MA DPU Grid Modernization Working Group

Questions for Utilities Regarding Meter Practices

Summary of Responses

1. Types of Meters Currently Installed

NSTAR

Energy AMR meters for 94% of customers.

Demand AMR meters for 5.5% of customers.

Time-of-Use meters for 0.5% of customers.

WMECO

Energy AMR meters for 89% of customers.

Demand AMR meters for 10% of customers.

Time-of-Use meters for 1% of customers.

National Grid

For customers up to 200kW - AMR meters.

For customers above 200 kW - solid state, time-of-use, interval meters.

Residential R-4 and C&I G2 - AMR with TOU information.

Largest C&I customers on G3 - various solid state meters.

Fitchburg Gas & Electric

All customers have AMI meters. This system is not capable of interval data recording without additional enhancements, but FG&E uses enhancements to provide interval data recording for larger customers and for load surveys.

2. Meter Ages and Planning Assumptions

	NSTAR	WMECO	National Grid	FG&E
Approximate average meter age (years)	Energy 10 Demand 7 TOU 5	Energy 12 Demand 8-9 TOU 2	17.8	7.1
Book life (years)	24	23	28.9	20
Operating life (years)	15 - 20	15 - 20	30	20 - 30
Approx. avg. life remaining (years)	5 - 15	3 - 18	12.2	12.9 - 22.9

3. Current Replacement Policies and Practices

NSTAR & WMECO

Meters that fail are replaced with a like meter.

NSTAR is currently in the process of life-cycle replacement of the early AMR meters installed in the 1990s (roughly 300,000 meters in the Boston Edison service territory).

National Grid

Meters that fail are replaced with AMR.

The Company also has a performance monitoring program, to evaluate meters for potential replacement. The oldest electro mechanical meters are replaced as they are removed from the field.

Fitchburg Gas & Electric

Meters that fail are replaced with a like meter.

4. Meters and Competitive Suppliers

NSTAR & WMECO

The Company owns the meters. Competitive suppliers do not purchase, install or read the meters.

According to DPU regulations, the Company will attach a device on meters for a competitive supplier or customer upon their request, at their cost.

National Grid

The Company has an Enhanced Metering Option available for those customers on competitive services that also want a Modem Service. Both the customer and the competitive supplier are provided access to the usage data.

The Company currently has 401 active installations for this service.

Fitchburg Gas & Electric

The Company purchases, installs and reads all meters, and performs all billing services. The supplier has the option to choose a complete bill (where the Company bills for generation services), or a dual bill (where the suppliers bills for generation services). FG&E has 401 customers on competitive supply; 267 have dual billing, and 134 have complete billing.

Upon customer or supplier request, the Company installs advanced interval metering with pulse output available for customer or supplier interface.

MA DPU Grid Modernization Working Group

Questions for Utilities Regarding Meter Practices

Responses of Fitchburg Gas and Electric Light Company d/b/a Unitil

February 14, 2013

The questions below are intended to solicit helpful background information for the Customer-Facing Subcommittee and the Steering Committee. We would like to distribute this information ahead of the February 26th Customer-Facing Subcommittee meeting, if possible.

In those cases where the information is different across rate classes, please provide for each rate class separately.

1) Current meters

   a. The type(s) of meters currently in-service and the functions available: including for example AMR; AMI with or without interval metering; AMI capable of two-way communication, etc.

   Response: Unitil currently has AMI, AMR, and interval metering systems. The AMR system is used for gas metering in New Hampshire and Maine and a limited area of Massachusetts. Interval readings are provided via Itron's MV90 system with phone lines to customer meters or optically probed by a meter technician. The primary billing system for electric customers and most of the gas customers in Massachusetts is the AMI system.

   Unitil's AMI system provides for two way communications with the meter and other field devices, is capable of gathering system performance data at every meter, and can be easily integrated with other systems. The AMI system is not capable of interval data recording without additional enhancements, but Unitil utilizes Itron's MV90 system to provide this capability for larger customers and for load surveys.

   The AMI system utilizes ultra-low bandwidth, power line carrier signals and parallel frequency communications for simultaneous communication with all meters. Data is transmitted to a server with router capability located at substations. The data is then transmitted by telecommunication lines to Unitil's centralized server room where it is made available across the Company's information network to all of the operating centers for billing, status monitoring, or analysis. The Company views the AMI system as offering a strategic platform for additional technological, management, and evaluative capabilities, including:

   (1) better monitoring of daily load and peak load conditions at the customer level or specific circuits through available daily usage, peak, and on-demand load surveys;

   (2) hourly,[1] daily and on-demand meter reads;

   (3) remote "virtual" access (e.g., for disconnections and reconnections) or physical remote disconnect with service limiting capabilities at the meter;[2]

[1] Systems in Massachusetts are capable of daily data queries. Systems in New Hampshire have daily and "streaming" live data capabilities.

(4) electric system monitoring, including load, voltage, reliability, power quality, outage and momentary outage detection; (See footnote 1)

(5) remote configuration of all meter types;

(6) four configurable TOU periods recorded in the endpoint with the ability to schedule TOU and critical peak periods on-demand;

(7) direct interaction with in-home displays, thermostats and smart appliances with ZigBee®-enabled endpoints;(See footnote 2) and

(8) distribution automation capabilities such as remote capacitor control.

Most importantly, Unitil's AMI can serve as the platform for demand-response and TOU programs.

b. The approximate average age of the meters installed.

Response: 7.1 Years.

c. The book life used to recover the costs of the meters installed.

Response: The average service life for accounting purposes is 20 years.

d. The expected operating life of the meters installed.

Response: The electro-mechanical meters are expected to have an operating life of 20-30 years, but batteries and endpoints are electronic devises and may therefore have a reduced life based on operating settings and technology obsolescence. We do not have a long enough experience with the newer electronic meters to provide an expected operating life.

2) Company replacement policies and practices

a. Please describe the Company's current practice for replacing meters when they are no longer operable. Does the Company simply replace when a meter fails, or is there a regular replacement schedule? If so, please describe.

Response: Unitil replaces upon failure and does not replace on a regular schedule.

b. What type of meter is used for replacement (AMR, AMI, Other)? What functions do the replacement meters offer?

Response: Unitil's practice is to replace with like technology. See 1a for detail of technology.

3) Meters and competitive suppliers

a. Please describe the role that competitive generation suppliers play in the Company's decisions regarding meters in your service territory.

i. If the competitive suppliers have requested specific types or functions of meters, please describe?

Response: Upon request from the Customer and Supplier, Unitil has installed advanced interval metering with pulse output available for customer and/or Supplier interface. Unitil also offers an interval data

[2] Enabling this technology requires a meter replacement but is fully compatible with existing AMI system.

service. This service is a web based service that provides the ability to view and download historical readings in a web based environment.

ii. Please describe any roles that competitive suppliers play in the purchasing, installing, or reading the meters, or sending bills?

Response: Unitil purchases, installs, and reads meters as well as performs all billing services. The Supplier has the option to choose a complete bill (Unitil bills for both distribution services and Supplier provided energy supply) or a dual bill (where the Supplier bills the customer directly for their energy supply service).

In instances where the supplier undertakes billing for the supply (dual billing), Unitil provides the supplier with consumption readings. In January 2013, for FGE, there were 401 customers on third party supply. Of those, 267 were dual billed and 134 had complete billing.

iii. If a competitive supplier installs, or has a customer install, an advanced meter to record interval data in support of a competitive supplier offered time-based rate, how does this interface with regular utility meter reading and billing?

Response: Unitil only uses company-specified revenue-grade metering for billing and meter reading purposes.

(End of document.)

MA DPU Grid Modernization Working Group

Questions for Utilities Regarding Meter Practices

January 25, 2013

The questions below are intended to solicit helpful background information for the Customer-Facing Subcommittee and the Steering Committee. We would like to distribute this information ahead of the February 26th Customer-Facing Subcommittee meeting, if possible.

In those cases where the information is different across rate classes, please provide for each rate class separately.

1) Current meters

    a. The type(s) of meters currently in-service and the functions available: including for example AMR; AMI with or without interval metering; AMI capable of two-way communication, etc.

    Response:

- National Grid has AMR equipped meters for residential customers as well as small commercial and industrial customers up to 200 kW. For customers above 200 kW , the Company uses solid state meters that provide time-of-use information and can be programmed for either five or fifteen minute interval metering. Most are read using a handheld device and our legacy Meter Reading system, while some can be remotely interrogated through one-way communications using public telephone service . The company does have AMR meters that provide time-of-use information for fixed periods for Residential class R-4 and also provides peak customer demand for the commercial/industrial rate class G-2., For the largest customers above 200 kW on Rate G-3, various solid state meters from Itron, GE, Elster Electricity Metering, and Landis+Gyr are utilized .

    b. The approximate average age of the meters installed.

    Response: 17.8 Years

    c. The book life used to recover the costs of the meters installed.

    Response: 28.9 Years

    d. The expected operating life of the meters installed.

    Response: 30 years

2) Company replacement policies and practices

    a. Please describe the Company's current practice for replacing meters when they are no longer operable. Does the Company simply replace when a

meter fails, or is there a regular replacement schedule? If so, please describe.

Response:

- National Grid does replace meters when they fail, additionally we use a performance monitoring program (Pick for test) to select meters for evaluation. Meters that fail the test are removed from service and the type of meter is recorded and tracked. If a class of meters becomes problematic, the Company will develop a replacement plan to remove those meters from service over time. Additionally the oldest electro mechanical meters are being replaced as they are removed from the field for various reasons

b. What type of meter is used for replacement (AMR, AMI, Other)? What functions do the replacement meters offer?

Response: AMR

3) Meters and competitive suppliers

a. Please describe the role that competitive generation suppliers play in the Company's decisions regarding meters in your service territory.

i. If the competitive suppliers have requested specific types or functions of meters, please describe?

ii. Please describe any roles that competitive suppliers play in the purchasing, installing, or reading the meters, or sending bills

iii. If a competitive supplier installs, or has a customer install, an advanced meter to record interval data in support of a competitive supplier offered time-based rate, how does this interface with regular utility meter reading and billing?

The Massachusetts electric tariffs include an 'Enhanced Metering Options' tariff put in place specifically for competitive suppliers. We have in place a mechanism where the customer 'subscribes' to Enhanced Metering as either 'Modem Service' or 'Pulse Service'.

If the customer elects Modem Service, they provide an analog telephone line and we install a Modem and Recorder equipped meter. It is read remotely by the Meter Data Services (MDS) group, and data is sent to the Energy Profiler On-line (EPO) product. From there, the customer, or their competitive supplier is provided access to their usage data. If the Supplier is billing for the commodity (electricity), they have the ability to bring this data into their application and generate bills. The Company has 407 active installations for this service.

In this manner, National Grid provides a 'standard', secure, traceable electricity meter that we own operate and maintain. The customer and/ or their supplier has access to the data.

MA DPU Grid Modernization Working Group

Questions for Utilities Regarding Meter Practices

January 25, 2013

The questions below are intended to solicit helpful background information for the Customer-Facing Subcommittee and the Steering Committee. We would like to distribute this information ahead of the February 26th Customer-Facing Subcommittee meeting, if possible.

In those cases where the information is different across rate classes, please provide for each rate class separately.

1) *Current meters*

    a. *The type(s) of meters currently in-service and the functions available: including for example AMR; AMI with or without interval metering; AMI capable of two-way communication, etc.*

Boston Edison began deploying an Automated Meter Reading ("AMR") drive-by system in 1994. The first 300,000 meters were strategic deployments for hard-to-read locations and were deployed from 1994-1999. From 2003 through 2007, the remaining 800,000 meters were deployed to complete the entire NSTAR Electric territory. Western Mass Electric Company ("WMECO") followed a similar transition plan, completing its upgrade to AMR in 2005.

For both Boston Edison and WMECO, the initial business case for implementing AMR meters across the service territory was to achieve cost savings associated with reading meters through reduced labor and fleet costs. In addition, it was expected that upgrading to AMR meters would lead to an increase in customer satisfaction by reducing the number of estimated and inaccurate bills. To that end, NSTAR Electric experienced a 44% reduction in billing cases from 2003 to 2008, associated with a reduction in the number of estimated or inaccurate reads.

For both companies, the system has performed well, and the initial business case has been fully realized. The AMR technology is capable of providing reliable readings based on the frequency of drive-by events. The data flow from meter reading to billing has been built into an efficient and robust process that serves Northeast Utilities ("NU") customers with accurate and reliable billing information while utilizing to a greater degree the existing applications infrastructure.

As shown in **Table 1** below, the vast majority of NSTAR Electric and WMECO's metering population consists of Energy AMR -- ERT meters, which utilize Itron's encoder receiver transmitter ("ERT") technology to enable drive-by meter readings. The meters are configured to "chirp" readings at varying intervals ranging from approximately every 15 seconds. Typically once per month, the Company's meter readers will drive by and capture the Standard Consumption Message ("SCM"), which is used for billing purposes.

Large C&I customers may have a Demand – AMR -- ERT meter that transmits the SCM as well as the peak demand amount, which represents the highest usage recorded for any 15 minute period in a given month. Like the Energy meters described above, these meters also communicate via ERT technology to enable drive-by meter readings.

NSTAR Electric has optional Time of Use ("TOU") rates available to all customers and WMECO has optional TOU rates available to C&I customers[1]. Customers who opt into this rate receive a TOU meter that transmits interval consumption data. This data may either be transmitted via cellular or modem service. The interval data is then translated into peak and off-peak usage for time differentiated billing. These meters also have the ability for two-way communication in that the meters can be configured to transmit interval consumption data to the Company automatically, and the Company is also able to "ping" the meters remotely. In this way, these meters do enable some of the functionality of "AMI" meters, given that they enable two-way communication between the Company and the meter. It should be noted that, although this rate has been available for a number of years, for NSTAR Electric, less than 500 residential customers opt into this rate.

Table 1. NSTAR Electric & WMECO Meter Information

Meter Type	Communication	NSTAR Electric		WMECO	
		Approx. Coverage By Percent	Approx. Number	Approx. Coverage By Percent	Approx. Number
Energy – AMR -- ERT	Drive-by	94%	1,120,000	89%	207,000
Demand – AMR -- ERT	Drive-by	5.5%	67,000	10%	25,000
TOU	cellular/modem	0.5%	7,000	1%	1,500[2]

b. The approximate average age of the meters installed.

As shown in Table 2 below, the meter population of each Company is relatively new, particularly in light of the fact that meter manufacturers typically assert a 15-20 year useful life. NSTAR Electric completed its conversion to AMR in 2007 and is in the process of life-cycle replacement for the early meters installed in the 1990s. WMECO completed its conversion to AMR in 2005. Since both companies are actively monitoring the performance of the metering infrastructure, many meters are newer than the average installation dates listed below.

Table 2. NSTAR Electric & WMECO – Average Age of Current Meter Population

Average age of meters	NSTAR Electric	WMECO
Energy	2003	2001
Demand	2006	2004-2005
TOU	2008	2011

[1] WMECO does have general service TOU rates available to residential customers. However, these rates are not specifically designed for the residential customer class, so while it is technically available to them, it may not be economical for many customers to opt into this rate. If we were to offer a residential TOU rate, it may be appropriate to develop a rate designed specifically for the residential customer class.

[2] Includes approximately 800 load research customers.

c. The book life used to recover the costs of the meters installed.

Currently, the average service life for accounting purposes for NSTAR Electric is approximately 24 years and for WMECO the average service life is approximately 23 years.

d. The expected operating life of the meters installed.

Each company assumes a 15-20 year useful life, consistent with the vendor advice.

2) Company replacement policies and practices

a. Please describe the Company's current practice for replacing meters when they are no longer operable.

b. Does the Company simply replace when a meter fails, or is there a regular replacement schedule?

When a meter fails, NSTAR Electric and WMECO replace the meter and either send the meter back to the vendor if within warranty (typically 2 or 3 years), or retire the meter if out of warranty.

NSTAR Electric has a life-cycle replacement program to replace meters as the meters approach the end of operable life. For example we are currently replacing the electromechanical AMR meters that were installed in the mid 1990's. WMECO also utilizes replacement programs based upon in-service testing performance analysis from Electric Meter Laboratory data.

c. What type of meter is used for replacement (AMR, AMI, Other)? What functions do the replacement meters offer?

Any meter that fails is replaced with a like meter. There are a number of reasons for this, including:

- It is not economical or practical to install a single AMI meter when an AMR meter fails. This is because AMI meters require an expansive communications infrastructure in order to enable two-way communications. The meter alone without communications does not provide additional functionality to justify the added costs. Meters utilizing cellular or modem based communications, similar to those used by the Companies today for opt-in TOU applications, are in many cases an effective way to implement TOU rates on a targeted basis, but rolling this infrastructure out on a large scale may not be appropriate in all cases, and may prove more costly than other alternatives. Depending on the specific characteristics of the utility and desired functionality, utilities would analyze other communications mediums, including mesh network or powerline carrier technology prior to transitioning to system-wide AMI.

- The meter is just one element of an integrated system that is required for system-wide AMI. For instance, in addition to the meter and communications system, companies would need a Meter Data Management System ("MDM") and billing system capable of handing the interval data to enable complex time varying rate designs. These systems are costly and complicated to purchase and implement, which detracts from the business case for going to AMI.

- For a company with AMR meters, the business case is less appealing to install AMI meters than it is for a company without AMR. Companies like NSTAR and WMECO who have already installed AMR have already realized much of the cost savings associated with reading meters through reduced labor and fleet costs.

Given the above considerations of cost and complexity of AMI deployments, coupled with the fact that NU has already realized much of the operational benefits promised by AMI by installing an AMR metering infrastructure, NU has invested elsewhere in order to achieve many of the benefits enabled by AMI. Many of these investments were outlined by the companies in the presentations provided at the Grid Modernization Kick-Off Workshop on November 14, 2012.

3) Meters and competitive suppliers

a. Please describe the role that competitive generation suppliers play in the Company's decisions regarding meters in your service territory.

i. If the competitive suppliers have requested specific types or functions of meters, please describe?

ii. Please describe any roles that competitive suppliers play in the purchasing, installing, or reading the meters, or sending bills?

iii. If a competitive supplier installs, or has a customer install, an advanced meter to record interval data in support of a competitive supplier offered time-based rate, how does this interface with regular utility meter reading and billing?

Competitive suppliers do not purchase, install, or read the meters. The utility owns the meters, and is therefore responsible to perform these functions. Competitive suppliers do have the option to bill customers directly for the energy supply portion of their bill if they choose.

Although all metering equipment must be installed and maintained by the distribution companies, there is a provision in the Terms and Conditions – Competitive Suppliers M.D.P.U. No. 201B section 7B. titled "Ownership of Metering Equipment" that states that we will attach a device on meter for competitive supplier or customer upon request at their cost.

7B. <u>Ownership of Metering Equipment</u>

Should a Customer or Competitive Supplier request a new meter or request that a communication device be attached to the existing meter, the Company shall provide, install, test, and maintain the requested metering or communication device. The requested meter or communication device must meet the Company's requirements. The Customer or Competitive Supplier shall bear the cost of providing and installing the meter or communication device. Upon installation, the meter or communication device shall become the property of the Company and will be maintained by the Company. The Company shall complete installation of the meter or communication device, if reasonably possible, within thirty (30) days of receiving a written request from the Customer or Competitive Supplier. The Company shall bill the Customer or Competitive Supplier upon installation.