respective interruption/restoration shall be delivered to the AMI Master Station within fifteen minutes of the time when the sustained interruption/restoration was detected by the meter.

Valued: DLC will favor proposed AMI that is capable of message delivery within five minutes.

6.23.2.7 Group Commands & Responses

Required Information: AMI Vendor to describe the number of groups that can be defined by the AMI system.

6.23.2.8 Control Commands & Responses – Single Meter

Valued: A message to a single meter commanding immediate execution of a control function (i.e. demand register resets, service switch state changes, etc.) shall be delivered from the AMI Master Station to the meter, and, a response message acknowledging receipt and execution of the command shall be delivered from the meter to the command initiator within one minute. If Bidder cannot meet the one minute timeframe, please describe the shortest amount of time possible.

6.23.2.9 Control Commands & Responses – Groups

Required: A message to a group of at least 10,000 AMI end-points commanding immediate execution of a control function (i.e. load shed) shall be delivered from the AMI Master Station to end-points in the group within five minutes. The response message acknowledging receipt and execution of the command shall be delivered from each group meter to the command initiator within fifteen minutes of receiving the command.

6.23.2.10 Management Commands – Single Meter

Valued: A message to a single meter commanding scheduled execution of one or more meter management functions (i.e. changing an interval length) shall be delivered from the AMI Master Station to the meter, and, a response message acknowledging receipt of the management command shall be delivered from the meter to the command initiator within one minute.

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6.23.2.11 Management Commands – Multiple Meters

Required: A message to a group of at least 10,000 meters commanding scheduled execution of one or more meter management functions (i.e. changing an event threshold setting) shall be delivered from the AMI Master Station to each meter in the group within 5 minutes. A response message acknowledging receipt of the management command shall be delivered from each group meter to the command initiator within 15 minutes of receiving the command.

6.23.2.12 Scheduled Data Requests – Single Meter

Valued: A data request message to a single meter that configures and schedules recording of one or more "snap-shot" readings (i.e. measuring voltage) shall be delivered from the AMI Master Station to the meter, and, a response message acknowledging receipt of the request message shall be delivered from the meter to the data requestor within one minute.

6.23.2.13 Scheduled Data Requests – Multiple Meters

Required: A data request message sent to a group of at least 10,000 meters that configures and schedules recording of one or more "snap-shot" readings (i.e. voltage measurements) shall be delivered from the AMI Master Station to each meter in the group within five minutes. A response message acknowledging receipt of the request message shall be delivered from each group meter to the data requestor within fifteen minutes of receiving the request.

6.23.2.14 On-Demand Data Requests – Single Meter

Valued: A message to a single meter requesting real-time or stored data shall be delivered from the AMI Master Station to the meter, and, the requested data shall be delivered from the meter to the data requestor within one minute.

6.23.2.15 On-Demand Data Requests– Multiple Meters

Required: A message to a group of at least 10,000 meters requesting real-time or stored data shall be delivered from the AMI Master Station to the meter group within five minutes. The requested data shall be delivered from each group meter to the data requestor within fifteen minutes of message receipt.

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6.23.2.16 Consumption Information for Demand Response

Valued: The AMI shall acquire and relay up-to-date demand response information from its source(s) to in-premise customer information display devices within one minute of update initiation.

6.23.2.17 Remote Firmware Replacement

Required: The proposed AMI shall be capable of remotely replacing the AMI or meter firmware in all AMI meters within a period of a few days, while, at the same time, satisfying all other data latency criteria described in the previous subsections.

Required Information: Bidder's proposal shall include and explain Bidder's estimate of the time required to remotely upgrade the meter firmware in all meter endpoints.

6.24 AMI Test

Required: Prior to shipment from the factory to DLC, the AMI meter supplier shall perform and document tests verifying proper operation of the AMI capabilities provided with each new AMI meter. DLC's requirements for pre-shipment testing of the meters' metering capabilities are specified in Section 2.16, titled "Meter Test".

As a minimum, the AMI tests performed by the supplier shall fully verify the following:

- Communications with the AMI network
- Communications with customer premise devices (if the capability is provided)
- Remote demand reset
- Automatic self-registration (if the capability is provided)
- Remote program administration
- Remote firmware upgrade
- Service switch control
- Correspondence of the AMI register values with the displayed meter readings
- Compliance with DLC's specifications for pre-shipment AMI programming

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6.25 AMI Master Station

The primary AMI Master Station will be located at DLC's Wood's Run data center in Pittsburgh, PA. The backup AMI Master Station will be located at DLC's backup data center in Penn Hills, PA. Both the primary and backup instances of the AMI Master Station shall be able to conduct two-way data communication with all customer meters and other AMI end-points (i.e. distribution devices) by way of the AMI Network. The intent of this RFP section is to describe the AMI Master Station only in sufficient detail to establish DLC's minimum requirements, but not to unnecessarily restrict the thoughtful practice, experience and recommendations of the Bidder.

As the "head-end" of the DLC AMI, the AMI Master Station will serve as the central point of metering data aggregation, formatting, and handoff to DLC's Meter Data Management System. The AMI Master Station also will manage the AMI Network, controlling and monitoring the communications and data acquisition elements of the AMI.

Required Information: Bidder shall clearly and fully describe the architecture of the proposed AMI Master Station including all hardware, software, network elements, and integration interfaces needed to concurrently support production, development, testing, and training instances of the AMI Master Station.

6.25.1 AMI Master Station Hardware

Guided by Bidder's specifications and oversight, DLC will acquire, install, and configure all of the hardware needed for complete implementation of the proposed AMI Master Station (file servers, web servers, database servers, application servers, workstations, network interfaces, power supply, cables, external disk storage, backup system, etc.).

Required Information: Bidder's proposal shall itemize, quantify, and describe each required hardware item with details sufficient to ensure procurement of the correct hardware by DLC. Prior to installation of the AMI Master Station hardware, the AMI provider shall specify any applicable configuration requirements for each hardware component. Requirements for compatibility of Bidder's proposed AMI Master Station hardware with DLC's planned IT environment are described in Section 6.30.1, titled "AMI Integration".

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6.25.2 AMI Master Station Software

Required Information: Bidder shall provide a full description of all system, database, and application software components, as further defined below, required for implementation and operation of the proposed AMI Master Station. Bidder's proposal shall also clearly and fully describe any required software elements of the AMI Master Station (such as, for example, database software) that Bidder does not propose to provide.

6.25.2.1 System Software

System software comprises those software components that, in combination with the system hardware, provide the system functions required to support operation of the proposed AMI Master Station application(s) and database(s). This category includes the operating system, local network services, file services, web services, security services, data protection and system recovery.

Required: The proposed system software shall be established, well-proven, commercially available product based on widely-adopted technology standards.

6.25.2.2 Database Software

Database software comprises those software components that, running on system hardware and system software, provide the database services required for operation of the system application(s).

Required: The proposed database software shall be an established, well-proven, commercially available product based on widely-adopted database technology standards.

Section 6.30.1.8, titled "Database Software~~Database Software~~", describes DLC's database management framework and its specific requirements for AMI compatibility and integration with that framework.

6.25.2.3 Application Software

Application software comprises those software components that, in combination with the system hardware, system software, and database software, provide the network management, meter

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data acquisition, data management, and data presentation functions of the proposed AMI Master Station.

Required: The proposed application software components will be well-proven, commercially available products based on widely-deployed programming languages and compatible with widely-adopted system and database technologies.

6.25.2.4 Software Licensing, Maintenance & Upgrades

Required Information: Bidder's proposal must provide the following information (when applicable) for each proposed software component:

- One-time cost of license procurement and recurring costs for future license maintenance and version upgrades
- Bidder's and/or software vendor's policies and procedures for software maintenance and version upgrades for multiple system images supporting Production, Disaster Recovery (DR), Load Balancing, Training, Release Testing and Quality Assurance (QA)
- Bidder shall describe any software keys, restrictions of use, or other limitations that may in any way restrict DLC's full and open use of the AMI

6.25.2.5 Software Technical Support

Required Information: Bidder's proposal must provide the following support information (when applicable) for each proposed software component:

Describe resources, programs, and costs for software technical support services provided by the Bidder and/or other software vendor.

If a "Users Group" exists, its structure, purposes and governance shall be described. If the Users Group has an informal or formal role in submitting or disseminating software upgrades, that process shall be described.

6.25.3 AMI Data

6.25.3.1 Data Categories

AMI data comprises several categories of data, coming from multiple source types, and serving a variety of functions:

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- **Customer Data.** Customer meters and other AMI end-point devices generate and deliver billing data (energy consumption and demand) and/or other meter data (voltage, power factor, outage status, tamper flags, service connect/disconnect confirmation, etc.). Following acquisition and validation, the AMI Master Station stores the information as static data in one or more internal data repositories for long term storage by the AMI, or, in preparation for transfer to DLC's Meter Data Management System (MDMS).
- **Configuration Data.** The AMI Master Station, AMI Network, customer meters, and other AMI end-point devices all operate in accordance with a complex, inter-related set of configuration and management settings that are stored as dynamic data in configuration files distributed throughout the infrastructure.
- **Management Data.** The AMI Master Station, AMI Network, customer meters, and other AMI end-point devices all generate various types of system management messages (errors, system events, control events, operator events, status, etc.) that are described by static data records stored in various system log files.

6.25.3.2 Data Quality

Required Information: Bidder shall describe the provisions in the proposed AMI to assure the quality and productivity of the Customer Data. Data quality functions include the following:

- Identify, correct/recover, or reject meter billing data deemed to be suspect or in error
- Identify, correct/recover, or reject other meter data deemed to be suspect or in error
- Filters and conversions to make power outage reporting useful during widespread outages
- Filter to remove false positive tamper detection flags

6.25.3.3 Data Integrity

Data integrity is corrupted when a system event or human action causes improper elimination or modification of data.

Required: All software and hardware elements of the AMI shall support full SOX compliance (logging, auditability, security, integrity, disaster recovery, etc.).

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Required Information: Bidder shall describe the provisions in the proposed AMI to protect, preserve, and restore the integrity of each category of system data.

6.25.3.4 Data Warehousing Functions & Capacity

Required: The AMI Master Station shall store and manage all AMI configuration and operating data supporting its AMI control and monitoring functions. Both current data and historical data (supporting change tracking) shall be retained indefinitely unless it is purged through operator action or by automated data management functions.

The AMI Master Station shall temporarily store and manage all collected measurement, status, and event data pertaining to customers' electric services before transferring the data to DLC's MDMS. In addition, the AMI Master Station shall continually provide the MDMS with up-to-date data describing, as a minimum, the following configuration and operating information for each AMI meter/end-point:

- Installed equipment type and serial number
- Installed firmware version
- All programmable settings that control the configuration and operation of meter/end-point (intervals, thresholds, schedules, operating modes, etc.)
- Current operating status (in-service, out-of-service, error)

Required Information: Bidder shall describe the proposed AMI Master Station's data storage approach and its anticipated requirements for internal and external storage capacity.

6.25.4 AMI Clock & Calendar

Required: The clock & calendar functions maintained and operated by the AMI Master Station and the AMI Network shall be consistent with and shall support fully all the functions defined for the meter clock in Section 2.14.10, titled "Meter Clock(s)".

6.25.4.1 Time Base

Required: All elements of the AMI Master Station and the AMI Network that have time-related and/or date-related functions shall perform those functions on the basis of Coordinated Universal Time (UTC), without inclusion of a time-zone offset.

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6.25.4.2 Clock Synchronization

Required: All date & time settings in all elements of the AMI Master Station and AMI Network shall be updated to match reference date & time data regularly provided to the AMI by DLC's enterprise Network Time Server (NTS). In between NTS updates, the AMI's elements shall synchronize their internal clocks with their respective internal or external time-bases (oscillator, master time reference source). The proposed AMI shall manage time synchronization such that the difference in time between any AMI element and the DLC NTS does not exceed ± 0.5 second.

Required Information: Bidder shall clearly and fully explain how time synchronization is implemented in the proposed AMI, and how this implementation achieves the specified maximum error.

6.25.4.3 Time Resolution

Required: All elements of the AMI Master Station and the AMI Network performing time-related functions shall perform those functions down to a resolution of 1/100 of a second, or better.

6.25.4.4 Calendar Days

Required: The AMI's date-related functions shall support functional distinctions for weekdays, weekend days, and holidays. The AMI shall be programmable by DLC to support not less than 12 holidays, including all major U.S. national and religious holidays.

6.25.4.5 UTC Translation

Required: For purposes of data entry (manual or automated), user application presentment, and report generation, the AMI shall support translation between its UTC-based date & time data and the applicable local date & time, with adjustment to daylight savings time when applicable. The start and end dates of the daylight savings period shall be utility-configurable.

6.25.5 User Interfaces

Required: The majority of DLC's users will interact with the AMI's data and functions by way of the MDMS. Nonetheless, all types of data and application functions managed by the AMI Master

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Station shall also be directly accessible for user viewing and/or manipulation, subject to appropriate application and data security constraints.

6.25.5.1 User Categories

Required: Access to the data and application functions of the AMI Master Station shall be provided to at least three user categories, for example:

- System administrators
- System operators
- DLC business and engineering personnel

6.25.5.2 Initial User Access Provisions

Required: Upon initial start-up, AMI users shall have access to user-appropriate application screens, menus, and process controls that will, with a minimum of user education, facilitate viewing, manipulating, and/or downloading the types of information listed below. Where applicable, users shall be able to perform functions on the basis of user-defined date/time ranges and entity groups (i.e. all meters on a specified distribution feeder):

- kW load profile
- kVA load profile
- Power factor profile
- Voltage profile
- kWh consumption
- Tamper detection history and current data
- Service continuity history and current data
- AMI communication network statistics and alert records
- AMI end-point configuration
- AMI Network configuration settings
- AMI application configuration settings

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6.25.5.3 Navigation & Control

Required Information: Bidder shall clearly and fully describe the application screens, menus, and process controls that enable users to locate, view, manipulate, and download the above listed data types.

6.25.5.4 Data Visualization

Required: DLC expects Bidder's proposed AMI application software to generate and display a variety of data visualization graphics (e.g. tables, pie charts, bar charts, line charts, etc.).

Required Information: Bidder shall describe and provide samples of the types of visualization graphics that the proposed AMI can apply to each type of displayed and/or printed AMI data.

6.25.5.5 Data Presentation & Output Tools

Valued: The proposed AMI shall include software tools and application features that will enable DLC personnel (business and technical) to design and implement new forms of data presentation and data output in support of business and operating requirements that emerge after system installation.

Required Information: Bidder shall describe the proposed tools and application features that will fulfill this requirement, with emphasis on their flexibility and versatility for future analyses.

6.25.6 Data Exchange

Data exchange comprises organizing and moving data between the AMI Master Station and other DLC information systems. This includes sending/receiving messages and importing/exporting data sets. Detailed data exchange requirements, specific to the other systems that shall communicate with the AMI, are described in Section 6.30 titled "AMI Integration".

6.25.6.1 Support for All Data Types

Required: The proposed AMI shall support exchange of all types of measurement, status, control, and configuration data.

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6.25.6.2 Exchange Data Formats

DLC expects Bidder's proposed AMI application software to send and receive data in a variety of common data formats including XML messages and delimited ASCII text files for communication with other DLC computer systems, and .xls or .csv files for export to user spreadsheet applications.

Required Information: Bidder shall describe the exchange data formats that will be operable with the proposed AMI.

6.25.6.3 Automatic & Operator Initiation

Required: Data exchange will occur in response to both automatic and operator-initiated processes operating in either the AMI Master Station or other utility information systems.

6.25.6.4 Scheduled & Unscheduled Exchanges

Required: The proposed AMI Master Station shall support both scheduled and unscheduled (on-demand) exchanges of messages and data sets with other utility information systems.

6.26 System Management

Required: The proposed AMI shall include management capabilities sufficient to support industry best practices for system planning, operation, maintenance, and troubleshooting.

Required Information: Bidder's AMI proposal shall clearly and fully describe the proposed system management capabilities and shall explain how those capabilities will enable DLC personnel to efficiently, effectively, and comprehensively manage the AMI's hardware, software, and network elements.

6.26.1 Compatibility & Integration

Valued: A high degree of technical compatibility supporting extensive integration of the AMI's system management functions with DLC's system management framework. Section 6.30.1.6 titled "Network Monitoring & Management~~Network Monitoring & Management~~", describes DLC's system management framework and its specific requirements for AMI compatibility and integration with that framework.

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6.26.2 System Mode Control

Valued: AMI provisions to optimize AMI operation for differing utility operating conditions, such as routine operation, storm response, security alert, AMI maintenance, etc.

Required Information: Bidder's proposal shall address the following questions, as applicable:

- How are AMI operating modes defined?
- How are the modes invoked by DLC's AMI operators?
- How (if at all) are modes automatically invoked in response to AMI or utility system operating conditions?
- What facility, if any, is provided to allow DLC to define AMI operating modes and mode transitions in the future?

6.26.3 Operator Automation Functions

Required: The AMI Master Station software shall require a minimum of operator intervention for the completion of various core tasks once successfully initiated.

Required Information: Bidder's proposal shall address the following questions, as applicable:

- If any data retrieval tasks are interrupted or suspended for any reason—whether the interruption is planned or not—what notification is given (e.g.: visual notice advising or warning of the incident on the operator's screen, audible alert, software log entry, etc.)?
- In the event of such an interruption, does any screen notification contain suggested corrective action(s) required to resume normal operation?
- What means are provided to allow the AMI operator to automate functions by preparing scripts, process flows, job schedules, batch commands or other means?

6.26.4 Performance Monitoring & Reporting

6.26.4.1 Real-Time Monitoring

Required: The proposed AMI shall provide DLC personnel with the ability to effectively, efficiently, and comprehensively monitor AMI performance in real-time.

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Required Information: Bidder shall describe the real-time performance monitoring provisions in the AMI Master Station and AMI Network.

6.26.4.2 Capture & Store AMI Performance Data

Required: The proposed AMI shall have the features and capacity needed for on-going capture and storage of performance-related data for all elements of the AMI.

Required Information: Bidder shall describe the proposed AMI's provisions for capturing and storing performance data pertaining to the AMI Master Station and AMI Network.

6.26.4.3 Generate AMI Performance Reports

Required: The proposed AMI shall provide DLC personnel with the ability to effectively and efficiently produce a comprehensive set of reports that clearly portray AMI performance for any moment or period in the life of the system.

Required Information: Bidder shall describe the proposed AMI's provisions for performance reporting.

6.27 AMI Security

Required: All elements of the proposed AMI shall support industry best practices for protection of data confidentiality, data integrity, and operational security. In compliance with Sarbanes-Oxley requirements, all AMI data communicated between discrete AMI elements shall be secure and encrypted. Section 6.30.1.4 titled "Security~~Security~~", describes DLC's IT security management framework and its specific requirements for AMI compatibility with that framework.

Required Information: Bidder shall clearly and fully describe the data protection and operation security provisions in the AMI Master Station, AMI Network, AMI meters, other AMI end-point devices (if any), and communicating customer-premise devices (if any). Bidder's descriptions shall explain how said provisions will prevent unauthorized access to the data and control functions of all accessible system elements.

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6.28 Conformance with NEMA SG-AMI 1-2009

Required Information: Bidder shall describe how the proposed AMI's conformance with the NEMA SG-AMI 1–2009 standard supports multi-level protection of remotely accessed meter programming, information, and control functions.

6.29 AMI Resilience

Required: High AMI availability is of paramount importance; consequently, the Bidder's proposed AMI Master Station, AMI Network, and AMI meters must satisfy rigorous requirements for downtime tolerance, failure detection, failure response, and disaster recovery.

Required Information: Bidder shall describe how major hardware, software, or data failure scenarios will affect operation of the proposed AMI. Bidder shall also describe the countermeasures provided, and the system design philosophy for the AMI Master Station in terms of hot standby, automatic fail-over, redundancy, backups, etc.

Section 6.30.1.14 titled "Disaster Recovery~~Disaster Recovery~~", describes DLC's IT disaster recovery framework and its specific requirements for AMI compatibility with that framework.

6.29.1 Master Station

6.29.1.1 Planned Downtime

Required: Planned downtime of an AMI Master Station component shall not interfere with timely collection of meter data. DLC requires that any part of the AMI Master Station may be taken out of service for a minimum of six hours, for maintenance or software upgrades, without loss of any revenue metering data.

Required Information: Bidder shall describe how the proposed AMI Master Station will accommodate a six hour maintenance outage.

6.29.1.2 Failure Detection & Reporting

Required: The proposed AMI Master Station shall effectively detect, annunciate, and log significant errors and failures of the system's key hardware and software components.

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Required Information: Bidder shall describe how the proposed AMI Master Station will support effective detection, reporting, and recording of errors and failures.

6.29.1.3 Failure Response

Valued: To the greatest practical extent, the proposed AMI Master Station shall automatically isolate and bypass detected system problems with little or no effect on system capability or performance. If an automated response is not practical or possible, then the AMI provider shall provide straightforward, efficient, and well documented procedures for manual problem isolation and bypass.

Required Information: Bidder shall describe the automated and/or manual processes that support failure response for the proposed AMI Master Station.

6.29.1.4 Electric Service Outage Tolerance

Required: The AMI Master Station shall be unaffected by an electric service outage of indefinite duration. There shall be no lost data, no production of errors, nor any spurious control actions. The AMI Master Station shall autonomously return to normal operation as power is returned, without operator intervention.

If a power outage at the AMI Master Station exceeds the limit of the uninterruptible power supply, then the AMI Master Station shall automatically shut down in an orderly manner, ensuring rapid re-booting and return to service upon restoration of electric service.

6.29.1.5 Disaster Recovery

The AMI Master Station can be damaged or destroyed by a variety of man-made and natural causes. Disasters include loss or corruption of any or all of the following:

- Master Station hardware
- application data
- core software (system, database, application)
- software configuration files (system, database, application)
- network communication

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Required: Bidder shall propose disaster recovery provisions for the AMI Master Station that will support DLC's Recovery Time Objective (RTO) of 24 hours and Recovery Point Objective (RPO) of the end of the previous business day. The successful Bidder will be required to provide detailed procedures for the following:

- Data protection
- Configuration protection
- System recovery & validation
- Data recovery & validation
- Application recovery & validation
- Maintenance of master Station documentation

Required: AMI provider shall provide a backup Master Station.

Required Information: Bidder's proposal shall describe recommended practices and available components (whether included or at extra cost).

6.29.2 AMI Network

6.29.2.1 Planned Network Downtime

Required: Planned downtime of an AMI Network component (for maintenance or upgrade) shall not interfere with timely recovery of meter reading data. DLC requires that any part of the AMI Network may be taken out of service for at least six hours without loss of any revenue metering data.

Required Information: Bidder shall describe how the proposed AMI Network will accommodate such a maintenance outage.

6.29.2.2 Network Failure Detection & Recording

Required: Utilizing the network management capabilities of the AMI Master Station, the proposed AMI Network shall effectively detect, annunciate, and log significant errors and failures of the network's key hardware and software components.

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Required Information: Bidder shall describe how the proposed AMI Master Station and AMI Network will support effective detection, reporting, and recording of network component errors and failures.

6.29.2.3 Network Failure Response

Valued: To the greatest practical extent, the proposed AMI Master Station and AMI Network shall automatically isolate and bypass detected network problems with little or no effect on system capability or performance. If an automated response is not practical or possible, then the bidder shall provide straightforward, efficient, and well documented procedures for manual problem isolation and bypass.

Required Information: Bidder shall describe the automated and/or manual processes that support failure response for the proposed AMI Network.

6.29.2.4 Electric Service Outage Tolerance

Required: The configurations, programs, and data stored in AMI Network components shall be unaffected by an electric service outage of indefinite duration. There shall be no data loss, no errors, and no spurious control actions. AMI Network components shall autonomously return to normal operation as power is returned, without operator intervention. If an electric service outage affecting all or part of the network exceeds the limit of uninterruptible power supplies, then the affected network components shall automatically shut down in an orderly manner, ensuring rapid re-starting and return to service upon restoration of electric service.

6.29.2.5 Network Disaster Recovery

The AMI Network can be damaged or destroyed by a variety of man-made and natural causes. Disasters include loss or corruption of any or all of the following:

- Network hardware & media
- Network software
- Network configuration files

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Required: Bidder shall propose disaster recovery provisions for the AMI Network that support DLC's Network Recovery Time Objective (NRTO) of 24 hours. The successful Bidder will be required to provide detailed procedures for the following:

- Configuration protection
- Network recovery & validation
- Maintenance of network documentation

Required Information: Bidder's proposal shall describe recommended practices and available components (whether included or at extra cost). Bidder shall state whether the proposed AMI provides an alternate means of collecting AMI data if part or all of the AMI Network is inoperative. Please describe the alternate means of data collection, if provided.

6.29.2.6 Endpoint Failure Recording

Required: The management capabilities of the proposed AMI Master Station and AMI Network shall effectively detect, record, and annunciate significant errors and failures of AMI meters and other AMI end-point devices (if any).

Required Information: Bidder shall describe how the AMI Master Station and AMI Network will support effective detection, logging, reporting, and notification of errors and failures in meters and other end-point devices.

6.30 AMI Integration

Required Information: Bidder shall clearly and fully describe the proposed AMI's provisions for effective integration with DLC's other information systems and IT infrastructure. As a minimum, Bidder shall respond to the integration requirements and preferences described in the following subsections.

After performing its initial evaluation of Bidders' responses to this RFP, DLC will select a "short list" of prospective AMI providers who will be evaluated in greater depth before DLC makes its final Bidder selection. Bidders selected by DLC for further consideration, will be required to prepare a complete response to a detailed IT integration assessment survey. For Bidder's reference, the survey is provided with this RFP in Attachment J - DLC IT Integration Assessment Survey.

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6.30.1 DLC's IT Environment

6.30.1.1 Server Hardware

Required: All servers and other elements of the AMI Master Station shall utilize hardware that is commonly available on the open market and complies with the following criteria:

- Serviced by standard maintenance requiring no special procedures;
- Covered by manufacturer warranty;
- No proprietary or custom components or processes;

Valued Attributes: DLC will favor AMI proposals featuring systems that employ IBM or Dell server hardware.

6.30.1.2 Server Operating Systems

Most of DLC's servers run on AIX, or Windows.

Required: For Windows-based application servers, the OS must be Windows Server 2003, or later, with a migration path to Windows Server 2008.

Valued Attribute: If the proposed solution employs an Oracle database, then DLC will prefer to have the database servers run on AIX.

6.30.1.3 Virtualization

DLC is committed to effective use of server virtualization and load sharing for servers supporting application processes and web services.

Valued Attribute: DLC will favor proposals featuring an AMI Master Station that is readily compatible and proven with at least one widely applied virtualization solution (i.e. VMware, Xen, etc.).

6.30.1.4 Security

Required: DLC employs LDAP and Active Directory for identification, authentication, and authorization of users and external processes and the AMI must interoperate with these.

Required: The proposed AMI Master Station shall comply with the following security criteria:

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Security for software running on Windows servers must interoperate with Active Directory

Full compliance with Sarbanes –Oxley (SOX) requirements for security management

6.30.1.5 System Operations

Valued: DLC uses OPC Tracker and Tivoli Workload Scheduler for centralized planning, execution, and tracking of the processes running on its multiple systems; consequently, DLC will favor proposals featuring AMI Master Stations that readily interoperate with Tivoli Workload Scheduler for purposes of job control. Potential future upgrades may be to the following systems:

- BMC, Control-M product
- IBM, Tivoli TWS/z and TWS/d
- UC-4, Operation Mgmt/Application Mgmt.

Required Information: Bidder shall identify the system schedulers it supports and how its AMI Master Station interoperates with each.

6.30.1.6 Network Monitoring & Management

Valued: DLC is employing HP OpenView for centralized monitoring and management of its enterprise network resources; consequently, DLC will favor proposals featuring AMI elements that readily interoperate with HP OpenView.

Required Information: Bidder shall identify all proposed AMI elements that are SNMP-enabled.

6.30.1.7 File Sharing

DLC employs the usual variety of file sharing and transfer technologies applied in an open systems environment (FTP, SFTP, NFS, SFS, SMB, etc.).

Required Information: Bidder shall identify all means of file sharing/transfer that can readily interoperate with the proposed AMI Master Station applications and file systems.

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6.30.1.8 Database Software

DLC's largest and most critical database systems run on Oracle. Microsoft SQL Server is also employed on a few Windows-based systems.

Required: The proposed AMI Master Station's database software shall comply with the following criteria:

If the proposed system uses Oracle, then the version must be 10G or higher

Full compliance with SOX requirements for data versioning, auditability, and integrity

Valued: DLC prefers to have the AMI Master Station database run on Oracle. Nonetheless, if Bidder provides persuasive reasons for doing so, DLC will consider a Master Station running MS SQL Server.

6.30.1.9 Database Structure

Valued: DLC's business, engineering, and operating functions extensively employ Crystal Reports as its preferred analytics and reporting tool for extracting and analyzing information from DLC's database systems. Generally, Crystal Reports works best when a database system has a loosely-coupled database structure that facilitates analytic queries, report design, and report production. Consequently, DLC will favor proposals featuring loosely-coupled database structures in the AMI Master Station.

Required Information: Bidder shall describe the proposed data model structure and any restrictions on querying the data directly from a third party tool.

6.30.1.10 Enterprise Data Storage

DLC employs an enterprise data storage architecture based on an Equi-Logic SAN that is managed by Tivoli Storage Manager.

Valued: DLC will favor proposals featuring an option where the AMI Master Station employs DLC's enterprise storage system as its primary resource for storing AMI data.

Required Information: If utilization of DLC's enterprise storage system is proposed, then Bidder shall present evidence of compatibility and/or proven interoperation with the same type of storage system.

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6.30.1.11 Workflow Management

Valued: DLC does not currently have an enterprise standard for workflow management. Nonetheless, DLC recognizes the many benefits of workflow management and will value proposed AMI Master Stations that include workflow management capabilities – especially if those capabilities are open to integration with external systems.

6.30.1.12 Network

DLC's enterprise computer network employs all of the network technologies and protocols typically used in a large, integrated, utility computing environment comprising a mainframe, UNIX servers, Windows servers, and Wintel workstations.

Required: DLC expects that any proposed AMI Master Station will be entirely compatible with its network environment.

Required Information: Bidder shall clearly and fully describe the network technologies and protocols that will readily interoperate with its proposed system architecture. Any significant exceptions must be specifically noted. Short-listed Bidders will be required to describe the likely network bandwidth needed for each of the system's major internal and external interfaces (application server – database server, AMI – MDMS, etc.).

6.30.1.13 User Interfaces

Valued: DLC prefers proposals featuring AMI user and administrator interfaces that require nothing more than a standard Web browser (IE6 or later) in the workstation. Proposals that require installing and operating any additional software component(s) on any user workstation are discouraged but not prohibited.

Required Information: Bidder shall clearly and fully describe any requirement(s) for adding software (application or other) to user and/or administrator workstations. If such software is necessary, Bidder shall specify the following:

- workstation hardware, software, and configuration requirements;
- recommended processes for deployment, upgrades, and patches;
- external resource dependencies.

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Valued: DLC will favor proposals featuring AMI user and administrator interfaces that can be implemented using Citrix and/or VPN technologies.

6.30.1.14 Disaster Recovery

DLC uses IBM's Tivoli Storage Manager (TSM) as its standard tool for performing application and database backup.

Valued: DLC will favor proposals featuring an AMI Master Station that is certified/compliant with IBM's TSM system.

Required Information: Bidder shall indicate whether or not its proposed AMI Master Station is certified/compliant with IBM's TSM. Bidder shall also identify any other storage or backup management systems with which its system is certified/compliant.

6.30.2 DLC's IT Integration Framework

DLC has selected Oracle's family of Fusion, SOA, and Service Bus products as the foundation for integrating its information systems.

Required: The proposed AMI Master Station shall effectively employ SOA and/or ESB technologies for communication among its application modules and for interoperation of its system components with DLC's other information systems.

Required Information: Bidder shall clearly describe how its proposed AMI Master Station will fulfill this requirement.

6.30.3 System Interfaces

For the purposes of this RFP, a system interface comprises the hardware and software that performs the physical and logical functions needed for a specific type of message and/or data exchange between two distinct systems. Based on this definition, two systems can be linked by multiple interfaces.

Required Information: Bidder's proposal shall identify and recommend specifications for all required interfaces between the proposed AMI and other DLC systems, including (but not limited to):

- the meter data management system

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- security applications
- domain name server
- DHCP server
- network time server
- network management applications
- job scheduling and control
- enterprise storage management system
- network printing
- network file systems
- electronic mail
- etc.

6.30.4 Meter Data Management System

DLC plans to purchase *and* install a meter data management system (MDMS) in time for it to be integrated with the initial AMI deployment. The MDMS *will* serve as the primary repository and pre-processor (i.e. VEE, outage data reduction, etc.) of all measurement, status, and event data collected by the AMI. The MDMS will also serve as the gateway for communications with the AMI supporting data requests, commands, and alert messages from/to DLC's other information systems (CIS/Billing, OMS, load control, work management, etc.).

Required Information: Bidder shall clearly and fully describe the proposed AMI's ability to support the integration capabilities and attributes specified in the following subsections:

6.30.4.1 Commissioning – MDMS Notifies the AMI Master Station

Required: The AMI Master Station shall "commission" a meter and begin sending the meter's data to the MDMS only when the MDMS notifies the AMI Master Station that it has associated the meter with its Service Point and Customer Account and cleared the meter change order.

Valued: If the AMI Master Station supports aliases for the meter (or communications device) then the commissioning process should provide the Service Point as alias information.

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6.30.4.2 Non-Commissioned Devices – AMI Notifies the MDMS

Valued: The AMI Master Station should notify the MDMS when a registered and communicating AMI meter has not been commissioned within a configurable period of time. This will allow the MDMS exception management functions to track down order completion data to complete the process.

Required Information: Bidder shall describe the AMI Master Station's interactions with MDM to ensure that an end-point device is known and properly correlated to "Service Points" and Accounts prior to data being sent to the MDM.

6.30.4.3 Meter Errors and Events

Valued: The AMI Master Station should notify the MDMS when it receives data from an AMI meter that indicates an error and/or event that could affect the availability or accuracy of the meter's interval and/or register data.

6.30.4.4 Interval Channel Data

Required: The AMI Master Station shall deliver to the MDMS meter interval data that correlates to the meter's corresponding register data. Every interval must be accounted for, even if there is no data for the interval. If the AMI provides its interval data in the context of "day-light-savings" time, then the interval data associated with the Fall crossover day should represent a 25 hour day and the interval data associated with the Spring crossover day should represent a 23 hour day.

Valued: There should be no gaps or overlaps in the sequential series of meter interval data sets delivered from the AMI Master Station to the MDMS.

6.30.4.5 Register (Scalar) Data

Required: The AMI Master Station shall deliver meter register data to the MDMS on both a scheduled basis and when queried through a service request from the MDMS. When the reading includes a demand register, the act of reading shall invoke a reset of the demand register once successful transmission of the read has been confirmed.

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6.30.4.6 Service Switch Operation Requests

Required: The AMI Master Station shall provide to the MDMS an interface that allows the MDMS to request operation (open or close) of an AMI meter's internal service switch. The AMI Master Station shall confirm receipt of each service switch operation request from the MDMS, attempt to execute the requested operation, and immediately communicate the outcome of the operation to the MDMS.

6.30.4.7 Service Switch Operation Events

Required: The AMI Master Station shall immediately notify the MDMS when an AMI operator or another DLC system requests operation (open or close) of an AMI meter's internal service switch. The AMI Master Station shall immediately report to the MDMS the receipt and outcome of each service switch operation request.

6.30.4.8 Service Switch Status Requests

Valued: The AMI Master Station shall provide to the MDMS an interface that allows the MDMS to request on-demand acquisition of the status (open or close) of an AMI meter's internal service switch.

6.30.4.9 Repeat Data Delivery to the MDMS

Required: The AMI Master Station shall support repeat deliveries of meter data to the MDMS when requested by the MDMS.

6.30.4.10 Coordinated Data Caching and Purging

Valued: The AMI Master Station and MDMS should automatically coordinate caching and purging of the meter data stored in the AMI Master Station. If this capability is supported, then each meter data item must remain stored in the AMI Master Station at least until the MDMS communicates positive confirmation from that the data item has been successfully received and processed.

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6.30.4.11 Scheduled Data Caching and Purging

Required: If the AMI Master Station and MDMS cannot automatically coordinate caching and purging of the AMI Master Station's stored meter data, then the data shall be retained in the AMI system for a configurable period of at least 45 days; after which the AMI Master Station shall automatically purge "end-of-life" data.

6.30.4.12 SOA Request Packages

Valued: DLC will favor a proposed AMI Master Station with SOA-based interfaces that employ defined service packages to support various types of interaction with other DLC systems. Package types might include:

Remote Outage Reads

A package for outage reads may equate to a single voltage read for a single phase service but would equate to reading voltage on each phase of a polyphase service with the same single request and response.

Remote Billable Reads

A package for billable reads will return all registers and interval channels that are marked as billable through a commissioning/remote-programming exchange with the MDM. If the rate structure for an account requires kVARh in addition to kWh, then the response to the package request should return all UOMs (Units of Measure).

Remote Disconnect

A package for a remote disconnect request. This package should include executing the "Billable Read" package after performing the disconnect function.

Remote Reconnect

A package for a remote connect request. This package should include executing the "Billable Read" package prior to performing the connect function.

Remote Programming

A package for a remote program change. . This package should acquire ALL current meter data both before and after executing the program change.

Synchronous and Asynchronous Services

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Packages should support both synchronous and asynchronous requests where the package allows a synchronous interface to request an asynchronous response. For example, this might be used in conjunction with group command requests (discrete or packaged) which return multiple responses for one request.

6.30.4.13 Multi-Instance Load Balancing

Valued: If the AMI Master Station comprises multiple system instances, then provisions should be made with the MDMS (and any other client system) to ensure that the MDMS knows which instance to communicate to for commissioning and service request fulfillment.

6.30.4.14 Normal versus DR-Failover Controls

Valued: The AMI Master Station should notify the MDMS when it switches between its configuration for normal production operation and its disaster recovery configuration.

6.30.4.15 Continuous Operations (24 by 7) Release Management

Valued: The AMI Master Station should notify the MDMS when the release level of key software (application, database, and OS) of any AMI system instance changes. At a minimum, notifications should be communicated for any release changes that impact interface protocols or behaviors.

6.30.4.16 Component Health States

Valued: The AMI Master Station should notify the MDMS when a malfunction that could impact data acquisition is detected in an AMI component. The MDMS will use the received notification(s) when performing "root cause analyses" for missing data or other exception conditions.

6.30.4.17 Clock Management Events

Required: In the event when a meter or system clock change can impact interpretation of meter data, the AMI Master Station shall notify the MDMS in a way that allows the MDMS to timely react with appropriate exception control.

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6.30.4.18 Support for MDMS Interface Testing

Valued: DLC expects that the AMI provider will employ various tools for its Quality Assurance (QA) testing. DLC will value an AMI proposal in which the AMI provider shares appropriate tools for testing the interface between the AMI Master Station and the MDMS. Tools valued by DLC include test drivers, protocol simulators, and a collection of sample test cases as described below. Any tools provided by the AMI provider should be reviewed, and if necessary updated, with each new release of AMI Master Station software.

Test Drivers to simulate meter data coming out of the AMI system and would also simulate SOA service requests going into the AMI system. This would be directly related to test cases so that the MDMS could test inputs without a live AMI system and could compare SOA requests generated to those provided by the test drivers.

SOA Service Simulators to provide responses to service requests to simulate what the live system will do. If the simulator is designed to support specific test cases, a live system would not need to be configured to support initial MDMS tests for various services. This would also provide a behavior comparison between the simulator and the live system which is configured to test the same test cases.

Test Cases are not expected to cover the specific issues to be tested by DLC but will instead provide an example to be followed by DLC when we use the testing tools.

6.30.4.19 Integration with MDMS Products

Required Information: Bidder shall explicitly indicate whether and how its proposed AMI can readily integrate with MDMS products currently available from each of the following vendors: Itron, eMeter, Aclara, Ecologic Analytics, Energy ICT, and Oracle. Information regarding integration with MDMS solutions from other vendors is also of interest. DLC will particularly value examples of successful integration between the proposed AMI product and MDM systems at other electric utilities.

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6.31 AMI Documentation

6.31.1 Describe the Proposed AMI

Required Information: Bidder's proposal shall identify, describe, and quantify each component of the proposed AMI. The proposal shall also provide a concise narrative description of the overall AMI operation, with a specific explanation for each significant hardware and software component in the system architecture. All issues and remedies related to system performance shall be discussed, especially those regarding:

- communication range
- customer density
- data latency
- data transport capacity
- susceptibility to electromagnetic interference
- fault tolerance

Bidder shall support the description of the proposed AMI with a block diagram showing the following items and functions, as a minimum:

- Meter with AMI communication capability
- AMI Network
- AMI Master Station
- Data storage and interface to DLC's enterprise storage system
- Presentation and analysis functions, including analysis resources for DLC analysts and Web interface for customers

Unless otherwise stated in Bidder's AMI proposal, all AMI attributes, functions, and services described in the proposal will be understood to be included in Bidder's pricing for the proposed AMI. Any described attributes, capabilities, or services that are not included in the Bidder's price for the proposed AMI must be explicitly identified and priced as extra cost options.

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6.31.2 Identify Third-Party Sources

Required Information: Any significant aspect of the system that is to be provided by a source other than the Bidder shall be described in detail and will be identified as "by others." Otherwise, DLC will understand that the proposed AMI is a complete "end-to-end" solution provided entirely by the Bidder.

6.31.3 Provisions for Space, Mounting, Power & Environmentals

Required Information: Bidder's proposal shall clearly and fully describe Bidder's expected requirements for equipment space, mounting arrangements, power, and environmental conditions to be provided by DLC in support of the AMI implementation.

6.31.4 Deployed AMI Design & Configuration

Required: Prior to initial AMI acceptance, the AMI Provider shall produce and deliver text, tabular, and graphical documentation that clearly and accurately describes the deployed AMI. The provided documentation shall describe the asset identification, location, product specifications, installed configurations, physical interconnections, and logical interfaces for all hardware, software, and network elements of the AMI Master Station, the AMI Network, and for each interface between the AMI and other DLC systems.

Required Information: Bidder shall describe the proposed content, formats, tools, and procedures for producing and delivering the required documentation. DLC invites Bidders to provide representative samples that effectively illustrate the nature of their documentation framework.

6.31.5 Manuals

Required: At the time of formal project launch, the selected AMI Provider shall deliver to DLC a suitable quantity of each applicable product manual in hardcopy form. The suitable quantity of hardcopies for each of manual will be established during contract development.

Required Information: Bidder's AMI proposal must include a softcopy of each user, administrator, and technical support manual for each distinct hardware and software element of the proposed AMI.

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6.32 AMI Training

Required Service: Before and during the AMI deployment, Bidder shall provide comprehensive training at utility-provided facilities for various levels of DLC personnel and DLC contractors who will:

- install meters and/or AMI customer premises equipment
- operate, administer, and maintain the installed system
- troubleshoot, diagnose and repair the installed system

Required Information: Bidder shall clearly and fully describe the proposed curriculum, resources, and methods for training DLC personnel and contractors.

7 Acceptance Test

7.1 Description of Acceptance Test

DLC will require the selected AMI Provider to conduct an Acceptance Test to establish that the provided AMI meets the function, performance, reliability, coverage and serviceability objectives set forth in this RFP and, further, as represented by the selected AMI Provider in its proposal and in all subsequent presentations or discussions, if any.

This section illustrates DLC's expectation and intention to Bidders, so that Bidders may include in their proposals the effort needed to support the Acceptance Test. When a Bidder has been selected, DLC will discuss reasonable adjustments to this procedure to conform to Vendor-specific technical realities provided that such adjustments do not diminish the adequacy of the Acceptance Test to verify the desired AMI attributes.

This RFP establishes the functions and performance that are required, which must be met, and functions that are valued, which may be met. The Acceptance Test is intended to verify both. Details of the Acceptance Test will be negotiated with the selected AMI Provider before final contract signing. The Acceptance Test will be constructed to be suitable for rigorous verification of the acceptability of the provided AMI. Conditions for final acceptance of the completed AMI will be described in the negotiated contract with the selected Bidder(s).

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Acceptance testing will be in stages and payment milestones and contract termination clauses may apply to each stage as negotiated with Bidder. The final stage of the Acceptance Test will be performed upon complete deployment of the proposed system.

7.2 Acceptance Test Overview

This section describes the Acceptance Test DLC will require the selected Bidder to conduct. The Acceptance Test is contractually binding on both DLC and the selected Bidder, and will establish milestones for both parties. The selected Bidder will be responsible for organizing and conducting the Acceptance Test, which will be monitored and witnessed by DLC.

Required Information: The Bidder shall provide a proposed Acceptance Test Plan.

7.2.1 Purpose

The Acceptance Test will demonstrate the ability of the AMI to perform in conformance with the specifications in the contract under the most demanding conditions likely to occur during the operating life of the system. Specific maximum and minimum conditions should be noted in the acceptance test plan. The purpose is to establish that the selected AMI Provider has met all obligations and that the system performs as required by DLC.

Functions exercised will include all those listed in this RFP document.

7.2.2 Approach

The Acceptance Test will exercise all functions that reasonably can be deliberately exercised. Some features of the system will not be practical to test, such as tolerance of direct or near lightning strike. Except for such functions, the Acceptance Test will exercise all AMI features and capabilities, and will measure the performance to the fullest extent practical. To this end, some functions will require simulation test/contrivance. DLC will pursue and assemble contrivances as needed for the Test, and will require the selected AMI Provider to participate and support the work. Examples may include temporary minor software alterations or additions to enable system test without executing actual field functions, simulation of discrete events such as tamper flags, and/or adjustment of the system clock to simulate passage of long time intervals in a short test interval. The Acceptance Test will occur in stages to identify problems early and to establish confidence for the continuing work and funding. Early tests will

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demonstrate system viability, compliance with the submitted proposal and validate deployment processes. A final Acceptance Test Stage will exercise all capabilities of the provided AMI.

7.2.3 Stages and Timing

The test will comprise six (6) stages. Formal sign-off accepting each stage must occur prior to proceeding to the next stage.

7.2.3.1 Shop Test

DLC will conduct initial testing in the meter shop to test and affirm acceptable programming and accuracy prior to field deployment. The Shop Test will exercise communication over the AMI Infrastructure and acceptable AMI meter performance prior to deployment of a larger test population for the initial test.

If more than one AMI technology is proposed each AMI will be tested for compliance and system acceptance. Failure of one system will constitute failure for all systems.

7.2.3.2 Initial AMI Test

This test will verify the reliable performance and security of the network systems to communicate with customer meters. This includes testing of information security and recoverability.

Required Information: The Bidder shall provide a description of the proposed plan to verify AMI Network operability. When approximately 5,000 meters are equipped, the Initial Network Test will exercise most system functions and measure performance to identify any problems and assure that the system is performing as expected including the system and network management functions.

7.2.3.3 Integration Test

This test will verify the integration of various (or all) key elements/components in the complete AMI solution. The purpose of integration testing is to verify functional, performance and reliability requirements placed on the critical components.

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Required Information: The Bidder shall provide a description of the proposed plan for integration testing.

This test may be conducted concurrently with the Initial AMI Test.

7.2.3.4 Usability Test

This test will assess the usability of the AMI components that feature human-interface functions.

Required Information: The Bidder shall provide a description of the proposed plan for usability testing.

This test may be conducted concurrently with the Initial Network Test.

7.2.3.5 Active AMI Deployment Test

This test will verify readiness of the system to support DLC business processes end-to-end. This test shall include performance/load/stress testing, security testing, and recoverability testing.

Required Information: The Bidder shall provide a description of the proposed plan to ensure that *all AMI capabilities are fully operational for all functions as specified in this RFP.*

7.2.3.6 Final Acceptance Test

The Final Acceptance Test will follow completion of 99% of the deployment.

7.2.4 Documentation of the Acceptance Test

Documentation of the Acceptance Test will comprise the Acceptance Test Plan and the Acceptance Test Procedure. Both documents will be drafted by the selected AMI Provider, and developed collaboratively by DLC and the selected AMI Provider

7.2.4.1 Acceptance Test Plan

The Acceptance Test Plan is the document that defines the test structure and content. Creating this document is the means by which DLC and the selected Bidder will reach agreement on the Acceptance Test details.

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Required: The Bidder shall provide a proposed Acceptance Test Plan. The Acceptance Test Plan will identify all tests and describe the means by which they will be supported and executed. It will describe any fixtures, contrivances, system modifications or other support elements. And it will identify all functions tested in each major step of each Stage of the Acceptance Test. It will describe the consequences of test failure, the alternatives available for the AMI Provider to remedy failure, and the consequences of subsequent repeated test failure.

7.2.4.2 Acceptance Test Procedure

The Acceptance Test Procedure is the document that guides the execution of the test and serves as the contractually binding record of AMI success. For every step of each test stage, the Acceptance Test Procedure includes individual paragraphs that:

- Name the test step
- Provide operator instructions as needed to guide the people conducting the test
- Explicitly describe the expected test results
- Provide a place to record actual results
- Provide a signature line for the initials of authorized utility personnel witnessing the test
- Provide a signature line for the initials of the AMI provider to co-sign on the steps that fail

The AMI Provider shall document the Acceptance Test, the methods, and the performance parameters demonstrated in the form of a brief (less than15 pages) Acceptance Test Report. When the Acceptance Test is complete, every signature line of the Acceptance Test Procedure shows the initials of the authorized DLC witness(es) attesting to successful execution. Upon successful Acceptance Test completion, DLC will be contractually obligated to formally accept the AMI and complete payment to the AMI Provider.

7.2.5 Progress Verification Tests

DLC will conduct tests at intervals during deployment to verify that system elements continue to perform satisfactorily. These Progress Verification Tests will be less rigorous than the Acceptance Test, but will not be less formal. DLC expects that progress payments to Bidder will be contingent on successful Progress Verification Tests.

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8 Installation Services

The Installation Contractor will be responsible for all aspects of planning and managing the delivery of an AMI System, including the installation of AMI Meters, and any necessary meter collection points (MCP). The Installation Contractor will be responsible for all subcontracts for services, equipment required, and facilities to deliver the proposed solution.

Bidder will specify the quantity of MCPs, their locations, and will propose installation services for the MCPs. The deployment of AMI Meters for a particular route will be scheduled to occur after the communication network that supports the meter's ability to self-register with the head-end system has been deployed and successfully tested in that area.

8.1.1 AMI Installation Schedule

Pending approval of the SMPI Plan by the PUC, DLC expects to begin installation of 8,000 Smart Meters in the fourth quarter of 2012 with system-wide completion of approximately 610,000 meters by year-end 2018. 8,000 meters will be installed during the fourth quarter of 2012 and 120,000 meters will be deployed every year after. Duquesne's desire is to complete meter installation in lots of 2,500 by geographic region.

DLC desires that routes/zones will be sequentially converted to AMI from AMR by geographic regions (to be later defined by DLC). Each route/zone shall be completed to the fullest extent possible before work begins on another route/zone.

The Installation Contractor will ensure that meter installations occur outside of the billing window (billing window for electric is a 7 day period, 3 prior and 3 after the scheduled reading day) so that customer bills are not adversely affected.

Required: Bidders will propose an installation schedule and associated costs based the installation beginning in fourth quarter of 2012 ending in 2018.

Required Information: Bidders shall present and describe an alternative, shortest feasible, installation schedule that may be better suited for DLC. It is expected that, based on experience, Bidders will identify an ideal deployment schedule that balances the deployment effort, staffing, duration, and costs. Bidders shall describe the impact on costs and project risks if DLC were to adopt this alternative schedule. Pricing for this alternate should be included in the pricing table.

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Required Information: DLC will be required to install AMI meters to any customer who selects the option, even if the required infrastructure is not in place yet. DLC will handle the one off installations. Installation Contractor shall explain its approach to handling these one-off installations.

8.1.2 Meter Collection Points Installation

Required Information: Bidder shall describe the process for installing MCPs and associated equipment such as antennas or repeaters.

Required: Bidder must adhere to all Pennsylvania State and Federal licensure requirements for the installation of towers, MCPs, antennas, repeaters, etc.

Required Information: Bidder will provide a proposed installation diagram that shows spacing requirements and where the MCP and associated equipment will be placed on the poles or towers.

Required Information: Bidder will provide the specification sheet on the MCP and associated equipment. Specification must include how the MCPs will be powered and any battery requirements. If multiple MCPs or antenna models are prescribed, then specification sheets will be included for each model.

Required Information: Bidder shall describe the amount of "make ready" work that is typically needed before a MCP is installed. Bidder shall describe DLC's level of involvement with the MCP rollout.

8.1.3 Hardware Inventory Requirements

A proposal shall include provision by Bidder of all required warehouse, shop, and office space. DLC can't provide indoor and\or outdoor space on company owned property to accommodate Installation Contractor's requirements.

DLC envisions that all equipment will be shipped directly from the manufacturer to a location determined by the Installation Contractor. The Installation Contractor shall assume custodial responsibility upon receipt.

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Required: The Installation Contractor will be responsible for receiving the AMI Meters and performing incoming inspection tests (in accordance with Bidder proposed Acceptance Testing structure defined in Section 7). The Installation Contractor will also be responsible for warehousing, distributing, and installing the AMI Meters, and MCPs, maintaining an adequate supply, and disposing of the legacy devices. Meters will be delivered to the Installation Contractor and DLC will test a number of meters prior to installation.

An electronic file(s) will be provided to DLC for loading equipment, data, including acceptance test results, into the DLC the existing AMS2000 Automated Micro Systems.

Required Information: Bidder shall describe its experience and proposed inventory control procedures and work flows with regard to receipt, testing, storage and transfer of assets. Bidder shall describe its procedures for physical security that will be in place to protect the meter inventory, warehouses, and datacenter, etc.

Valued: Bidder shall describe proposed capabilities to support barcode reading for automated asset tracking through the supply chain process from receipt through installation.

8.1.4 AMI Meter Installation

The chosen Bidder will be required to change out all single phase and polyphase self-contained meters. Bidders are also asked to propose solutions for changing out transformer rated meters; however, DLC may elect to perform some of this work with internal resources.

Required: DLC has approximately 30,000 Alpha (transformer rates and self-contained) 3-phase meters and single phase meters connected via telephone lines. Some of these locations have multiple meters connected via one phone line. Installation pricing should be reflective of this requirement. Attachment D – DLC AMI Pricing Table indicates these meters with a *** denotation.

Required Information: Bidder shall describe, in detail, the meter change out process including any new AMI procedures (i.e. meter programming checks, voltage checks, installation verification, AMI communication verification, safety practices, etc.). Bidder shall describe its associated quality assurance and quality guarantees/warranty to DLC.

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Required: Bidder shall propose to perform single phase and polyphase self-contained meter installations, single phase and polyphase transformer rated installations.

Valued: Bidder shall describe and price the process for providing an electronic picture of the removed meter prior to removal.

Required Information: Explain multi-meter installation process to ensure there will be no mixed metering.

8.1.5 Used Meter Disposition

Legacy meters removed from the field will stay under the Installation Contractor's control until disposal. Only meters that are tagged for energy diversion or additional testing will be transferred to DLC.

Required: Bidder shall plan to store used meters for 60 days after removal for possible retrieval related to billing inquiries resulting from the new AMI Meter installation.

Required: Bidder shall propose a plan for selling and/or disposing of the legacy meters in accordance with State laws and good business practices. Plan shall specifically address the process to dispose of any hazardous materials.

Required Information: Bidder shall describe its assumptions, provisions and requirements pertaining to Bidder's management of meter inventory.

8.1.6 General Installation Information

8.1.6.1 Work Hours and Restricted Installation Periods

Required Information: Bidder shall propose a standard work schedule (hours & days of the week) for all installation work. Bidder will identify any restricted installation periods. Bidder shall also identify any work schedules that result in added costs.

Valued: DLC prefers 7 a.m.-3:30 p.m. Monday through Friday for normal work hours, excluding DLC standard holidays. Work hours may be altered from summer to winter. No installation contractor will be allowed on customer premise after dark.

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8.1.6.2 Meter Seals, Keys, and Barrel Locking Rings\Devices

DLC has customer keys that are needed for accessing 3.2% (19,350) of the total accounts. The accounts that require keys are coded in the CC&B system. This information will be included in the route/zone download file that will be provided to the installation contractor.

DLC has approximately 15% (92,000) barrel lock. Of the total barrel lock population, 3.3% (3000) would have to be cut-off and replaced. DLC will provide meter seals, locks, and\or barrel locks for securing the meter installations.

Required Information: Bidder shall recommend a process for controlling the inventory and disbursement of seals, keys, and barrel lock keys. Bidder shall include a process and timeline for reporting lost keys and/or locks.

8.1.6.3 A –Base Meters

DLC has less than twenty (20) A-Base meters. DLC Meter Operations will install socket adapters and the new AMI meter at all sites having an A-Base meter.

8.1.6.4 Customer Information and GPS Coordinates

DLC has provided the manual meter reading routes that include the premise address of each meter. See Attachment H AMI Meter Locations.

Required: Bidder shall describe and include in the installation price its ability to provide GPS coordinates of all electric meter locations upon AMI Meter installation. This information would be included in the upload file of meter installations that will be provided to DLC.

8.1.7 Deployment Management

8.1.7.1 Approach and Appointments

Required Information: Bidder shall describe the proposed approach to managing the scheduling, completion, and close-out of individual installations. Bidder shall propose a detailed process for setting meter change-out appointments with customers whose meters require customer to be present. Bidder shall include appointment timeframes (e.g., +/- 2 hours) and process for rescheduling should either party fail to meet the appointment. Bidder shall define the

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maximum number of attempts that they will make to access meters prior to turning them over to DLC. Bidder shall specify any additional costs for attempts beyond the stated maximum.

Required Information: Bidder shall include a process for communicating to DLC its meter change-out appointments with customers so that DLC's Customer Service Representatives are aware of these appointments.

Required Information: Bidder shall describe the progress reports that DLC can expect to receive during the deployment. Bidder shall provide sample control reports and metrics used to measure performance.

8.1.7.2 Problematic Installations

To facilitate an efficient rollout, Bidder will be required to report any unsafe conditions that occur during the meter change-out process that becomes a safety concern to DLC. DLC will be responsible for the repair. The cost of repairs will be borne by DLC, unless the damage is caused by the negligence of the Bidder or its contractor.

Required: When an unsafe condition or evidence of meter tampering is found, DLC shall be notified immediately, and the contractor will vacate the premises if they deem it unsafe to stay on property.

Required: Bidders shall take an electronic picture of each problematic installation that occurs and shall be provided to DLC.

Required: During installation of a route/zone, if Installation Contractor finds a premise that is not on the change out list, this premise address shall be reported to DLC immediately.

Required Information: Bidder shall propose a process for identifying and completing repairs to damaged sockets and the timely reporting of these situations to DLC. Bidder shall propose payment terms and conditions that include details such as labor rates, material markups, needed authorizations, or administrative costs.

Required Information: Bidder shall propose a process to inspect electric metering facilities for obvious signs of tampering including, but not limited to: jumpers, tampered meters, un-metered load on the line side of the meter, damage caused by apparent attempts to open the meter and\or socket, etc. The process shall include taking a picture of the tampering and a means to report tamper/theft discoveries to DLC.

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Required Information: Bidder shall propose a process for reporting any unsafe situations to DLC immediately.

8.1.8 Installation Data Management

A significant amount of data will be gathered during the AMI Meter change-outs. This data must be captured, secured, stored, verified and transferred to DLC. DLC's intention is to leverage the Installation Contractor's experience to best achieve a smooth and efficient rollout of AMI Meters while mitigating risk.

Required Information: Bidder shall propose the means and procedures for reliably capturing the installation-related data and then transferring the data electronically to DLC daily. Bidder shall propose a process for ensuring that the data that it captures and reports back to DLC are accurate and complete. DLC envisions that data would be electronically provided before 6:00 a.m., or sooner if possible, the next working day after the meter change-out. If a list of standard items exists, Bidder shall provide it to DLC. The following list is a starting point for discussion.

- ID of the installer
- Address of premise
- Date and time the order is completed
- Final read of the removed meter
- Interval data from the removed meter within 3 working days, if applicable
- Meter number of the removed meter
- Read from the newly set AMI Meter (dial reads should be zero on all new meters)
- Meter number of each AMI Meter
- AMI device ID attached to the AMI Meter (this will be dependent on the type of electric meter and AMI selected)
- GPS coordinates of the installed AMI Meter
- Meter location code
- Results of tamper inspection

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- Results of socket inspection for correct ANSI Form
- DLC follow-up flag due to incorrect data found in the field
- Comment section to include the incorrect versus correct data found
- Other items to be outlined during negotiation process
- Picture of new AMI Meter installed (valued)

Required: Bidder shall propose and describe any Meter Installation tools that would be needed by DLC personnel doing AMI Meter installations.

8.1.9 Customer Communications & Contact

It is DLC's intent to minimize the impact on the customer during the meter change-out process. DLC strives to continuously improve customer service and satisfaction and are looking for Bidders with similar focus on the customer experience.

Required Information: Bidder shall briefly (no more than one page) describe its experiences and its process for achieving the highest level of customer satisfaction throughout the AMI Meter deployment.

7.3.9.1 Notification Means

Required: Bidder shall notify customers by US Mail two weeks in advance of the meter change-out. Bidder shall provide a copy of the proposed notice for DLC's review, edits and approval. DLC notices should include company logos, company generated content, and appropriate contact information.

Valued: Bidder shall leave a Bidder supplied door hanger after completing the meter change-out. During negotiations, Bidder shall provide a sample of the proposed door hanger for DLC review, edits, and approval. The DLC door hangers should include company logos, company generated content, and appropriate contact information.

7.3.9.2 Meter Change out Provisions

Required: The installation contractor will be required to adhere to all DLC's meter change out and installation procedures.

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7.3.9.3 Customer Call Center (CCC)

Required Information: Bidder shall describe the Customer Call Center proposed for communicating with DLC's customers. Bidders shall define the lines of responsibility among DLC and the Installation Contractor, and the Installation Contractor.

Required: Installation Contractor shall report to DLC all calls on record. DLC may chose to implement the CCC using its own resources.

Required Information: Bidder shall list and describe the types of situations and the process used when contacts from DLC customers to its customer call center require transfer to DLC. Description shall include proposed policies, procedures, and approach for transferring customer contacts from Bidder's customer call center to DLC.

Required Information: Bidder shall describe the proposed approach to maintaining an excellent service level and processes for customer complaint resolution.

Required Information: Bidders shall describe the process and frequency for apprising DLC of customer complaints, service levels, and satisfaction.

7.3.9.4 Use of Automation to Interact with Customers

Required Information: Bidder shall describe any planned use of electronic mail for handling interactions with DLC customers, including the process the Bidder will use. If Bidder proposes using electronic mail as part of its customer call center solution, then DLC must review and approve all elements of the planned electronic mail interaction with customers prior to activation of the electronic mail service.

Required Information: Bidder shall describe any planned use of a web portal for handling interactions with DLC customers. If Bidder proposes using a web portal as part of its customer call center solution, then DLC must review and approve all elements of the planned web portal prior to its activation.

Required Information: Bidder shall describe any planned use of Bidder's interactive voice response (IVR) system for handling calls from DLC customers to Bidder's customer call center. If Bidder proposes using an IVR as part of its customer call center solution, then DLC must review and approve all elements of the IVR's interaction with callers prior to IVR activation.

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7.3.9.6 Customer Claims

Required Information: Bidder shall provide its policies and procedures for managing customer claims in a timely manner. Bidder shall propose a process for communicating customer claims to DLC.

8.1.10 Human Resource Management

Required Information: Bidder shall describe its proposed hiring process and screening practices. DLC desires to know if Bidder's tendencies are to hire locally or bring in workers from out of state. When practical, DLC encourages hiring locally. Bidder shall disclose existing legal relationships and/or litigation between its subcontractors and their clients or customers, and between Bidder and its clients or customers.

8.1.11 Safety & General Work Rules

Bidder shall comply with all applicable international, federal, state and local health and safety laws and regulations, and state work rules. DLC will separately provide general safety training and conduct random safety inspections. Penalties for non-compliance with agreed upon safety practices will be negotiated. Please reference Attachment E- DLC Safety Manuals.

Required: Installation personnel must adhere to NERC required background checks for all critical infrastructure that may need to be accessed during the installation process.

Required Information: Bidder shall clearly show that the Installation Contractor or Installation Contractor has an established safety program and safety processes in place to ensure a safe work environment for installers.

Required Information: Bidder shall describe the approach to promoting and enforcing safe work practices in the field and warehouse. The Installation Contractor is responsible for providing periodic reports including safety related incidents.

Required Information: Bidder shall describe the means of recording and transferring safety incidents to DLC.

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8.1.12 Training

Required: All installation personnel must adhere to NERC cyber security training guidelines. DLC has a NERC cyber security training program available to contractor. Training requirements must adhere to DLC's current training requirements/programs as selected.

Required Information: Bidder shall describe the approach to selecting and training field workers. Bidder shall describe the qualifications of workers including any technical, safety, and customer contact training as applicable to the respective project roles.

8.1.13 Identification, Uniforms, and Vehicles

DLC will not provide work-related apparel, personal protective equipment, identification, or vehicles to Installation Contractor or Installation Contractors. Workers are expected to have personal protective equipment including but not limited to hardhat, safety glasses, face shield, fire retardant clothing, electrical rated shoes, and rubber gloves with protectors. DLC will provide identification magnets for vehicles.

Required: Installation Contractor shall adhere to all DLC electric metering installation requirements.

Required: Bidder shall have uniformed shirts that have a clearly visible logo of company name and shall also have identification tags.

Required Information: Bidder shall describe the forms of identification used to inform DLC customers about the Installer's identity, vehicle, and job responsibilities.

9 Project Management

9.1 Project Plan

Required Information: Bidder shall describe the proposed plan for the project, key milestones, reporting, project management plan, documentation, training, on-site support, dispute resolution, resource availability.

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9.2 Project Management Tools

Required Information: The Bidder shall describe the tools (including software) to be used to ensure quality, timeliness and performance of the project. The Bidder shall identify recognized industry standards and guidelines to which these tools and methods conform.

DLC currently uses Microsoft Project to track major projects. The Bidder's solution shall be compatible with Microsoft Project application.

9.3 Project Organization

Required Information: Describe the Bidder organization proposed to manage the work. Include an organization chart. Identify by name the key personnel and provide resumes. DLC understands that the individuals cited as key personnel will manage the work, and reserves the right to approve, or not, any personnel substitution.

9.4 Subcontractor Roles

Required Information: Describe in detail the involvement of each subcontractor in the project plan. Identify each subcontractor's specific roles and responsibilities, and the plan for the Bidder to react if a subcontractor does not deliver as expected.

9.5 Status Reporting

Required Information: Describe the planned project status reporting approach and methods.

9.6 Project Inventory Management

A key element of cost control and adherence to schedule (and an issue constraining how trade-offs are made) is the availability of product and labor.

Required: The Bidder shall describe the inventory management practices and labor staffing practices that will be used to ensure adherence to schedules.

9.7 Quality Control

Required Information: Describe the quality control process.

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9.8 Problem Escalation

Required Information: The Bidder shall describe the escalation plan for problems or issues that arise during the project.

9.9 Project Scope

Required Information: Bidder shall provide a sample Project Scope of Work identifying the essential tasks and actions of the project. The Scope shall identify the party responsible for each element of the Scope of Work in manner that provides DLC a clear understanding of Bidder's expectations of DLC during the implementation of the AMI.

10 Product Support & Evolution

10.1 Product Support Practices

Required Information: To the extent not covered in response to Section 6.25.2, Bidder shall describe its AMI product support practices, including help desk, remote and field troubleshooting support, and device repair/replacement.

10.2 Product Road Map

Required Information: Bidder shall provide a product road map showing planned new function and feature additions to the proposed AMI capability. As part of the description of the planned evolution, Bidder shall state its policy concerning new product generations and product obsolescence.

10.3 Compatibility with In-Service Product

Required Information: Bidder shall explain the strategy for maintaining the compatibility of new developments described in response to **Error! Reference source not found.** above with its existing in-service AMIs, such as the proposed to DLC.

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10.4 Software Upgrade Practices

10.4.1 Previous Releases

Required Information: Describe the schedule of software releases in the three years prior to the software versions proposed.

10.4.2 Typical Release Implementation

Required Information: Bidder shall describe a typical implementation of a software maintenance release.

10.4.3 Role of Users

Required Information: Bidder shall describe the role of existing AMI users in Bidder's software development process for new or enhanced products.

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11 Bidder Qualifications

11.1 Identity & Contact

Required: Bidders shall submit Attachment K – Vendor Questionnaire.

Required: Bidders responding to this RFP shall provide the following corporate information:

Company: _____

Primary Contact: _____

Address: _____

_____

Telephone Number: _____

Fax Number: _____

E-mail Address: _____

Secondary Contact: _____

Address: _____

_____

Telephone Number: _____

Fax Number: _____

E-mail Address: _____

11.2 Reference Installations

11.2.1 Utility References

Required Information: Bidder shall provide references, in the table below, for a minimum of three (3) utilities, similar to DLC, at which its proposed solution is in use. Refer to Section 1.1.1, Description of DLC. DLC shall be granted the right to contact the representative(s) for each utility reference.

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Utility Name	Utility Contact	Contact's Phone #	# Meters Installed
1.			
2.			
3.			

11.2.2 Additional Data

Required Information: For each reference, briefly describe how the AMI installation demonstrates the capabilities sought by DLC.

Required Information: For each reference, include the following information:

- Date deployment began.
- Number of AMI meters currently installed
- Date full deployment is expected to be completed.

11.3 Financial Resources

Required Information: The Bidder shall submit two (2) hard copy sets of audited financial statements: balance sheet, income statement, and statement of cash flow for each of the three most recently completed fiscal years, including notes to financial statements, independent accountants' reports and annual reports.

11.4 Industry Relationships

11.4.1 Subcontractor Relationships

Required Information: If Bidder plans to enter into contracts with subcontractors and suppliers to complete the proposed project, Bidder represents that Bidder and its subcontractors, suppliers and agents are properly insured, licensed, and qualified to perform the type of Services proposed.

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Bidder shall remain entirely responsible for the quality, completeness and timeliness of the work of its contractors and subcontractors. Bidder shall fully disclose existing legal relationships and/or litigation between its subcontractors and their clients or customers, and between Bidder and its clients or customers.

11.4.2 Partnership and Alliance Relationships

Required Information: Describe all (if any) partnerships, alliances, and other strategic relationships Bidder has established with other energy industry participants, including AMI and meter developers and suppliers, distribution automation suppliers, utilities (other than direct sales relationships), software suppliers, and integration and consulting firms.

11.5 Skills & Relationships

The Bidder will be responsible to provide delivery and installation of AMI infrastructure and head-end software and hardware.

Required Information: Describe expertise, experience, stability, competence and credibility of your company to ensure the success of the DLC project. A 1-2 page discussion is expected.

12 Pricing Table

Required Information: Bidder shall provide quoted prices by completing the Pricing Table electronically in Attachment D – DLC AMI Pricing Table.

13 Contract and Terms

Attachment G - DLC General Terms and Conditions that contains DLC's standard contract terms and conditions. The final contract(s) will be negotiated with the successful bidder(s). Prior to Contract execution, DLC reserves the right to amend the General Terms and Conditions dependent on a review of the proposal of the successful bidder.

Required: In addition to these standard terms and conditions, DLC requires bidder to accept the following additional terms and conditions.

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13.1 Right to Operate Unsatisfactory Equipment

If the operation or use of the Equipment after delivery and/or installation does not reasonably comply with the technical requirements set out in the Specifications, the Buyer shall have the right to operate and use the Equipment until such deficiency can be reasonably corrected provided that the period of such operation or use pending correction shall not impede or delay the ability of the Seller to perform corrections.

Such operation and use shall not constitute an acceptance of any part of the Equipment or work, nor shall it relieve Seller of any requirements of the Contract, nor shall it act as a waiver by the Buyer of any requirement of the Contract.

13.2 Warranties

13.2.1 Functional Warranty (system level, One Year)

Seller warrants that the AMI System supplied pursuant to this Contract constitutes a system suitable for the purposes articulated in this Contract. The AMI System comprises the hardware and software elements furnished by the Seller, but not elements of the telecommunications infrastructure provided by the Buyer. The AMI System shall perform and support the functions and performance required by this Contract for a period of one (1) year following the Acceptance Test.

During such one year period, Seller shall be responsible, at Seller's expense, for any and all necessary additions, modifications, repair or replacement of all elements of the AMI system, including revenue meters with integral communication devices, to ensure operation and subsequent expansion of the AMI System in compliance with the provisions of this Contract. Such responsibility includes, at the Buyer's option, field labor to install, remove, or modify Network Devices that Seller provides under this Contract, to modify any AMI System software, and to test such modifications, to confirm that the AMI System operates in compliance with the provisions of this Contract. The Buyer shall notify Seller promptly of any failure of the AMI System to meet functional and/or performance requirements of this Contract.

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13.2.2 Materials & Workmanship Warranty (device level, 10 years declining share)

All hardware and software provided by Seller shall be free of Defects in materials and workmanship. "Defect" and "Defective" mean a failure of the hardware or the software to comply with its specifications or to comply with the requirements of this Contract. Seller and the Buyer shall each bear a share of the cost of replacing material that is found by the Buyer to be Defective, as described in this section. Seller shall provide to the Buyer convenient and efficient instructions and procedures for shipping Defective material to Seller for repair/replacement. Material provided by Seller that is found by the Buyer to be Defective will be returned to Seller within 60 days of when the Defect is evident to the Buyer. If the Defect is determined to be defective, then the pro-rated sharing of expenses shown below shall apply. Seller shall repair or replace the Defective item at its pro-rata portion of the expense, and return it to the Buyer within 30 days.

In the 10 year period of use and operation that follows the successful Acceptance Test, Defects of any type/class of items of the AMI System (including electric revenue meters) exceeding ½% of devices of that type/class per rolling 12-month interval are considered excessive, and become the pro-rata responsibility of Seller. Seller shall bear a pro-rata share of the material and change-out labor costs to remedy such Defective items in accordance with the following schedule, stated in years from successful Final Acceptance Test completion:

- Within 0-3 years: 100% to Seller, 0% to the Buyer
- Within 4-6 years: 80% to Seller, 20% to the Buyer
- Within 7-10 years of: 50% to Seller, 50% to the Buyer
- More than 10 years after: 0% to Seller, 100% to the Buyer

Seller shall not be obligated to ship, repair, or replace the item at its pro-rata portion of the expense if the Defect in an item is determined to have arisen from: misuse; installation by the Buyer, as opposed to Seller's installation, not in compliance with training or manuals provided at the time of installation; operation or use not in compliance with applicable training, manuals, specifications, or the provisions of this Contract; neglect; modification; accident; vandalism or

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other intentional damage; or exposure to adverse conditions exceeding performance levels required by applicable specifications.

13.3 Inspection

Materials and equipments ordered hereunder are subject to inspection and acceptance by the Buyer. Such inspection and acceptance however, shall not be conclusive with regard to defects that could not have reasonably been discovered by such an inspection or latent defects, fraud or such gross mistakes as amount to fraud, and shall not be deemed to alter or affect the obligation of Seller or the Rights of the Buyer under the Warranties clauses above.

13.4 Unauthorized Rework

Under no circumstances is Seller permitted to repair or rework defective articles by welding, soldering or otherwise without Buyer's written permission.

13.5 Premium Transportation

Any premium transportation costs incurred by the Buyer and as a result of Seller's failure to meet the delivery schedule shall be paid for by Seller.

13.6 Technology Escrow

(The AMI contract must include a mutually agreeable Technology Escrow Agreement assuring the Buyer's access to technology.)

It is imperative that the Buyer be able to provide for the operation, support and expansion of the specified AMI system, including the addition or replacement of compatible elements of the system. If Seller for any reason becomes unable or unwilling to provide needed additional equipment, hardware, software or support services, the Buyer shall have assured access to all information, documentation, data, drawings, rights, procedures, and any other materials useful or necessary, and shall have unimpeded access to Seller's subcontract manufacturers, to procure additional hardware and software. Such hardware and software will be for the Buyer's use only. This requirement does not convey a right of the Buyer to make or have made AMI system components for sale to others. Seller shall state, for the Buyer's approval, what

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provisions will be made to provide this assurance, and what means will exist for the Buyer to periodically be assured that the information and materials are both current and useful.

13.7 Arbitration and Dispute Resolution

In the event of any dispute, claim, question, or disagreement arising from or relating to this Contract, or the breach thereof, the parties hereto shall use their best efforts to settle the dispute, claim, question or disagreement. To this effect, they shall consult and negotiate with each other in good faith and, recognizing their mutual interests, attempt to reach a just and equitable solution satisfactory to both parties. If a settlement cannot be reached through negotiation, the parties agree to endeavor first to settle the dispute by mediation administered by (i) the American Arbitration Association under its Commercial Mediation Procedures before resort to arbitration or (ii) a mediator acceptable, in their sole discretion, to the parties. If settlement cannot be reached through negotiation and mediation, the parties agree it shall be settled through arbitration. The arbitration shall be administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules. Each party shall bear its own costs and expenses, including without limitation attorney fees, and an equal share of the arbitrators' fees and administrative costs of the arbitration. Except as may be required by law, neither a party nor an arbitrator may disclose to any third party the existence, content, or results of any arbitration hereunder without the prior written consent of all parties to the arbitration. This Contract is governed by Pennsylvania Law and all mediation and arbitration relative to this Contract shall occur in the County of Allegheny, State of Pennsylvania.

13.7.1 Acknowledgement of Arbitration

By their execution of this Agreement, each party hereby acknowledges the following:

This Contract contains an agreement to arbitrate. After signing the purchase order, each party understands that it will not be able to bring a lawsuit concerning any dispute that may arise which is covered by the agreement to arbitrate, unless it involves a question of constitutional or civil rights. Instead, each party agrees to submit any such dispute to an impartial arbitrator.

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13.8 Patents & Intellectual Property Assets Warranties

Seller agrees to protect and save harmless the Buyer from all costs, expenses or damages, arising out of any infringement or claim or infringement or Patents in the Buyer's use of material or equipment furnished pursuant to this order. Without limitation, Seller indemnifies and holds harmless the Buyer in any litigation that may arise with respect to the intellectual property rights related to the AMI System, including attorneys' fees and expenses.

Seller represents that:

- It is the owner of all rights, title, and interest in and to each of the patents and intellectual property assets and other proprietary rights in all materials provided hereunder, free and clear of all liens, security interests, charges, encumbrances, equities, and other adverse claims, and has the unfettered right to use same without payment to or permission from any third party.
- All of the patents are currently in compliance with formal legal requirements including payment of filing, examination, and maintenance fees and proofs of working or use, are valid and enforceable.
- No patent applicable to the AMI System has been or is now involved in any interference proceeding, reissue, reexamination, or opposition proceeding, nor is any potentially interfering patent or patent application of any third party known to Seller.
- No patent is infringed or has been challenged or threatened in any way. None of the products manufactured and sold, nor any process or know-how used by Seller infringes or is alleged to infringe any patent or other proprietary right of any other person or entity.
- All products made, used, or sold under the patents have been marked with the proper patent notice.
- It is the lawful owner of licensor of software or software license provided hereunder, and that it has the authority to grant or assign a license thereto, and that doing so does not infringe upon any intellectual property rights of any third party.

Seller is not knowingly infringing upon or otherwise acting adversely to any copyrights, trademarks, trademark rights, service marks, service names, trade names, patents, patent rights, licenses, trade secrets or other proprietary rights owned by any other person or entity,

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and no claim or action by any such person or entity is known by Seller to be pending or threatened with respect thereto. The use of the term "know" or "knowingly" includes that which Seller reasonably should know.

14 RFP Attachments

Attachment A - Intent to Respond with Proposal

Attachment B - MBE Contracting Report

Attachment C - Non-Collusion Affidavit

Attachment D – DLC AMI Pricing Table

Attachment E – DLC Safety Manuals (one document includes the following)

Section 300 – Personal Protective Equipment - General

Section 301 – Head Protection

Section 305 – Foot Protection

Section 306 – Protective Clothing and Garments

Attachment F - Guidelines for Communication Space Attachments

Attachment G – DLC General Terms and Conditions

Attachment H – AMI Meter Locations

Ha – AMI Meter Locations

Hb – AMI Meter Locations (by zip code and form)

Attachment I – DLC Asset Locations

Ia - DLC Asset Locations (Towers and 200 MHz Radio)

Ib - DLC Asset Locations (Communication Towers)

Attachment J- DLC IT Integration Assessment Survey

Attachment K - DLC Communications Map

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PA PUBLIC UTILITY COMMISSION
SECRETARY'S BUREAU

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DUQUESNE LIGHT COMPANY	:	
Smart Meter Procurement and	:	Docket No. M-2009-2123948
Installation Program	:	

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the Assessment of Needs, Technology Solutions and Vendor Selection of Duquesne Light Company in the above-referenced proceeding has been served upon the following persons, in the manner indicated, in accordance with the requirements of § 1.54 (relating to service by a participant):

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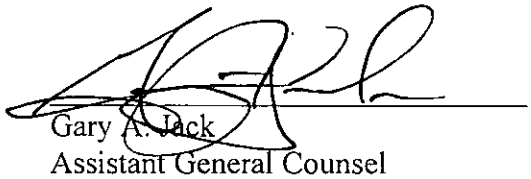

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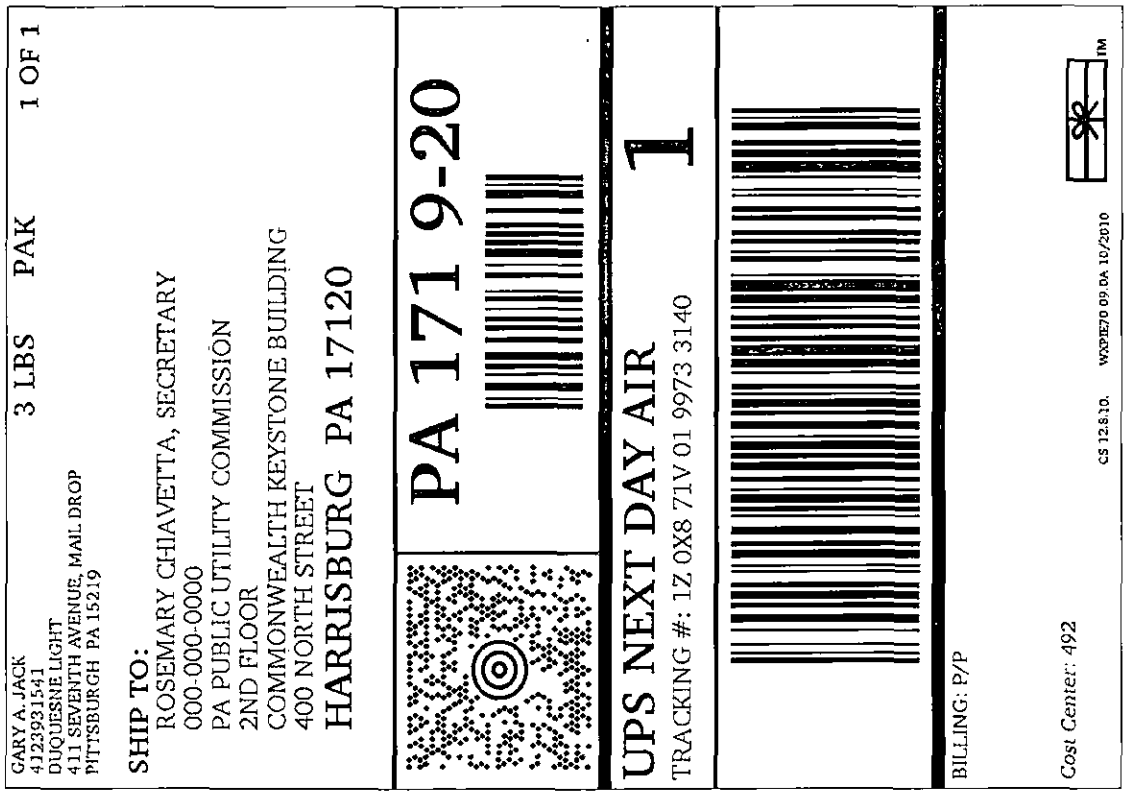
Dated: December 30, 2010

UPS CampusShip: View/Print Label

1. **Print the label(s):** Select the Print button on the print dialog box that appears. Note: If your browser does not support this function select Print from the File menu to print the label.

2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers without a Daily Pickup
   Schedule a same day or future day Pickup to have a UPS driver pickup all your CampusShip packages.
   Hand the package to any UPS driver in your area.
   Take your package to any location of The UPS Store®, UPS Drop Box, UPS Customer Center, UPS Alliances (Office Depot® or Staples®) or Authorized Shipping Outlet near you. Items sent via UPS Return Services℠ (including via Ground) are also accepted at Drop Boxes.
   To find the location nearest you, please visit the Resources area of CampusShip and select UPS Locations.

   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

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