MADRI
Advanced Metering Working Group

Installed Meter Survey
Final Report
Draft

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Executive Summary

Distributed Resources have the potential to play a key role in the Mid-Atlantic region's electricity future. Public utility commissions of Delaware, District of Columbia, Maryland, New Jersey and Pennsylvania, along with the U.S. Department of Energy and PJM Interconnection have established the Mid-Atlantic Distributed Resource Initiative (MADRI) to develop regional policies and market-enabling activities to support distributed generation and demand response in the Mid-Atlantic region. Results of the initiative provide a basis for creating a favorable market environment for distributed generation and demand response. Initial focus areas for MADRI are Interconnection Standards, Advanced Metering, and regional DR Benefits Assessments.

The metering survey is part of a larger MADRI activity to identify ways that advanced metering can be more widely deployed throughout the PJM footprint and enable markets for distributed resources. The survey was sent to all utilities under the jurisdictions of the public utility commissions of Delaware, District of Columbia, Maryland, New Jersey and Pennsylvania with the goal of establishing an electric metering baseline. The MADRI Metering Working Group designed the survey to take a census of the current meter population throughout PJM, characterize the advanced metering and communications infrastructure currently in place, and investigate the functional capability of this advanced metering and how advanced meters are currently being used. Information resulting from the survey will help the Working Group better understand how meters are deployed throughout PJM.

Advances in meter, communications and control technology in recent years have resulted in entirely new metering functionality. These capabilities ultimately enable electricity consumers to have more choices and more control over their energy expenditures. New metering systems provide electric utilities options for better managing their transmission and distribution systems and give state utility commissions additional information for monitoring and measuring regulatory performance. Even with the driver of electricity restructuring, however, advanced metering and associated energy information systems have not become industry standards according to researchers at E-Source, an energy research organization.

Results of MADRI's Installed Meter Survey show that Advanced Meters and AMR meters are not yet the standard in the Mid-Atlantic States.

- Two-thirds of all installed meters are basic Watt-Hour meters.
- Advanced Meters are about 1% of the total meter population; but measure almost 20% of the region's electricity sales.
- More than a third of all meters are AMR meters.

By count, the greatest number of advanced meters is in the small C/I segment, while AMR meters are concentrated in residential markets. The penetration of AMR meters in the five MADRI jurisdictions is significantly higher than the national average of 24%, possibly indicating the impact of electric industry restructuring.

The high survey response rate enables the findings to be applicable to the entire MADRI region. Utilities who have responded to the survey account for more than 90% of the electricity business in the region even though they are only 20% of the total number of utilities in the five MADRI states. The four largest utilities, PSE&G, PECO Energy, PPL Electric Utilities, and Baltimore Gas and Electric, own more than half of all meters and have the majority of AMR and Advanced Meters.

Almost half of the MADRI-area meter count and half of the electricity sales (KWh) are in the state of Pennsylvania, which correlates with regional demographics – 44% of the people living in the MADRI states reside in Pennsylvania. Pennsylvania is also home to the greatest number of advanced meters; corresponding to a high level of industrial activity. Use of advanced metering is relatively low in two states, New Jersey and Maryland, which recently introduced hourly pricing of electricity. Interviews with utility metering managers suggest that the market for Advanced Meters will expand when the demand for hourly priced electricity grows.

The survey verifies that AMR and Advanced Meters have more extensive measurement capabilities than the standard meters.

- Most Advanced Meters take hourly measurements that are reported daily over phone modems.
- About three-quarters of the Advanced Meters can communicate bi-directionally.

Because of the enhanced data collection and communication capabilities of AMR and Advanced Meters, utilities are benefiting from new applications of meter data. For the small customers, a large percentage of AMR and Advanced Meters are used to detect meter tampering. Utilities frequently take advantage of advance metering to monitor power quality in the Large C/I segment. Users of Advanced Meters recognize the value of information from them. They list Energy Information Services, Customer Service and System Operation as the top three areas within their companies that directly benefit from Advanced Meter data.

Survey results provide evidence that advanced meters are increasingly being used to support distributed resources programs. Survey respondents report that a little more than 10% of the Advanced Meters for large customers are used for demand side management activities.

Advanced Meters measure a significant portion of electricity in the Mid-Atlantic States and have some functionality that can support distributed resource programs. The majority of the installed meters, however, have not been specifically designed or installed to fulfill the requirements of distributed generation or demand response metering. These more technically complex meters are also reported in the survey to have higher costs and shorter expected lives than traditional meters. Higher life-cycle costs than conventional meters are potentially one reason for the slow penetration of AMR and Advance Meters in the utility marketplace. The value of distributed resources to utilities and their customers may provide financial returns, in addition to operational and customer service benefits, to further justify investments in Advanced Meters.

The benefits of real-time load data from Advanced Meters potentially accrue to all members of the electricity value chain; from the generators, to the distributors, to the end-users. Time-based data from meters deliver value to all stakeholders:

- Consumers can manage their electricity usage in reaction to price signals while industrial users can additionally enhance overall productivity with energy information.
- Utilities manage costs with greater control over load dispatch and more rapid response to system or customer problems.
- Equipment suppliers benefit from increased sales to new markets.

MADRI is grateful to the utility managers and staff who participated in the survey of Installed Meters and took the time to answer follow-up questions. Without their diligent support, the gathering and presentation of this valuable information would not be possible.

Table of Contents

Survey

Objective

The objective of the Installed Meter Survey activity within MADRI's Advanced Metering Working Group is to develop an advanced metering baseline identifying how PJM distribution companies define advanced metering, what policies and procedures currently exist for the procurement and use of advance metering, how much advanced metering and communications infrastructure is currently in place, what the functional capability of this advanced metering is and how advanced meters are currently being used.

Methodology

MADRI's Advanced Metering Working Group has commissioned primary research to establish the advanced metering baseline. The research has encompassed a survey and personal interviews with metering contacts at major utilities in PJM to collect the data. MADRI has requested, through its utility commission members, that electric distribution companies operating in the Mid-Atlantic region of PJM complete the Installed Meter Survey. Data have been collected, tabulated and analyzed from utilities representing the majority of installed meters to understand current advanced meter experience, trends, needs and issues of the utilities with respect to advanced metering throughout the Mid-Atlantic region.

Survey Design

The Metering Working Group assisted in the design of the survey. The survey format allowed the collection of quantitative data to describe the installed base of electric meters in two areas – type of meters and use of meter by customer segment. The survey was designed to ask utilities a series of technical, operational, and strategic questions to gain insights about meter application, data retrieval and data use. The survey defined three meter types:

- Standard Watt-Hour Meter – Electromechanical or solid state meters measuring aggregated kWh manually retrieved over monthly billing cycles. Standard meter may also include functions to measure time-of-use and/or demand with data manually retrieved over monthly billing cycles. Time-of-use data are a record of usage over a specific period of time. Demand measurement records the maximum rate of energy usage over a specified period of time, such as 15 minutes or 30 minutes.
- Automated Meter Reading – Meters that collect data for billing purposes only and transmit this data one way. Aggregated monthly kWh data retrieved by variety of methods including drive-by vans with short-distance remote reading capabilities and communication over a fixed network such as a cellular network.
- Advanced Metering – Meters that measure and record usage data at a minimum, in hourly intervals, and which provides usage data to both consumers and energy companies on at least a daily basis. Data are used for billing and other purposes. Advanced meters include basic hourly interval meter and extend to real-time meters with built-in two-way communications capable of recording and transmitting instantaneous data.

A draft questionnaire was reviewed by members of the Metering Working Group and tested with a limited number of utilities prior to surveying the broad audience. Survey design issues addressed included: protection of proprietary information, sharing of data with other respondents, response

rates, consistency of responses, and timeliness of responses. The review process helped to minimize the impact of these issues.

Appendix A is the survey as delivered to electric distribution companies in Delaware, District of Columbia, Maryland, New Jersey and Pennsylvania.

Survey Delivery

Primary contacts at the utility companies were introduced to the survey through a letter and/or e-mail from the appropriate Public Utility Commission beginning the week of December 26, 2004. The Installed Meter Survey – in a Microsoft Word table format – was attached to the e-mail and enclosed in mailed correspondence. The deadline to submit responses was February 15, 2005.

Data Assessment

Survey responses have been assessed for consistency and quality. As required, follow-up phone calls have been made to clarify answers to the questionnaire. Results have been tabulated in an Excel workbook for analysis. Data and analysis have been segmented by customer class – residential, small business, and large industrial and commercial, meter type – standard meters, AMR and advanced meters, and by region. Responses to the survey are subject to interpretation of the definition of meter type and customer class. For this reason, accuracy of the findings is most accurate at an aggregated level.

Survey Results

Response Summary

Fifteen surveys, representing nineteen companies, were received in response to MADRI's request to submit data on installed electric meters. The responding companies are listed in Table 1. While these utilities amount to only 20% of the total number of utilities in the five MADRI states, they account for more than 90% of the electricity business in the region. Meter counts are closely correlated with the number of customers; meaning the survey has counted approximately 90% of the meters in the five-state MADRI region.

MADRI State	Utilities Responding to Survey	% of State Electric Load	% of State Electric Revenue	% of State Electric Customers	% of State Electric Utilities
Delaware	Delaware Cooperative, Conectiv	84%	82%	86%	18%
District of Columbia	PEPCO	100%	100%	100%	100%
Maryland	PEPCO, Conectiv, Baltimore Gas & Electric	77%	79%	80%	25%
New Jersey	PSEG, Rockland Electric, Jersey Central Power Light, Conectiv	98%	98%	98%	29%
Pennsylvania	Wellsboro, UGI, PPL, Pennsylvania Electric, PECO, Metropolitan Edison, Duquesne Light, Citizens' Electric, Allegheny Power	94%	93%	91%	15%
Total MADRI		91%	92%	91%	20%
Reference: 2003 EIA Data					

Table 1

In addition to asking questions to quantify the meter population, the survey requested demographic data to describe the responding companies. These data appear in Appendix B. A key piece of descriptive data is how the utility defines customer segments. Definition of customer classes varies from state to state and from utility to utility for commercial/industrial (C/I) segments. Utilities distinguish small and large C/I customers on the basis of voltage or demand. Data comparison is not straightforward on a customer segment basis and often it is necessary to combine the Small C/I and Large C/I segments into one group.

Overall Meter Data Summary

An estimated 13 million electric meters are in place in Delaware, the District of Columbia, Maryland, New Jersey and Pennsylvania. MADRI's Installed Meter Survey has counted more than 11.7 Million meters and the respondents have classified them by meter type – Standard, AMR and Advanced Meter – for three major customer classes. While residential customers have 90% of the meters in the MADRI region, they consume less than 40% of electricity sold. Industrial and commercial customers account for 10% of the meters and 60% of the electricity sales, see Figures 1 and 2. (Note: Electricity sales information related to meters has been estimated using Energy Information Agency (EIA) data for the year 2003.) The majority of meters, almost two-thirds, are

standard meters. Only 1% of the meter population is Advanced Meters. Since most advanced meters are installed at large commercial or industrial facilities, they measure a substantial portion of total annual sales, almost 20%. See Figures 3 through 4. By count, AMR meters are concentrated in residential markets while the greatest number of advanced meters is in the small C/I segment, Figure 5. For AMR meters, the annual sales are almost equally split among the three customer segments. For Advanced meters, almost 90% of annual sales are through large C/I meters, Figure 6.

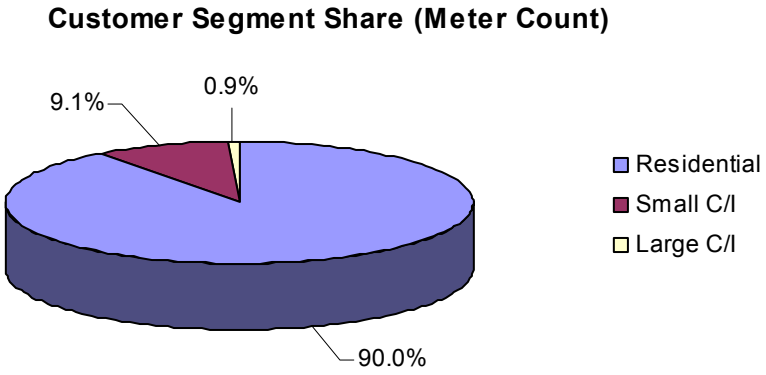

Figure 1

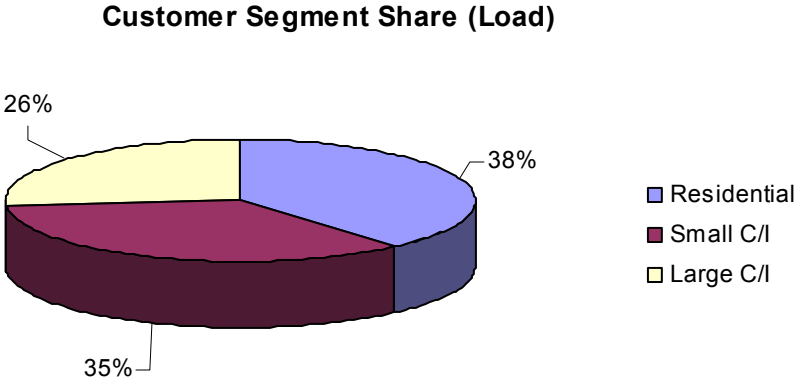

Figure 2

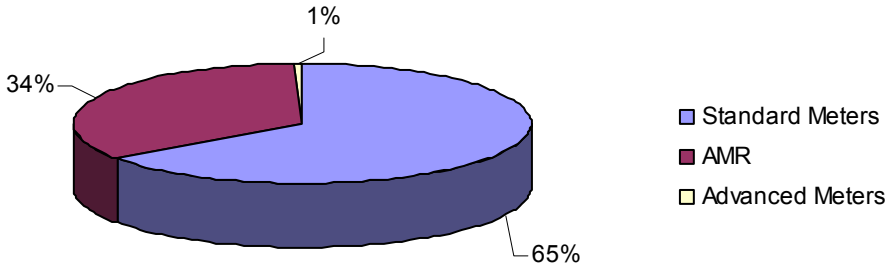

Figure 3

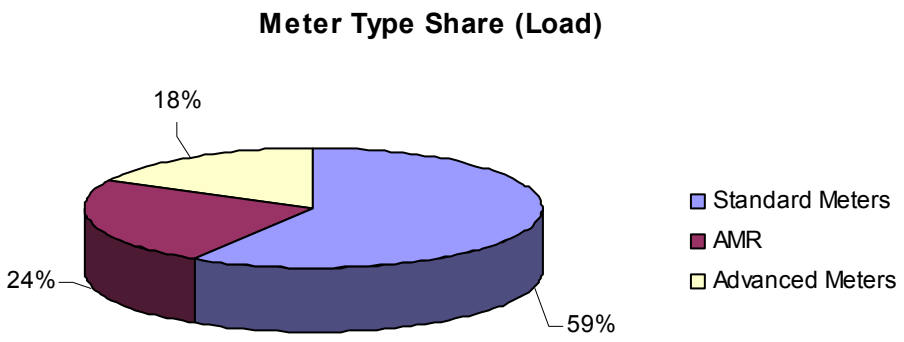

Figure 4

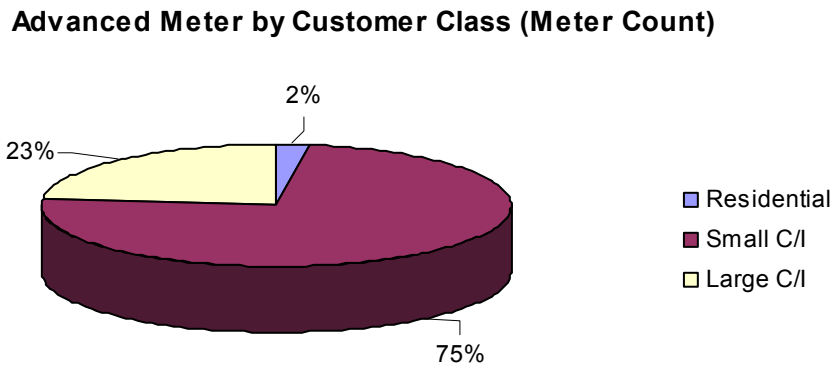

Figure 5

Note: Data for Small C/I advanced meter count to be verified by PPL.

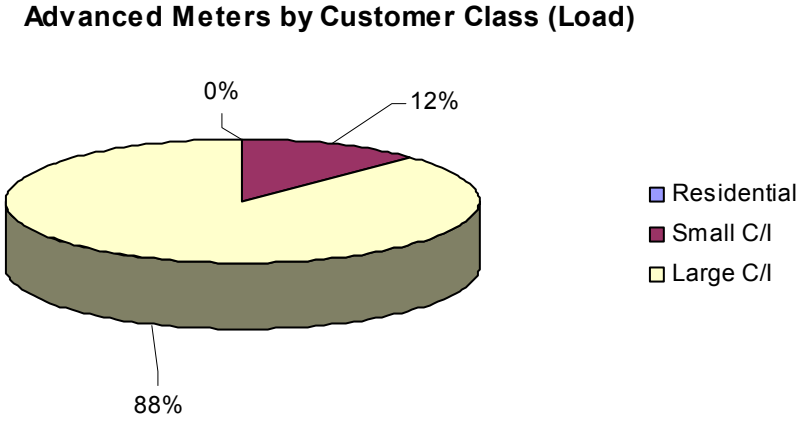

Figure 6

Summary by State

Pennsylvania is the largest energy consuming state in the five-state MADRI region, as well as the largest state in other demographic and economic categories, Table 2. Almost half of the meter population and half of the electricity sales (KWh) are in Pennsylvania, Figures 7 and 8. Pennsylvania and Maryland have the largest concentration of AMR meters, Figure 9. Almost 40% of the meter count in Maryland is AMR and Advanced Meters and more than 60% of the meters in Pennsylvania are AMR meters and Advanced Meters. In New Jersey, Delaware, and the District of Columbia, less than 2% of all meters are AMR and Advanced Meters. Use of advanced metering is relatively low in two states, New Jersey and Maryland, which recently introduced hourly pricing of electricity.

State	Population (2004 Estimate)	Gross State Product (2002 Data, Millions of Current Dollars)	
		Total	Manufacturing
Delaware	830,364	47,147	4,028
District of Columbia	553,523	66,440	191
Maryland	5,558,058	201,878	12,996
New Jersey	8,698,879	380,169	41,277
Pennsylvania	12,406,292	428,950	71,299
MADRI Total	28,047,116	1,124,584	129,791
Sources: U.S. Census, Bureau of Economic Activity			

Table 2

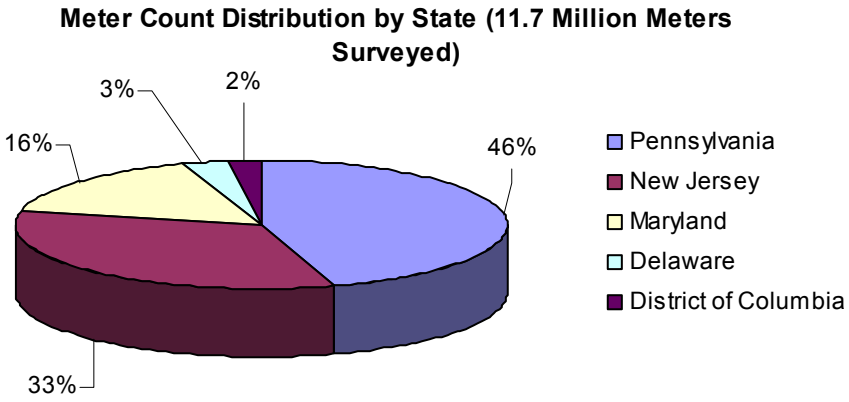

Figure 7

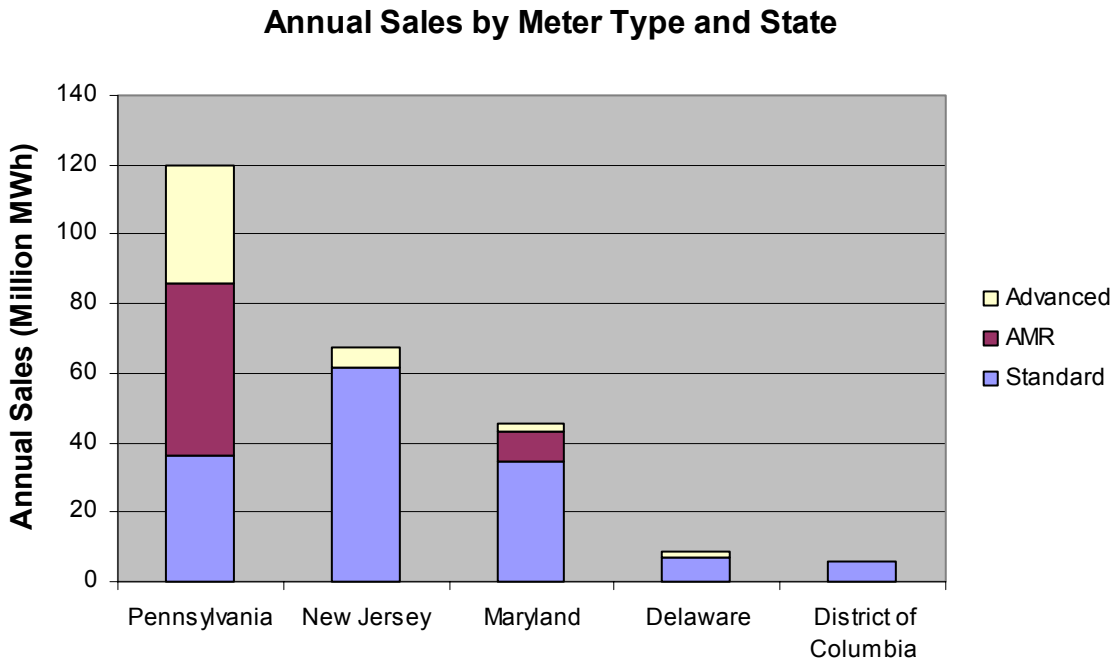

Figure 8

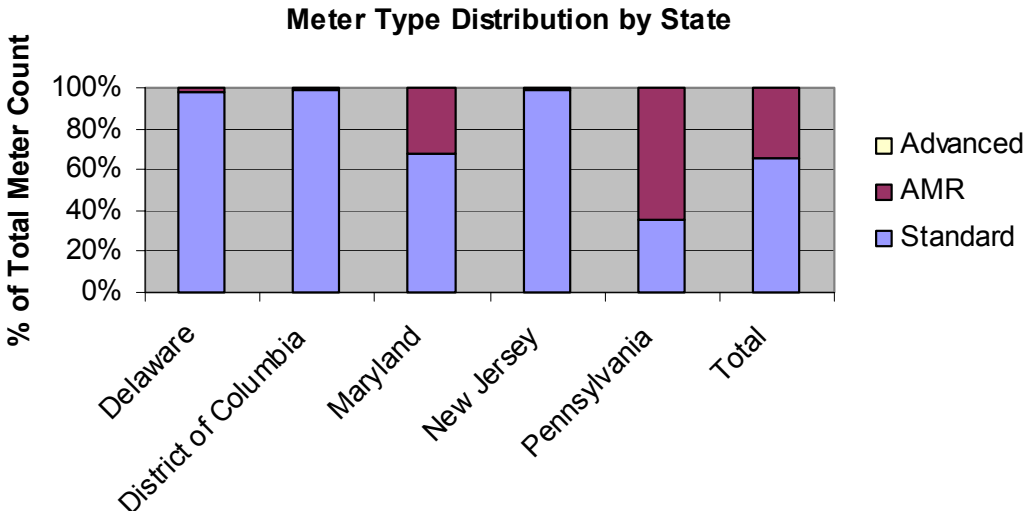

Figure 9

Summary by Utility

Four electric distribution companies, PSE&G, PECO Energy, PPL Electric Utilities, and Baltimore Gas and Electric own more than half of the meters in the MADRI region, Figure 10. Advanced meters are typically less than 1% of the meter population at all utilities and tend to be concentrated at large commercial/industrial sites. Major installations of AMR meters have been

undertaken by PECO Energy, PPL Electric Utilities, Baltimore Gas and Electric, and Duquesne Light, Figure 12.

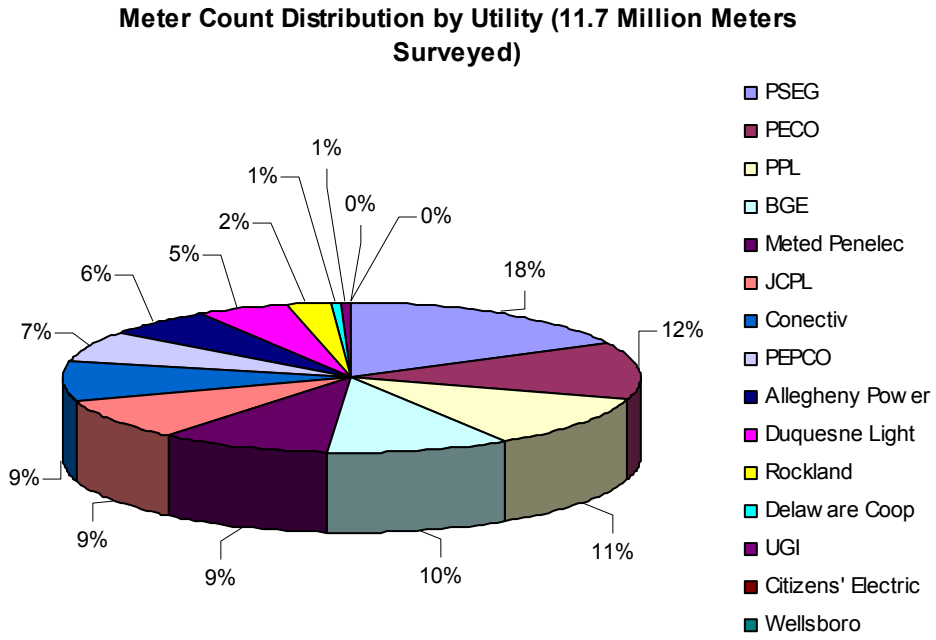

Figure 10

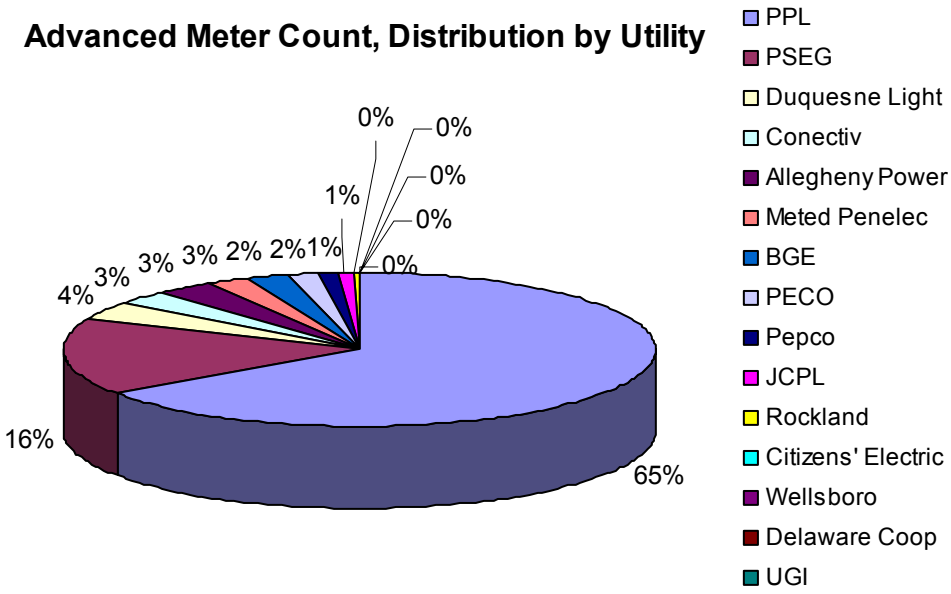

Figure 11

Note: "Advanced meter count, distribution by utility", needs to be verified. PPL has reported a disproportionately large concentration of advanced meters in the Small C/I segment and data are being reviewed.

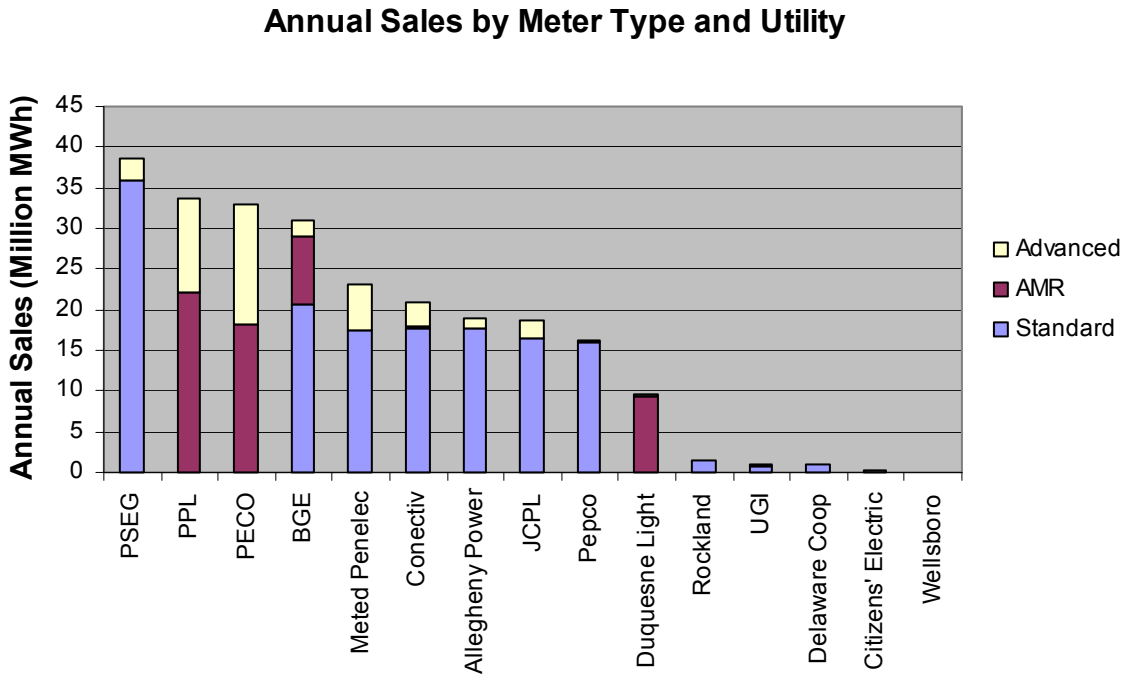

Figure 12

Overall Results

Meter Installation and Replacement Rates

Utilities install meters to meet the needs of new customers, to replace aging equipment, and to give customers expanded meter functionality. The rate of installation is dependent on the growth rate within a service territory and the expected lifetime of the meters. Survey results show residential equipment is expected to outlive meters for large customers by 20% to 100%, see Table 2. Correspondingly, utilities indicate residential meters have a lower replacement rate than C/I meters. From the survey, the average annual replacement rate for residential meters is 2.5%, the rate for small C/I meters is 4% per year, and large C/I meters are replaced at an average rate of 9% per year.

Meter Measurement Capabilities

The most important capability of the electric meter is its ability to measure usage (KWh) for billing purposes and all meters, regardless of type, have this capability. Standard meters for residential and small business customers primarily measure usage only. Larger customers whose rates include a demand component have meters that measure usage and demand. About a third of the largest customers have meters that measure time-of-use in addition to usage and demand (Figure 13). The survey verifies that AMR and Advanced meters have more extensive measurement capabilities than the standard meters (Figure 14). 100% of advanced meters in the Residential and Small C/I segments measure Usage, Demand and Time of Use and almost 90% of advanced meters in the Large C/I segment measure Usage, Demand and Time of Use. About half of all standard meters are technically capable of being upgraded to AMR meters.

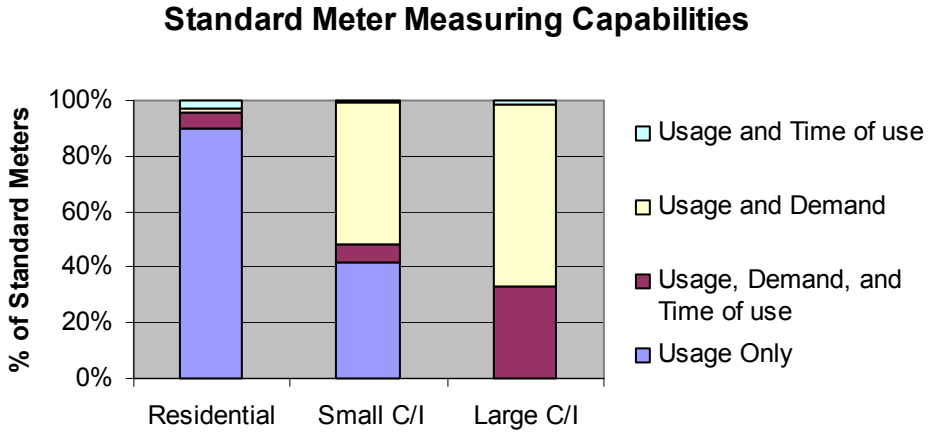

Figure 13

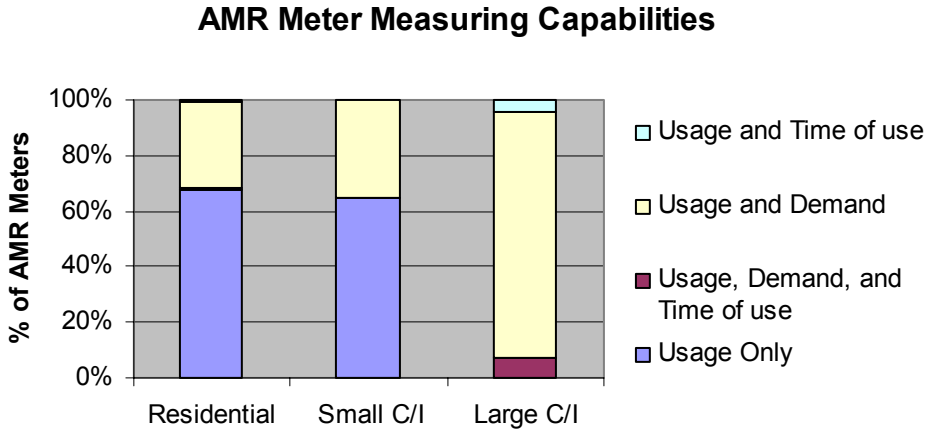

Figure 14

Data Management

Data management at the meter includes data collection, data storage and data retrieval. All meters keep a running tab of how much electricity is consumed and are read periodically for billing purposes. The key piece of meter data is cumulative electricity usage. Aggregated KWh requires minimal or no data storage at the meter. Demand and time-of-use measurements need to be stored because data are collected over a period of time. Less than 2% of all standard meters have data storage capabilities because the majority of standard meters only have the capability to measure usage. For AMR and advanced meters with wider capabilities, data storage is almost a standard feature. Most AMR and advanced meters for all customer segments include data storage:

- More than 60% of residential AMR and all advanced meters.
- About 80% of small C/I AMR and all advanced meters.
- Nearly 100% of large C/I AMR and all advanced meters.

All utilities report measuring data at fifteen minute to one hour intervals with advanced meters. Most data from Advanced Meters is retrieved on a daily basis; almost no data are retrieved more frequently, Figure 15.

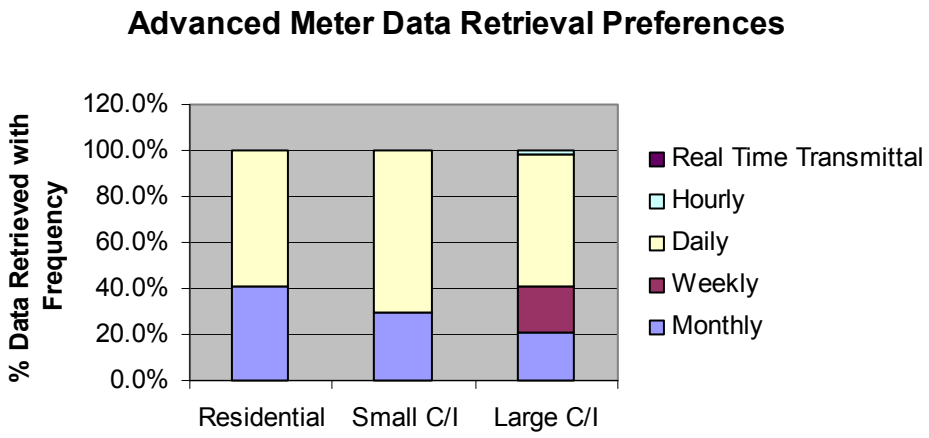

Figure 15

Communications

Communication of meter data to the home office can be accomplished through a number of channels including: Drive by communication, Radio frequency, Phone modem – Fixed network, Phone modem – Wireless network, Local area networks, and Internet. For AMR in the mass market, the most frequently used communication method is radio frequency, almost 70% of meters. For large customers, phone modems over a fixed network are the preferred way of communicating meter data from AMR and Advanced Meters. Another communication option mentioned in the survey is power line carrier. More than three-quarters of the advanced meters have two-way communication capability.

Functionality

Because of the data collection and communication abilities of AMR and Advanced Meters, utilities and end-users are afforded additional functionality. There are a wide range of services that are enabled including: Remote meter connect and disconnect, Outage notification, Meter tampering indication, Power Quality, and DSM Load Control. For the small customers, the most popular function is meter tampering indication. Power quality related functions are the most frequently cited advanced meter feature in the Large C/I segment. Demand side management functionality is most prevalent in the Large C/I meters. See Figures 16 and 17. The survey also asked where these highly functional advanced meters would benefit the utility organization: System Operation, Meter Maintenance, Customer Service (CIS), and Energy Information Services. Customer Service was the most frequently mentioned beneficiary of advanced metering in all three customer segments. The expectation is that advanced metering can provide the most benefits in the Large C/I sector, Figure 18.

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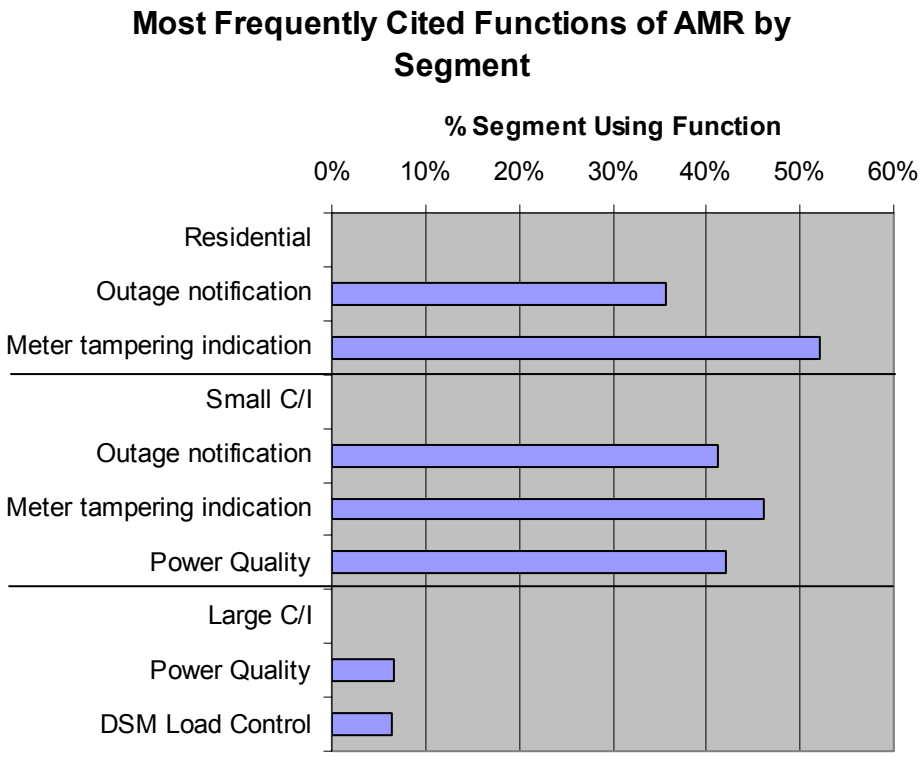

Figure 16

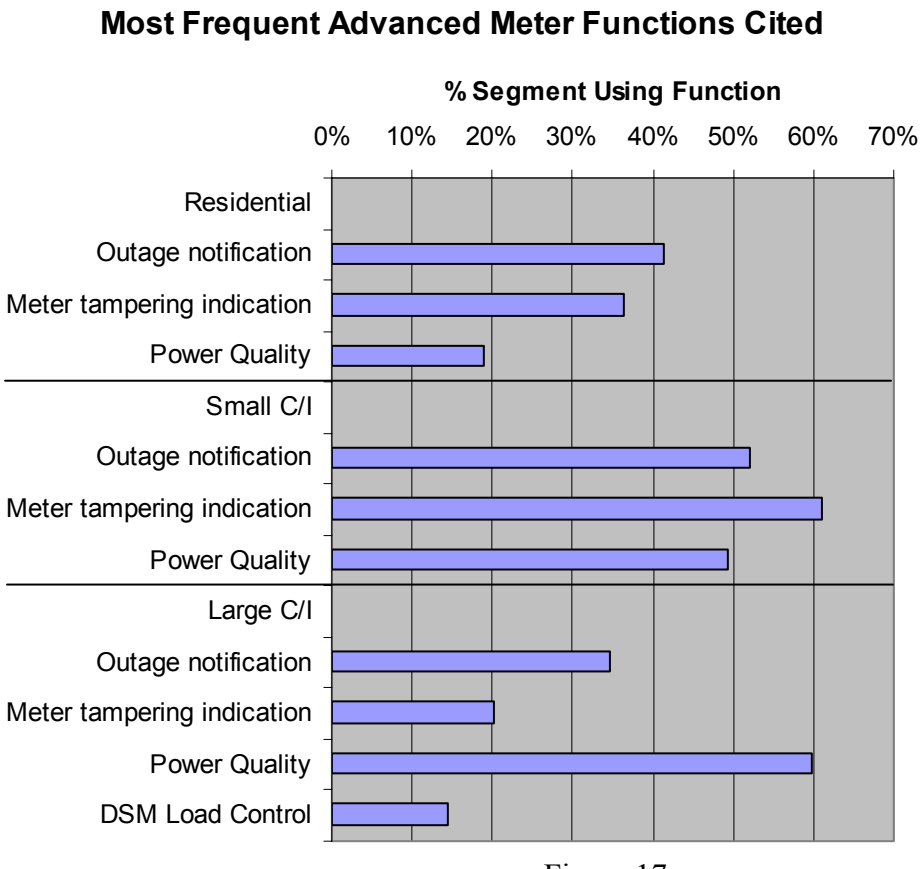

Figure 17

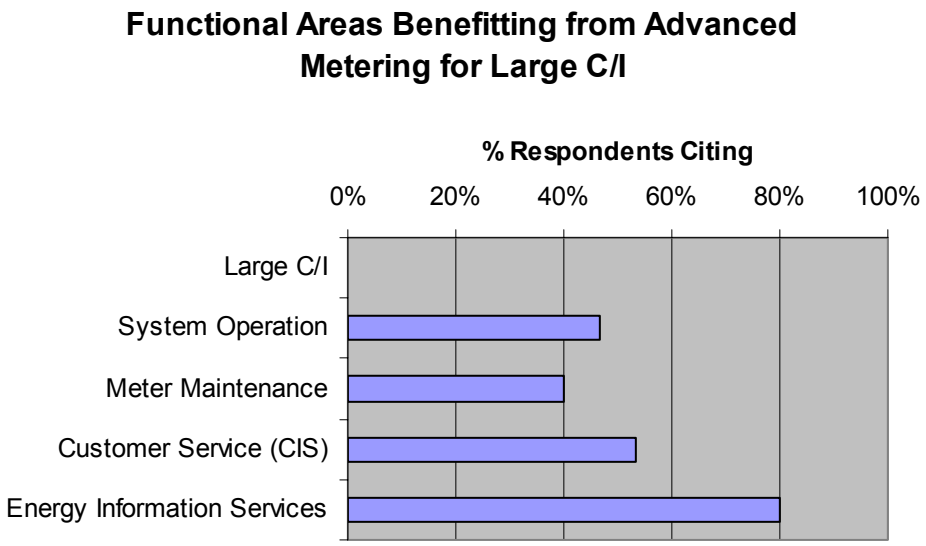

Figure 18

Suppliers, Costs and Expected Life

Not all respondents submitted complete lists of cost data, noting that certain financial data are proprietary. In certain instances, there is insufficient data (ID) to calculate a meaningful weighted average. In all cases, the trends in cost and lifetimes are more significant that the absolute numbers.

The larger and more technically complex meters have much shorter estimated lifetimes than basic meters for residential customers. Since most AMR and Advanced Meters have not gone through a complete life cycle, the expected lifetime reported in this survey is more likely an accounting lifetime, time over which to depreciate the value of the meter, rather than a measure of how long the meter is actually in use before replacement.

In general, advanced meters are more expensive and are expected to have a shorter lifetime than Standard and AMR meters, Table 3. All utilities that answered the cost related questions stated that meter costs, for all meter types, can be recovered through rates.

		Residential	Small C/I	Large C/I
Average expected Meter Lifetime (Years)	Standard	34	33	28
	AMR	20	18	15
	Advanced	19	16	16
Average New Meter Cost ($)	Standard	32	160	421
	AMR	77	229	ID
	Advanced	135	584	759
Average New Meter Installation Cost ($)	Standard	45	96	ID
	AMR	76	104	ID
	Advanced	108	131	243

Table 3

Respondents to the survey mentioned eleven different companies as suppliers of meters, Table 4. Several of the companies who have been major suppliers have divested their metering business, which has led to consolidation of the electric meter industry. The top five suppliers, ranked according to how frequently they were mentioned by survey respondents, are depicted in Figure 19. The most cited supplier of Standard meters is GE. ITRON is the most often mentioned supplier of AMR and Advance Meters.

Supplier	Status	Additional Information
ABB	Inactive	Metering business acquired by Elster in 2003
Austin International	Active	Remanufactured meters. http://www.electricalconnector.com/MeterShopServices.htm
Cannon	Active	http://www.cannontech.com/
DCSI, DCSI Comverge	Active	Meter communication systems. http://www.twacs.com/
Elster	Active	http://www.elstermetering.com/en/
GE	Active	http://www.geindustrial.com/cwc/products
ITRON	Active	http://www.itron.com/solutions/electric_util.html
Landis & Gyr (L&G)	Active	http://www.landisgyr.us/Landis_Gyr/Meters
Schlumberger	Inactive	Parts of metering business acquired by ITRON in 2004
Siemens	Inactive	Metering business sold and became Landis & Gyr in 2002
Transdata	Active	http://www.transdatainc.com/

Table 4

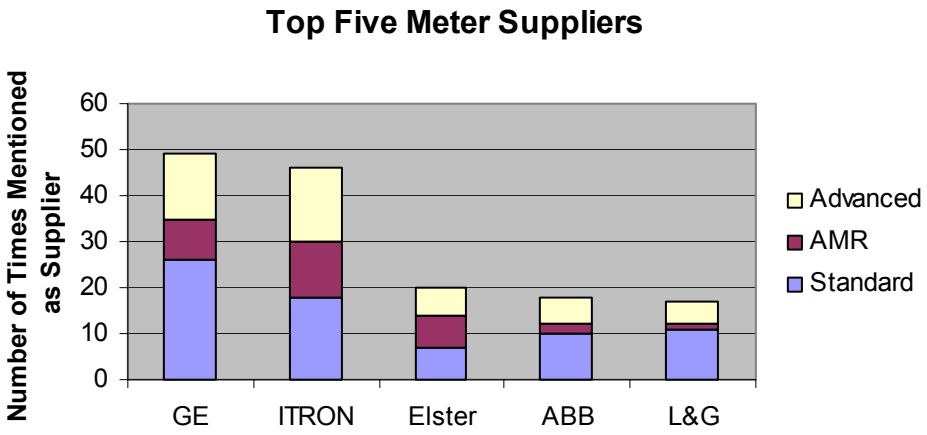

Figure 19

Results by Utility

The following pages present key data for each responding utility.

Allegheny Power

Company Name:	Allegheny Power
Company Street Address	800 Cabin Hill Dr..
Company City Address	Greensburg
Company State Address	PA 15601
Company Phone	724-837-3000
Company Web Address:	www.alleghenypower.com
Parent Company:	Allegheny Energy Inc.
Respondent:	Thomas Dugan
Respondent Title:	General Manager, Technical Services
Number of customers:	691,148
Residential	601,151
Small Commercial/Industrial (C/I)	89,889
Large Commercial/Industrial (C/I)	108

Allegheny Power – Meter Summary				
	Standard	AMR	Advanced	Total
Residential	679,000	1,000	0	680,000
Small C/I	12,000	0	0	12,000
Large C/I	10,000	0	2,000	12,000
Total	701,000	1,000	2,000	704,000

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Weekly
Communication System	AMR - Radio Frequency	NA	AMI – Phone Modem, Fixed
Additional Functionality	Meter Tampering	NA	Power quality

Baltimore Gas and Electric Company

Company Name:	Baltimore Gas and Electric Company
Company Street Address	39 West Lexington Street
Company City Address	Baltimore
Company State Address	MD 21201
Company Phone	410-234-5000
Company Web Address:	www.bge.com
Parent Company:	Constellation Energy Group
Respondent:	Craig Menzel
Respondent Title:	Supervisor – Meter Engineering & Data Acquisition
Number of customers:	1,190,471
Residential	1,072,090
Small Commercial/Industrial (C/I)	108,521
Large Commercial/Industrial (C/I)	9,860

BGE				
Meter Count	Standard	AMR	Advanced	Total
Residential	509,503	564,531	0	1,074,034
Small C/I	60,963	53,572	0	114,535
Large C/I	8,816	0	1,400	10,216
Total	579,282	618,103	1,400	1,198,785

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Weekly
Communication System	Radio Frequency	Radio Frequency	Phone Modem, Fixed and Wireless
Additional Functionality	NA	NA	Outage Notification, Power Quality

Citizens' Electric Company

Company Name:	Citizens' Electric Company
Company Street Address	1775 Industrial Blvd
Company City Address	Lewisburg
Company State Address	PA
Company Phone	(570) 524-2231
Company Web Address:	www.citizenselectric.com
Parent Company:	
Respondent:	John Kelchner
Respondent Title:	Sr. Director of Engineering & Operations
Number of customers:	6,501
Residential	5,431
Small Commercial/Industrial (C/I)	988
Large Commercial/Industrial (C/I)	37

Citizens' Electric				
Meter Count	Standard	AMR	Advanced	Total
Residential	5,431	200	0	5,631
Small C/I	950	0	38	988
Large C/I	6	0	31	37
Total	6,387	200	69	6,656

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	15 Minutes to 1 Hour	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	Monthly	Monthly
Communication System	Radio Frequency	Optical	Optical
Additional Functionality			

- Citizen's Electric is about to begin a comprehensive AMR deployment, scheduled to be completed by the end of 2005.

Conectiv Power Delivery

Company Name:	Conectiv Power Delivery
Company Street Address	800 King Street
Company City Address	Wilmington
Company State Address	DE 19899
Company Phone	302-429-3018
Company Web Address:	www.conectiv.com
Parent Company:	Pepco Holdings Inc.
Respondent:	Dale P. Gant
Respondent Title:	Manager of Meter Services
Number of customers:	944,567
Residential	853,320
Small Commercial/Industrial (C/I)	89,812
Large Commercial/Industrial (C/I)	1,435

Conectiv				
Meter Count	Standard	AMR	Advanced	Total
Residential	884,193	23,097	0	907,290
Small C/I	114,388	1,794	0	116,182
Large C/I	0	0	2,184	2,184
Total	998,581	24,891	2,184	1,025,656

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Monthly
Communication System	Walk by Radio	Walk by Radio	Phone Modem – Fixed, Wireless
Additional Functionality	Meter Tampering Indication	Meter Tampering Indication	

Delaware Electric Cooperative, Inc.

Company Name:	Delaware Electric Cooperative, Inc.
Company Street Address	PO Box 600, 14198 Sussex Highway
Company City Address	Greenwood
Company State Address	Delaware, 19950
Company Phone	(302) 349-9090
Company Web Address:	Delawareelectric.coop
Parent Company:	
Respondent:	Mark A. Nielson
Respondent Title:	VP Staff Services
Number of customers:	70,415
Residential	64,102
Small Commercial/Industrial (C/I)	5,844
Large Commercial/Industrial (C/I)	469

Delaware Coop				
Meter Count	Standard	AMR	Advanced	Total
Residential	63,623	479	0	64,102
Small C/I	5,844	0	0	5,844
Large C/I	465	4	0	469
Total	69,932	483	0	70,415

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	NA
Frequency of Data Retrieval	NA	NA	NA
Communication System	Drive by Communication	NA	NA
Additional Functionality			

Duquesne Light Company

Company Name:	Duquesne Light Company
Company Street Address	411 Seventh Avenue
Company City Address	Pittsburgh
Company State Address	PA
Company Phone	412-393-6000
Company Web Address:	www.Duquesnelight.com
Parent Company:	Duquesne Light Holdings Inc.
Respondent:	David P. Barger
Respondent Title:	Director – Meter Engineering
Number of customers:	584,740
Residential	526,900
Small Commercial/Industrial (C/I)	38,140
Large Commercial/Industrial (C/I)	19,700

Duquesne Light				
Meter Count	Standard	AMR	Advanced	Total
Residential	0	544,417	0	544,417
Small C/I	493	37,435	414	38,342
Large C/I	259	23,704	2,325	26,288
Total	752	605,556	2,739	609,047

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	15 Minutes to 1 Hour	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	Daily	Daily
Communication System	Radio Frequency	Radio Frequency	Phone Modem – Fixed, Wireless
Additional Functionality	Meter Tampering	Meter Tampering, Power Quality, DSM Load Control	Power Quality, DSM Load Control

Jersey Central Power & Light Company

Company Name:	Jersey Central Power & Light Company
Company Street Address	300 Madison Ave.
Company City Address	Morristown
Company State Address	New Jersey
Company Phone	(973) 401-8200
Company Web Address:	www.firstenergycorp.com
Parent Company:	Firstenergy Corp.
Respondent:	Nick Vass
Respondent Title:	Manager Central Electric Lab
Number of customers:	1,062,492
Residential	942,094
Small Commercial/Industrial (C/I)	119,848
Large Commercial/Industrial (C/I)	550

JCPL				
Meter Count	Standard	AMR	Advanced	Total
Residential	942,094	0	129	942,223
Small C/I	119,545	0	0	119,545
Large C/I	0	0	550	550
Total	1,061,639	0	679	1,062,318

	Residential	Small C/I	Large C/I
Data Measurement Interval	15 Minutes to 1 Hour		15 Minutes to 1 Hour
Frequency of Data Retrieval	Daily		Daily
Communication System	Phone Modem - Fixed	Phone Modem - Fixed	Phone Modem - Fixed
Additional Functionality	Outage Notification		Outage Notification

Metropolitan Electric Co./Pennsylvania Electric Co.

Company Name:	Metropolitan Electric Co./Pennsylvania Electric Co.
Company Street Address	2800 Pottsville Pike
Company City Address	Reading
Company State Address	Pennsylvania
Company Phone	(610) 929-3601
Company Web Address:	www.firstenergycorp.com
Parent Company:	Firstenergy Corp.
Respondent:	Kent Hatt
Respondent Title:	Rates and Regulatory Affairs
Number of customers:	1,109,458
Residential	967,158
Small Commercial/Industrial (C/I)	141,368
Large Commercial/Industrial (C/I)	932

Meted Penelec				
Meter Count	Standard	AMR	Advanced	Total
Residential	966,932	0	226	967,158
Small C/I	140,620	0	748	141,368
Large C/I	0	0	932	932
Total	1,107,552	0	1,906	1,109,458

	Residential	Small C/I	Large C/I
Data Measurement Interval	15 Minutes to 1 Hour	15 Minutes to 1 Hour	15 Minutes to 1 Hour
Frequency of Data Retrieval	Daily	Daily	Daily
Communication System	Phone Modem – Fixed, Wireless	Phone Modem – Fixed, Wireless	Phone Modem – Fixed, Wireless
Additional Functionality	Outage Notification	Outage Notification	Outage Notification

PECO Energy

Company Name:	PECO Energy
Company Street Address	2301 Market Street
Company City Address	Philadelphia, 19103
Company State Address	PA
Company Phone	215-841-4000
Company Web Address:	www.peco.com
Parent Company:	Exelon Corp.
Respondent:	William Patterer
Respondent Title:	Senior Rates Specialist
Number of customers:	1,541,115
Residential	1,385,000
Small Commercial/Industrial (C/I)	153,000
Large Commercial/Industrial (C/I)	3,115

PECO				
Meter Count	Standard	AMR	Advanced	Total
Residential	0	1,300,000	0	1,300,000
Small C/I	0	153,000	0	153,000
Large C/I	0	1,200	1,200	2,400
Total	0	1,454,200	1,200	1,455,400

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Daily
Communication System	Radio Frequency	Radio Frequency	Phone Modem – Fixed Network, Wireless
Additional Functionality	Outage Notification, Meter Tampering Indication	Outage Notification, Meter Tampering Indication, Power Quality	Outage Notification, Meter Tampering Indication, Power Quality

Potomac Electric Power Company

Company Name:	Potomac Electric Power Company
Company Street Address	701 Ninth Street, N.W.
Company City Address	Washington
Company State Address	D.C. 20068
Company Phone	202-872-2000
Company Web Address:	www.pepco.com
Parent Company:	Pepco Holdings Inc.
Respondent:	Reginald McCauley
Respondent Title:	Manager Meter Services
Number of customers:	713,600
Residential	640,800
Large/Small Commercial/Industrial	72,800
Large Commercial/Industrial (C/I)	N/A

PEPCO				
Meter Count	Standard	AMR	Advanced	Total
Residential	659,450	4,250	0	663,700
Small C/I	112,500	0	0	112,500
Large C/I	0	800	730	1,530
Total	771,950	5,050	730	777,730

	Residential	Small C/I	Large C/I
Data Measurement Interval			15 Minutes to 1 Hour
Frequency of Data Retrieval			Daily
Communication System	Radio Frequency		AMR :Phone Modem – Fixed, Wireless, AMI: Two-way paging
Additional Functionality	Outage Notification		Outage Notification, Power Quality

PPL Electric Utilities

Company Name:	PPL Electric Utilities
Company Street Address	2 N. Ninth St.
Company City Address	Allentown
Company State Address	Pennsylvania
Company Phone	(610) 774-5151
Company Web Address:	www.pplweb.com
Respondent:	Douglas Krall/Douglas Stinner
Respondent Title:	Mgr. – Regulatory Strategy/Sr. Forecaster
Parent Company:	PPL Corp.
Respondent:	Douglas Krall/Douglas Stinner
Respondent Title:	Mgr. – Regulatory Strategy/Sr. Forecaster
Number of customers:	1,350,028
Residential	1,180,571
Small Commercial/Industrial (C/I)	168,019
Large Commercial/Industrial (C/I)	1,438

PPL				
Meter Count	Standard	AMR	Advanced	Total
Residential	0	1,179,922	649	1,180,571
Small C/I	0	125,536	43,467	169,003
Large C/I	0	42	1,396	1,438
Total	0	1,305,500	45,512	1,351,012

	Residential	Small C/I	Large C/I
Data Measurement Interval	15 Minutes to 1 Hour	15 Minutes to 1 Hour	15 Minutes to 1 Hour
Frequency of Data Retrieval	Monthly	Monthly	Monthly, Daily, Real Time
Communication System	AMR: Power Line Communication, AMI: Phone Modem – Fixed, Wireless	AMR: Power Line Communication, AMI: Phone Modem – Fixed, Wireless	Phone Modem – Fixed, Wireless
Additional Functionality	Meters can be upgraded for additional functionality	Meters can be upgraded for additional functionality	Meters can be upgraded for additional functionality

Note: Data entered for Small C/I, advanced meters is being reviewed by PPL.

PSE&G

Company Name:	PSE&G
Company Street Address	80 Park Plaza
Company City Address	Newark
Company State Address	New Jersey
Company Phone	(973) 430-7000
Company Web Address:	www.pseg.com
Parent Company:	Public Service Enterprise Group Inc.
Respondent:	Walter Ross
Respondent Title:	Manager -Measurement Systems and Operations
Number of customers:	2,032,756
Residential	1,773,572
Large & Small Commercial/Industrial	259,184
Large Commercial/Industrial	N/A

PSEG				
Meter Count	Standard	AMR	Advanced	Total
Residential	1,930,555	1,627	571	1,932,753
Small C/I	57,126	0	7,324	64,450
Large C/I	38,684	0	3,258	41,942
Total	2,026,365	1,627	11,153	2,039,145

	Residential	Small C/I	Large C/I
Data Measurement Interval	15 Minutes to 1 Hour	15 Minutes to 1 Hour	15 Minutes to 1 Hour
Frequency of Data Retrieval	Daily	Daily	Daily, Hourly
Communication System	AMR: Radio Frequency, AMI: Phone Modem - Fixed, Wireless	Phone Modem - Fixed, Wireless	Phone Modem - Fixed, Wireless
Additional Functionality	Outage Notification, Meter Tampering Indication	Outage Notification, Meter Tampering Indication	Outage Notification, Meter Tampering Indication

Rockland Electric Company

Company Name:	Rockland Electric Company
Company Street Address	390 West Route 59
Company City Address	Spring Valley
Company State Address	New York
Company Phone	845-577-3260
Company Web Address:	www.oru.com
Parent Company:	Consolidated Edison Inc.
Respondent:	James L. Burke
Respondent Title:	Director – Customer Meter Operations
Number of customers:	290,091
Residential	258,091
Small Commercial/Industrial (C/I)	28,000
Large Commercial/Industrial (C/I)	4,000

Rockland				
Meter Count	Standard	AMR	Advanced	Total
Residential	246,757	11,384	0	258,141
Small C/I	19,547	0	0	19,547
Large C/I	1,948	67	90	2,105
Total	268,252	11,451	90	279,793

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Monthly
Communication System	Radio Frequency	NA	Phone Modem - Fixed, Wireless
Additional Functionality	Meter Tampering Indication	NA	

UGI Utilities Inc. – Electric Division

Company Name:	UGI Utilities Inc. – Electric Division
Company Street Address	400 Stewart Road
Company City Address	Wilkes-Barre
Company State Address	PA
Company Phone	610-796-3474
Company Web Address:	www.ugi.com
Parent Company:	UGI Corporation
Respondent:	Brian J Fitzpatrick
Respondent Title:	Senior Analyst – Electric Power Supply and Rates
Number of customers:	61,880
Residential	54,385
Small Commercial/Industrial (C/I)	6,927
Large Commercial/Industrial (C/I)	568

UGI				
Meter Count	Standard	AMR	Advanced	Total
Residential	35,511	19,038	0	54,549
Small C/I	6,940	0	0	6,940
Large C/I	568	0	0	568
Total	43,019	19,038	0	62,057

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	NA
Frequency of Data Retrieval	NA	NA	NA
Communication System	Drive by Communication	NA	NA
Additional Functionality	Meter Tampering Indication	NA	NA

Wellsboro Electric Company

Company Name:	Wellsboro Electric Company
Company Street Address	33 Austin St.
Company City Address	Wellsboro
Company State Address	Pennsylvania 16901
Company Phone	570-724-3516
Company Web Address:	Wellsboroelectric.com
Respondent Phone:	570-724-6701
Respondent:	Robert S. McCarthy
Respondent Title:	Vice-President, Engineering and Operations
Number of customers:	5,810
Residential	4,782
Small Commercial/Industrial (C/I)	1,014
Large Commercial/Industrial (C/I)	14

Wellsboro				
Meter Count	Standard	AMR	Advanced	Total
Residential	3,351	1,229	0	4,580
Small C/I	913	101	0	1,014
Large C/I	5	0	9	14
Total	4,269	1,330	9	5,608

	Residential	Small C/I	Large C/I
Data Measurement Interval	NA	NA	15 Minutes to 1 Hour
Frequency of Data Retrieval	NA	NA	Monthly
Communication System	Power Line Carrier	Power Line Carrier	Phone Modem - Fixed
Additional Functionality	Outage Notification, Meter Tampering Indication	Outage Notification, Meter Tampering Indication	Power Quality

Analysis and Conclusions

Since the passage of Energy Policy Act in 1992, the Mid-Atlantic region has been a leader in the trend toward a competitive electric industry. Public utility commissions in the Mid-Atlantic States of New Jersey, Pennsylvania, Maryland, Delaware, and the District of Columbia have revamped electricity regulations to promote competition. Many Mid-Atlantic utilities have changed their organizations through mergers, divestitures, entry into unregulated energy businesses, and other business dealings to become more responsive to the dynamics of a restructured electric market. The region benefits from a robust wholesale market operated by the PJM Independent System Operator (ISO), which has become the largest wholesale electricity market in the world.[1]

Even with the driver of electricity restructuring, however, advanced metering and associated energy information systems have not become industry standards. According to researchers at E-Source, "The principal reasons for the sluggish deployment of advanced metering and dynamic pricing are neither economic nor technological. Rather, cultural and political splits are at the heart of the impasse." [2]

"Cultural and political splits" reflect the nature of decision making among stakeholders in the electricity industry. In mature, technologically complex industries, decisions are usually considered and risk minimizing, so the business culture often creates barriers to implementation of new concepts. Overcoming obstacles to the adoption of advanced metering, in the end, depends on increasing "certainty" associated with these new products; certainty of technical performance and of cash flows returned from investments. Conflicting opinions associated with measuring performance and assigning a dollar value on meter information contribute to "political splits" and make it difficult to credibly calculate a return on investment.

The benefits of real-time load data from advance meters potentially accrue to all members of the electricity value chain; from the generators, to the distributors, to the end-users. Time-based data from meters is an essential element in operating cost management for all stakeholders. Utilities manage costs with greater control over load dispatch and more rapid response to system or customer problems. Consumers can manage their electricity usage in reaction to price signals while industrial users can additionally enhance overall productivity with energy information. Equipment suppliers benefit from increased sales to new markets.

The objective of the Installed Meter Survey is to characterize the meter population in the MADRI region, to gain some insight about how meter technology is advancing in the region and to establish a baseline of meter information against which to measure progress in the deployment of enabling meter technology. The survey has shown that some utilities have embraced new metering technology while others have not. Overall, the progress of advanced meter technology use in the five-state MADRI area surpasses the national average. The annual AMR survey by Chartwell estimates that more than 31 Million, about 24%, of all North American electric meters are automated and the MADRI survey estimates a 34% AMR penetration rate.[3]

At the utility level, there is no obvious correlation between the size of a utility or its location with its propensity to deploy AMR or Advanced Meters. In Maryland and New Jersey, where there is hourly pricing, there is little advanced metering, which deliver data for the purposes of managing could short term energy procurement. In Pennsylvania, some utilities no longer have basic watt-

[1] www.energetics.com/coalition/state.html
[2] www.esource.com
[3] www.chartwellinc.com

hour meters in place while their peers in the state are far from this standard with few AMR or Advance Meter installations.

Reasons for differences in the rates of deployment for AMR and Advance Meters between states and within states may be related to how a utility copes with uncertainty; particularly the uncertainty of restructuring and the uncertainty as to the amount of potential benefits to stakeholders. Naturally, uncertainties decrease over time as rules get clarified, experience is gained, and information is shared. One reason for the high concentration of AMR meters in Pennsylvania at this time could be related to it being the first Mid-Atlantic state to launch its restructuring program; there has been more time and information available to evaluate options and make business decisions.

Uncertainty of Restructuring

The electric industry in the Mid-Atlantic States has been in the process of restructuring since 1998 when Pennsylvania initiated its customer choice programs. In the following three years, New Jersey, Delaware, Maryland and the District of Columbia opened their market to competition. During the transition period, rates have been frozen and/or reduced so some of the incentives of a competitive market may not be realized until end of the transition period. Because restructuring of electric markets occurs on a state by state basis, there is a little uneasiness among stakeholders that the process may be reversed as it has happened in California.

> *Rather than being stimulated by deregulation, the move to advanced metering is, instead, being stymied by it. Many utilities that had begun implementation of advanced metering projects have slowed installations or placed them on hold. Companies that were in the planning stage have shelved their projects until the rules of ownership and stranded costs can be clarified and finalized. Utilities and meter service providers are not willing to risk the loss of capital associated with the upgrade and installation of advanced metering.*
>
> Emmett Kelly, "AMR Should Have Place in Today's Changing Industry," Pipeline & Gas Journal, April 2001.

Electricity restructuring was put into place with an implicit understanding that competition would lower prices in all customer segments. Competition has certainly induced price changes, but customers have begun to recognize there is more uncertainty regarding the direction of the price changes. As customers adapt to competitive electricity markets – with pricing more directly impacted by supply disruptions and delivery bottlenecks, for example – the value of the information from Advanced Meters will become more apparent.

In the changing regulatory environment, there is also uncertainty regarding who can or should own advanced meter equipment and who can or should own meter data. Historically, utilities and customers have collected, managed and applied meter data for their own specific needs guided by service specifications in utility tariffs. Restructuring does not seem to have significantly changed the customary relationship between utility, end-user, and meter data. Respondents to the survey have commented that all customers have options to receive real time data by getting access to utility meter data or by installing own meter equipment and that some EDCs analyze and deliver meter data to commercial and industrial customers for a fee. An equipment supplier interviewed during the survey noted that customer side hardware and software are available to satisfy the information needs of customers interested in time of use rates and demand response programs; however, current electricity pricing structure and status of distributed resources programs do not provide sufficient benefits for end-users to invest without government subsidies such as in New York and California.

Because of the uncertainty in the restructuring marketplace, a certain "chicken-or-the-egg" dilemma is occurring with advanced meters. Will competition and new pricing schemes create a market for advanced meters or will advanced meters enable the acceptance of competitive electricity options? One utility manager commented that the former would likely occur; saying that new metering equipment is installed after rates are in place and there is customer demand – equipment is not installed prior to rate roll out in order to change demand for a particular rate.

Uncertainty of Benefits

Many of the largest utility customers have recognized the benefits of advanced metering as it allows them to take advantage of special utility rates. In rate sheets for some of the larger utilities, advanced metering is an option for customers. Generally, there are extra charges for advanced metering equipment and installation. Customers make cost-benefit calculations to understand whether or not the expense of advanced metering is returned through lower electricity costs. Residential and small business customers have not yet perceived that information from advanced meters will help them manage uncertainty in competitive markets.

Discussions with respondents to the survey imply widespread use of advanced meters in all customer segments has some practical barriers to overcome. For example, businesses may not be able to respond to hourly pricing because of production schedule or process requirements. Large customers are more likely to participate in curtailment programs that give advanced notice. On the residential side, advanced meters may not be able to deliver direct benefits to customers according to one of the survey respondents. In addition to minimal perceived benefits, the mass market may not have the time or inclination to change behavior due to price signals.

From the utilities' perspective, cost saving benefits of deploying AMR and advanced meters are being recognized where restructuring has provided incentives to better manage costs. Distributed resources alone are not expected to drive the advance meter market. A meter manager commented that costs for meter infrastructure to support Demand Response by itself are not justifiable; there must be additional benefits to the utility. The real question is not whether enabling customers to see price, respond to price and benefit from that response will justify the required utility investment. Rather, the question is will the ability to meet the customer service expectations of 21st Century electric customers – as well as the ability to better operate, maintain, and plan the distribution system and to better react to outages – justify the required investment. The survey indicates EDCs are currently realizing operational benefits in numerous areas:

- Remote meter connect and disconnect
- Outage notification
- Meter tampering indication
- Power Quality
- DSM Load Control
- System Operation
- Meter Maintenance
- Customer Service (CIS)
- Energy Information Services

Ten percent of the survey respondents with Advanced Meters cited DSM Load Control as a benefit of advanced metering, pointing out the enabling relationship between Advance Meters and Demand Response.

There is an often heard concern expressed by utilities regarding cost recovery for metering investments. These survey results show that, universally, utilities are recovering metering costs.

Metering is just one of many investment options for an electric distribution company and decisions are made according to which option provides the greatest benefits for the investment. Quantifying the value of Advanced Meter information is key in calculating cost-benefit ratios for investments, particularly when utilities believe they are obtaining some of the information and benefits from more conventional equipment. For example, some utilities commented that

- Price communication can be done via the web or some other means without advanced meters
- Direct load control does not require advanced meters

New technology by itself also introduces uncertainty. The rapid advance of metering technology has advanced tremendously over the last ten to twenty years – becoming part of the digital world – has heightened uncertainty. Utilities are concerned about how new technology impacts their substantial, historical investments. Uncertainty about future technological developments and the fear of stranding costs may be contributing to the paralysis of some utilities in addressing the needs of 21st Century electricity buyers. Open architecture tools and a clear understanding of benefits can move decision makers beyond the current unsatisfactory status quo.

Market Penetration of AMR and Advanced Meters

The market for AMR and Advanced Meters will continue to expand organically with the replacement of meters that have reached the end of there useful lives. The Chartwell AMR survey anticipates the number of AMR meters to more than double by 2010. The issue is not if AMR and Advanced Meters will become the standard for measuring electricity, but when will they become the standard. Education of customers and utilities about the technology and its benefits is necessary to achieve a rate of growth that is sufficient to support the needs of the competitive electricity market, including the market for distributed resources.

Demand for advance meters may not pick up until end-users and utilities understand the real impact of competitive markets. Clearly, however, customers that cannot see price, respond to price, and benefit from that response will be stymied from acting on any understanding of competitive markets. Overcoming this "chicken-or-the-egg" problem requires comprehensive policy analysis and action by state regulators.

Appendix A

Survey Document.

INSTALLED METER SURVEY

The Mid-Atlantic Distributed Resource Initiative (MADRI) is requesting that electric distribution companies operating in the Mid-Atlantic region of PJM complete its Installed Meter Survey. Information resulting from the survey will help MADRI's Metering Working Group better understand how meters are deployed throughout PJM. This baseline knowledge of installed meters is important to achieving MADRI's objective of deploying advanced meters to help enable markets for distributed resources throughout PJM.

The public utility commissions of Delaware, District of Columbia, Maryland, New Jersey and Pennsylvania, along with the U.S. Department of Energy and PJM Interconnection have established MADRI to develop regional policies and market-enabling activities to support distributed generation and demand response in the Mid-Atlantic region.

Please read the survey instructions below carefully and complete the survey as thoroughly as possible. **Return it by February 15, 2005 to:** *Michael Lukasiewicz, malukasiewicz@mxroads.com or mail: 1318 Oxford, Glenview, IL 60025. (312) 282-1008.* Thank you for your assistance!

Survey Instructions

- This survey seeks to collect information about all meters currently installed in Company's service territory.
- Before attempting to complete the survey, please review all parts of the questionnaire. It may be helpful to print out the survey and gather the required information before entering the data into the document.
- The survey defines three broad meter types – standard, AMR, and Advanced – and prompts you to allocate the meter inventory to each of these meter types. Definitions are for guidance, use your best judgment.
- The survey splits a utility's customer base into three classes – residential, small commercial/industrial, and large commercial/industrial.
- For each meter type and customer class, enter requested data in the accompanying field.
- The survey is in WORD format. If you have Word on your computer, this document should automatically open in Word. You should then save the document to your desktop, complete the survey and e-mail it as an attachment to: malukasiewicz@mxroads.com
- You can direct any questions you have about the survey to Mike Lukasiewicz by e-mail or by phone at (312) 282-1008.

COMPANY INFORMATION

Company Name:	
Company Street Address	
Company City Address	
Company State Address	
Company Phone	
Company Web Address:	
Respondent:	
Respondent Title:	
Respondent Phone:	
Respondent E-mail Address:	
Company size (by number of customers):	
Residential	
Small Commercial/Industrial (C/I)	
Large Commercial/Industrial (C/I)	
If company counts government customers separately, list the number here. For survey below, include government meters with appropriate (C/I) class.	

COMMERCIAL/INDUSTRIAL CUSTOMER DEFINITIONS

Utilities have different ways of classifying customers; please provide definition, in technical terms, for two major non-residential customer classes using the criteria Voltage, Usage, or Demand.	Typical minimum requirements			
	Voltage	Usage (kWh per Month)	Demand (kW)	Other _____
Small Commercial/Industrial				
Large Commercial/Industrial				

METERING DEFINITIONS

Standard Watt-Hour Meter	Electromechanical or solid state meters measuring aggregated kWh manually retrieved over monthly billing cycles. Standard meter may also include functions to measure time-of-use and/or demand with data manually retrieved over monthly billing cycles. Time-of-use data are a record of usage over a specific period of time. Demand measurement records the maximum rate of energy usage over a specified period of time, such as 15 minutes or 30 minutes.
Automated Meter Reading	Meters that collect data for billing purposes only and transmit this data one way. Aggregated monthly kWh data retrieved by variety of methods including drive-by vans with short-distance remote reading capabilities and communication over a fixed network such as a cellular network.
Advanced Metering	Meters that measure and record usage data at a minimum, in hourly intervals, and which provides usage data to both consumers and energy companies on at least a daily basis. Data are used for billing and other purposes. Advanced meters include basic hourly interval meter and extend to real-time meters with built-in two-way communications capable of recording and transmitting instantaneous data.

Installed Meter Survey						
Total # Meters Installed on System						
Enter data for all following questions by customer class	**Residential**		**Small C/I**		**Large C/I**	
Total # of Meters Installed						
Total # Annual Meter Additions and Replacements						
STANDARD METER	Q1. How many of installed meters are standard watt hour meter?					
Standard Meter Functionality	a. Of the standard meters, how many measure usage and both demand and time of use?					
	b. Of the standard meters, how many measure usage and demand?					
	c. Of the standard meters, how many measure usage and time of use?					
	d. Of the standard meters, what percentage has data storage capability?					
	e. Of the standard meters, what percentage is technically capable of being retrofit with AMR?					
AMR	Q2. How many of installed meters are automated and use remote meter reading (AMR meters)?					
AMR Meter Functionality	a. Of the AMR meters, how many measure usage and both demand and time of use?					
	b. Of the AMR meters, how many measure usage and demand?					
	c. Of the AMR meters, how many measure usage and time of use?					
	d. Of the AMR meters, what percentage has the following data storage capability?					
		Monthly data		Monthly data		Monthly data
		Weekly data		Weekly data		Weekly data
		Daily data		Daily data		Daily data
		Hourly data		Hourly data		Hourly data
		No Data Storage		No Data Storage		No Data Storage
Continued on Next Page						

	Residential		Small C/I		Large C/I	
AMR Communication System	a. Of the AMR meters, what is the percentage in each type of communication system?					
		Drive by communication		Drive by communication		Drive by communication
		Radio frequency		Radio frequency		Radio frequency
		Phone modem – Fixed network		Phone modem – Fixed network		Phone modem – Fixed network
		Phone modem – Wireless network		Phone modem – Wireless network		Phone modem – Wireless network
		Local area networks		Local area networks		Local area networks
		Internet		Internet		Internet
		Other _____		Other _____		Other _____
	b. Communication capability enables additional meter functionality; of the AMR meters, what is the percentage of meters that have additional functionality?					
		Remote meter connect and disconnect		Remote meter connect and disconnect		Remote meter connect and disconnect
		Outage notification		Outage notification		Outage notification
		Meter tampering indication		Meter tampering indication		Meter tampering indication
		Power Quality		Power Quality		Power Quality
		DSM Load Control		DSM Load Control		DSM Load Control
		Other _____		Other _____		Other _____
ADVANCED METER	Q3. How many of installed meters are advanced meters? Meters record interval data (at least hourly) and have communications capability.					
Advanced Meter Functionality	a. Of the advanced meters, how many measure usage and both demand and time of use?					
	b. Of the advanced meters, how many measure usage and demand?					
	c. Of the advanced meters, how many measure usage and time of use?					
	d. Of the advanced meters, what percentage has the following data measurement interval?					
		Less than 5 seconds		Less than 5 seconds		Less than 5 seconds
		5 seconds to <1 minute		5 seconds to <1 minute		5 seconds to <1 minute
		1 minute to <15 minutes		1 minute to <15 minutes		1 minute to <15 minutes
		15 minutes to 1 hour		15 minutes to 1 hour		15 minutes to 1 hour

Continued on Next Page

	Residential		Small C/I		Large C/I	
Advanced Meter Functionality	a. Of the advanced meters, what is your current practice for frequency of data retrieval? List percentage that has the following data retrieval interval?					
		Monthly		Monthly		Monthly
		Weekly		Weekly		Weekly
		Daily		Daily		Daily
		Hourly		Hourly		Hourly
		Real Time Transmittal		Real Time Transmittal		Real Time Transmittal
Advanced Meter Communication System	b. Of the advanced meters, what is the percentage in each type of communication system?					
		Radio frequency		Radio frequency		Radio frequency
		Phone modem – Fixed network		Phone modem – Fixed network		Phone modem – Fixed network
		Phone modem – Wireless network		Phone modem – Wireless network		Phone modem – Wireless network
		Local area networks		Local area networks		Local area networks
		Internet		Internet		Internet
		Other _____		Other _____		Other _____
	c. Of the advanced meters, what is the percentage with two-way communications?					
	d. Communication capability enables additional meter functionality; of the advanced meters what is the percentage of meters that have additional functionality?					
		Remote meter connect and disconnect		Remote meter connect and disconnect		Remote meter connect and disconnect
		Outage notification		Outage notification		Outage notification
		Meter tampering indication		Meter tampering indication		Meter tampering indication
		Power Quality		Power Quality		Power Quality
		DSM Load Control		DSM Load Control		DSM Load Control
		Other _____		Other _____		Other _____
Advanced Meter Applications	e. Meter data have value within a utility for functions other than billing; what other utility functions currently use advanced meter data? (Type X in box for all that apply)					
		System Operation		System Operation		System Operation
		Meter Maintenance		Meter Maintenance		Meter Maintenance
		Customer Service (CIS)		Customer Service (CIS)		Customer Service (CIS)
		Energy Information Services		Energy Information Services		Energy Information Services
		Other _____		Other _____		Other _____

Continued on Next Page

	Residential			Small C/I			Large C/I		
	Q4. What are the typical, non-technical characteristics of the meters described by Questions 1, 2, and 3? Answers to these questions will only be reported on an aggregated basis.								
	Standard	AMR	Advanced	Standard	AMR	Advanced	Standard	AMR	Advanced
Vendor – List up to 3 top meter suppliers									
Expected Meter Lifetime (Years)									
New meter cost									
New meter installation cost									
Cost Recovery through rates (Yes/No)									
Average annual O&M cost per meter									

Appendix B

Data received from fifteen responding utilities.

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
Company size (by number of customers):																
Total	691,148	1,190,471	6,456	944,567	70,415	584,740	1,062,492	1,109,458	1,541,115	713,600	1,350,028	2,032,756	290,091	61,880	5,810	11,655,027
Residential	601,151	1,072,090	5,431	853,320	64,102	526,900	942,094	967,158	1,385,000	640,800	1,180,571	1,773,572	258,091	54,385	4,782	10,329,447
Small Commercial & Industrial (C/I)	89,889	108,521	988	89,812	5,844	38,140	119,848	141,368	153,000	72,800	168,019	259,184	28,000	6,927	1,014	1,283,354
Large Commercial & Industrial (C/I)	108	9,860	37	1,435	469	19,700	550	932	3,115		1,438		4,000	568	14	42,226
Small Commercial & Industrial																
Voltage	Less than 1 kV	N/A			120/240		<600Volts	1,108,526 <2400Vplt	Secondary	N/A	Below 12,000 volts	120/208	240 volts		Second-ary	
Usage (kWh per Month)	No minimum kWh	N/A			No min. rqmts.					1,000			kWh			
Demand (kW)	1 kW per month	<60 kW		DE, MD, VA <300, NJ < 750	Less than 50kW	50 & under				>25 kw		< 150 kw	kW	5	Greater than 7 Kw	
Other		N/A	1-phase										Time of Use			
Large Commercial & Industrial (C/I)																
Voltage	Greater than 1 kV	N/A			277/480or Primary		> 600Volts	932 > 2400Volt	Primary	N/A	12,000 volts and above	265/460	240 volts		Primary Voltage 2400V or Greater	
Usage (kWh per Month)	No minimum kWh	N/A			No min. rqmts.					7,500			kWh			
Demand (kW)	2,000 kW per month	>60 kW	>50kw	DE, MD, VA>=300, NJ >= 750	50kW or greater	Over 50				>500 kw		>= 150 kw	kW	100	50 KW Min	
Other		N/A	3-phase										TOU /L/P			
Total # of Meters Installed																
Grand Total # Meters Installed	704,000	1,198,785	6,456	1,026,016	70,415	609,047	1,062,492	1,109,458	1,454,200	775,000	1,350,028	2,039,145	279,586	62,057	5,900	11,752,585
Total # of Meters Installed by Customer Segment																
Residential	680,000	1,074,034	5,431	907,290	64,102	544,417	942,094	967,158	1,300,000	660,000	1,180,571	1,932,753	258,091	54,549	4,782	10,575,272
Small C/I	12,000	114,535	988	116,542	5,844	38,342	119,848	141,368	153,000	112,500	168,019	64,450	19,547	6,940	1,104	1,075,027
Large C/I	12,000	10,216	37	2,184	469	26,288	550	932	1,200	2,500	1,438	41,942	1,948	568	14	102,286
Total # Annual Meter Additions and Replacements																
Residential		12,367	210	69,294	5,021	27,000	30,000	25,000	13,000	17,000	15,000	46,752	1,601		450	262,695
Small C/I		2,449	70	13,877	536	1,500	7,500	7,000	1,530	2,000	5,000	1,031	471		25	42,989
Large C/I		464	1	306	47	2,600	65	50	12	250	10	5,117	285		2	9,209

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
Q1. How many of installed meters are standard watt hour meter?																
Residential	679,000	509,503	5,431	884,193	63,623	0	942,094	966,932	0	659,450	0	1,930,555	246,757	35,511	3,351	6,926,400
Small C/I	12,000	60,963	950	114,388	5,844	493	119,545	140,620	0	112,500	0	57,126	19,547	6,940	913	651,829
Large C/I	10,000	8,816	6	0	465	259	0	0	0	0	0	38,684	1,948	568	5	60,751
a. Of the standard meters, how many measure usage and both demand and time of use?																
Residential	0	0	0	3	0	0	0	103,761	0	62,000	0	0	242,147	0	0	407,911
Small C/I	0	0	0	125	0	0	2,169	478	0	35,000	0	0	2,915	0	0	40,687
Large C/I	0	8,816	0	0	20	0	0	0	0	0	0	10,880	1,151	0	0	20,867
b. Of the standard meters, how many measure usage and demand?																
Residential	0	0	0	0	0	0	0	1,837	0	0	0	83,008	3,156	0	0	88,001
Small C/I	10,000	0	601	91,144	0	493	68,176	82,582	0	0	0	61,633	15,451	1,658	913	332,651
Large C/I	10,000	0	31	0	465	259	0	0	0	0	0	29,368	123	497	5	40,748
c. Of the standard meters, how many measure usage and time of use?																
Residential	0	86,604	0	354	125	0	50,497	62	0	62,000	0	12,872	1,454	7	0	213,975
Small C/I	0	1,327	30	0	58	0	0	1,264	0	0	0	334	1,181	0	0	4,194
Large C/I	0	0	31	0	20	0	0	0	0	0	0	102	674	0	0	827
d. Of the standard meters, what percentage has data storage capability?																
Residential	0%	17%	0%	0%	1%	0%	0%	0%	0%	7%	0%	0%	4%	4%	0%	
Small C/I	0%	2%	5%	0%	1%	0%	0%	0%	0%	0%	0%	1%	0%	4%	0%	
Large C/I	0%	100%	80%	0%	5%	0%	0%	0%	0%	0%	0%	20%	0%	4%	0%	
e. Of the standard meters, what percentage is technically capable of being retrofit with AMR?																
Residential	85%	0%	65%	36%	27%	0%	30%	30%	0%	50%	0%	91%	45%	90%	100%	
Small C/I	83%	0%	70%	0%	33%	0%	25%	25%	0%	75%	0%	59%	0%	90%	100%	
Large C/I	100%	0%	0%	0%	50%	0%	0%	0%	0%	100%	0%	53%	0%	90%	100%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
Q2. How many of installed meters are automated and use remote meter reading (AMR meters)?																
Residential	1000	564,531	200	23,097	479	544,417	0	0	1,300,000	4,250	1,179,922	1,627	11,384	19,038	1229	3,651,174
Small C/I	0	53,572	0	1,794	0	37,435	0	0	153,000	0	125,536	0	0	0	101	371,438
Large C/I	0	0	0	0	4	23,704	0	0	1200	800	42	0	67	0	0	25,817
a. Of the AMR meters, how many measure usage and both demand and time of use?																
Residential	0	0	0	0	350	0	0	0	0	0	14,921	0	0	0	0	15,271
Small C/I	0	0	0	0	0	0	0	0	0	0	795	0	0	0	0	795
Large C/I	0	0	0	0	4	0	0	0	1200	800	16	0	67	0	0	2,087
b. Of the AMR meters, how many measure usage and demand?																
Residential	0	0	0	0	350	0	0	0	0	0	1,140,757	0	0	0	1,229	1,142,336
Small C/I	0	0	0	0	0	20,918	0	0	108,000	0	795	0	0	0	101	129,814
Large C/I	0	0	0	0	4	24,535	0	0	1200	0	16	0	0	0	0	25,755
c. Of the AMR meters, how many measure usage and time of use?																
Residential	0	0	0	0	350	0	0	0	15	0	14,921	0	0	0	0	15,286
Small C/I	0	0	0	0	0	0	0	0	0	0	795	0	0	0	0	795
Large C/I	0	0	0	0	4	0	0	0	1200	0	16	0	0	0	0	1,220
d. Of the AMR meters, what percentage has the following data storage capability?																
Residential																
Monthly data	0%	0%	100%	0%	73%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	
Weekly data	0%	0%	0%	0%	73%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Daily data	0%	0%	0%	0%	73%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	
Hourly data	0%	0%	0%	0%	73%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
No Data Storage	100%	100%	0%	100%	27%	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%	
Small C/I																
Monthly data	0%	0%	0%	0%	0%	56%	0%	0%	0%	0%	100%	0%	0%	0%	0%	
Weekly data	0%	0%	0%	0%	0%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Daily data	0%	0%	0%	0%	0%	9%	0%	0%	100%	0%	0%	0%	0%	0%	100%	
Hourly data	0%	0%	0%	0%	0%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
No Data Storage	0%	100%	0%	100%	0%	44%	0%	0%	0%	100%	0%	0%	0%	0%	0%	
Large C/I																
Monthly data	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	100%	0%	100%	0%	0%	
Weekly data	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Daily data	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Hourly data	0%	0%	0%	0%	100%	100%	0%	0%	100%	100%	0%	0%	0%	0%	100%	
No Data Storage	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
a. Of the AMR meters, what is the percentage in each type of communication system?																
Residential																
Drive by communication	0%	82%	0%	100%	27%	10%	0%	0%	3%	0%	0%	0%	0%	100%	0%	
Radio frequency	20%	100%	100%	0%	0%	90%	0%	0%	97%	100%	0%	100%	100%	0%	0%	
Phone modem – Fixed network	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Phone modem – Wireless network	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Local area networks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Internet	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other	80%	0%	0%	100%	73%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%	
Small C/I																
Drive by communication	0%	82%	0%	100%	0%	14%	0%	0%	3%	0%	0%	0%	0%	0%	0%	
Radio frequency	0%	100%	0%	0%	0%	75%	0%	0%	97%	0%	0%	0%	0%	0%	0%	
Phone modem – Fixed network	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Phone modem – Wireless network	0%	0%	0%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Local area networks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Internet	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%	
Large C/I																
Drive by communication	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Radio frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Phone modem – Fixed network	0%	0%	0%	0%	100%	37%	0%	0%	0%	80%	0%	0%	89%	0%	0%	
Phone modem – Wireless network	0%	0%	0%	0%	0%	60%	0%	0%	100%	20%	100%	0%	11%	0%	0%	
Local area networks	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Internet	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
b. Communication capability enables additional meter functionality; of the AMR meters, what is the percentage of meters that have additional functionality?																
Residential																
Remote meter connect and disconnect	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Outage notification	0%	0%	0%	0%	0%	0%	0%	0%	100%	13%	0%	0%	0%	0%	100%	
Meter tampering indication	100%	0%	0%	100%	0%	100%	0%	0%	100%	0%	0%	0%	100%	100%	100%	
Power Quality	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
DSM Load Control	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other _____	0%	0%	0%	0%	0%	0%	0%	0%	0%	87%	100%	0%	0%	0%	0%	
Small C/I																
Remote meter connect and disconnect	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Outage notification	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	
Meter tampering indication	0%	0%	0%	100%	0%	44%	0%	0%	100%	0%	0%	0%	0%	0%	100%	
Power Quality	0%	0%	0%	0%	0%	9%	0%	0%	100%	0%	0%	0%	0%	0%	0%	
DSM Load Control	0%	0%	0%	0%	0%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other _____	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	
Large C/I																
Remote meter connect and disconnect	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Outage notification	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	
Meter tampering indication	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	
Power Quality	0%	0%	0%	0%	0%	100%	0%	0%	100%	0%	0%	0%	2%	0%	100%	
DSM Load Control	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Other _____	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
Q3. How many of installed meters are advanced meters? Meters record interval data (at least hourly) and have communications capability.																
Residential	0	0	0	0	0	0	129	226	0	0	649	571	0	0	0	1,575
Small C/I	0	0	38	0	0	414	0	748	0	0	43,467	7,324	0	0	0	51,991
Large C/I	2,000	1,400	31	2,184	0	2,325	550	932	1,200	730	1,396	3,258	90	0	9	16,105
a. Of the advanced meters, how many measure usage and both demand and time of use?																
Residential	0	0	0	0	0	0	129	226	0	0	649	571	0	0	0	1,575
Small C/I	0	0	38	0	0	414	0	748	0	0	43,467	7,324	0	0	0	51,991
Large C/I	2,000	0	31	1,748	0	2,325	550	932	1,200	730	1,396	3,258	90	0	9	14,269
b. Of the advanced meters, how many measure usage and demand?																
Residential	0	0	0	0	0	0	0	0	0	0	649	571	0	0	0	1,220
Small C/I	0	0	0	0	0	0	0	0	0	0	43,467	7,324	0	0	0	50,791
Large C/I	2,000	1,400	0	436	0	0	0	0	1,200	0	1,396	3,258	0	0	9	9,699
c. Of the advanced meters, how many measure usage and time of use?																
Residential	0	0	0	0	0	0	0	0	0	0	649	571	0	0	0	1,220
Small C/I	0	0	0	0	0	0	0	0	0	0	43,467	7,324	0	0	0	50,791
Large C/I	2,000	0	0	0	0	0	0	0	1,200	0	1,396	3,258	0	0	9	7,863
d. Of the advanced meters, what percentage has the following data measurement interval?																
Residential																
Less than 5 seconds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
5 seconds to <1 minute	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
1 minute to <15 minutes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
15 minutes to 1 hour	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	
Small C/I																
Less than 5 seconds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
5 seconds to <1 minute	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
1 minute to <15 minutes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
15 minutes to 1 hour	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	100.0%	0.0%	
Large C/I																
Less than 5 seconds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
5 seconds to <1 minute	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
1 minute to <15 minutes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
15 minutes to 1 hour	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
a. Of the advanced meters, what is your current practice for frequency of data retrieval? List percentage that has the following data retrieval interval?																
Residential																
Monthly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Weekly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Daily	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	
Hourly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Real Time Transmittal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Small C/I																
Monthly	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Weekly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Daily	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	
Hourly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Real Time Transmittal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Large C/I																
Monthly	0.0%	0.0%	100.0%	99.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	
Weekly	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Daily	0.0%	0.0%	0.0%	0.1%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	95.0%	0.0%	0.0%	0.0%	
Hourly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	
Real Time Transmittal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
b. Of the advanced meters, what is the percentage in each type of communication system?																
Residential																
Radio frequency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Phone modem – Fixed network	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	69.0%	97.0%	0.0%	0.0%	100.0%	64.2%	0.0%	0.0%	0.0%	
Phone modem – Wireless network	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	31.0%	3.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Local area networks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Internet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	35.8%	0.0%	0.0%	0.0%	
Small C/I																
Radio frequency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Phone modem – Fixed network	0.0%	0.0%	0.0%	0.0%	0.0%	37.0%	60.0%	60.0%	0.0%	0.0%	100.0%	25.4%	0.0%	0.0%	0.0%	
Phone modem – Wireless network	0.0%	0.0%	0.0%	0.0%	0.0%	63.0%	40.0%	40.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Local area networks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Internet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	74.6%	0.0%	0.0%	0.0%	
Large C/I																
Radio frequency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Phone modem – Fixed network	50.0%	50.0%	0.0%	93.3%	0.0%	37.0%	81.0%	75.0%	100.0%	0.0%	100.0%	100.0%	89.0%	0.0%	100.0%	
Phone modem – Wireless network	50.0%	42.0%	0.0%	5.7%	0.0%	63.0%	19.0%	25.0%	0.0%	0.0%	100.0%	0.0%	11.0%	0.0%	0.0%	
Local area networks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Internet	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	8.0%	100.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
c. Of the advanced meters, what is the percentage with two-way communications?																
Residential	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	
Small C/I	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	
Large C/I	100.0%	92.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	11.0%	0.0%	0.0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
d. Communication capability enables additional meter functionality; of the advanced meters what is the percentage of meters that have additional functionality?																
Residential																
Remote meter connect and disconnect	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Outage notification	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	52.0%	0.0%	0.0%	0.0%	
Meter tampering indication	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	
Power Quality	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	52.0%	0.0%	0.0%	0.0%	
DSM Load Control	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Small C/I																
Remote meter connect and disconnect	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Outage notification	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	
Meter tampering indication	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	
Power Quality	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	
DSM Load Control	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	
Large C/I																
Remote meter connect and disconnect	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Outage notification	0.0%	65.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	100.0%	0.0%	75.0%	0.0%	0.0%	0.0%	
Meter tampering indication	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	
Power Quality	100.0%	65.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	75.0%	0.0%	0.0%	100.0%	
DSM Load Control	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other _____	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	

	Allegheny Power	BGE	Citizens' Electric	Conectiv	Delaware Coop	Duquesne Light	JCPL	Meted Penelec	PECO	PEPCO	PPL	PSEG	Rockland	UGI	Wellsboro	Totals
e. Meter data have value within a utility for functions other than billing; what other utility functions currently use advanced meter data? (Type X in box for all that apply)																
Residential																
System Operation						X										
Meter Maintenance						X										
Customer Service (CIS)						X	X	X								
Energy Information Services							X	X								
Other _____											x					
Small C/I																
System Operation			X									X				
Meter Maintenance						X						X				
Customer Service (CIS)			X			X	X	X				X				
Energy Information Services			X				X	X				X				
Other _____											x					
Large C/I																
System Operation		X	X	X					x			X	X		x	
Meter Maintenance		X		X		X						X	X		x	
Customer Service (CIS)			X	X		X	X	X			x	X			x	
Energy Information Services		X	X	X		X	X	X	x	X	x	X	X		x	
Other _____	x	X		X							x					