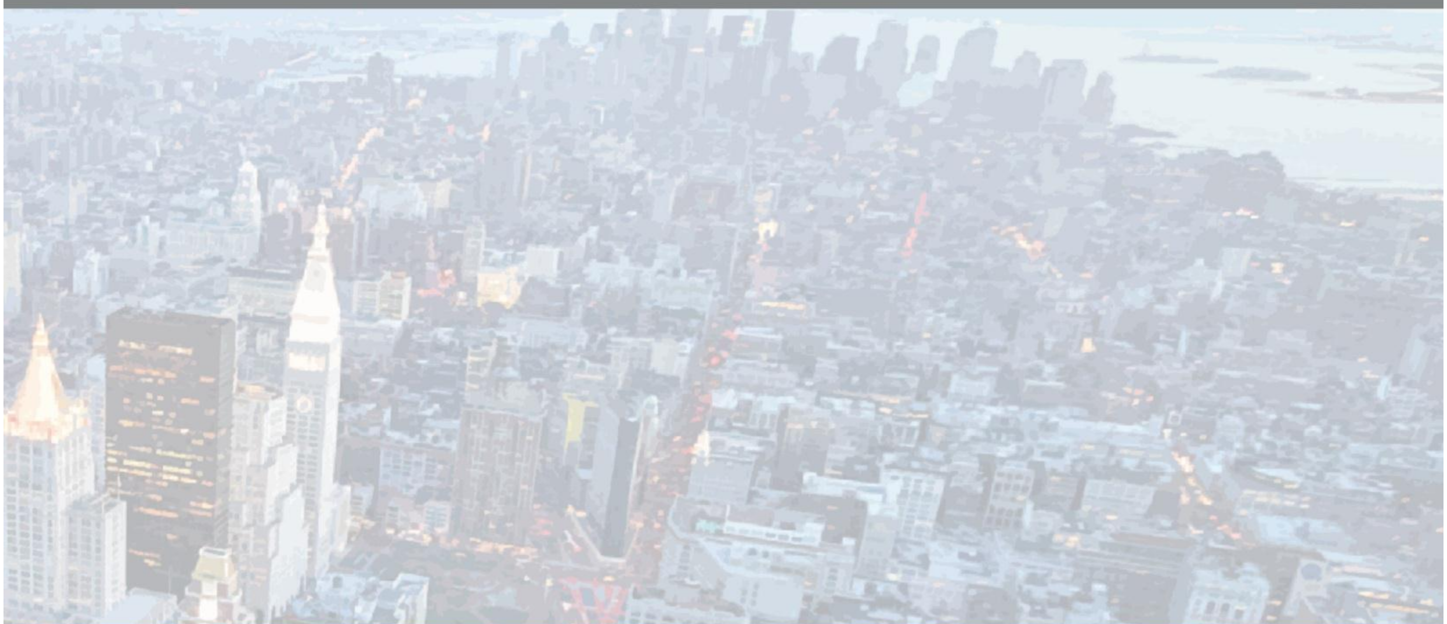
New York City
Economic Development
Corporation



Citywide Metering and Monitoring

Metering Guidelines and Specifications

Version 1.2

1. Introduction and Purpose

The purpose of this document is to provide information and specifications for the NYC citywide utility metering system components. Information provided in this document includes meter specifications for each utility type and the data collection devices used to gather information from the meters. The information in this document is intended to promote a standards-based expansion of the City's metering infrastructure through dedicated metering projects and energy-related capital investments.

1.1. Metering Goals

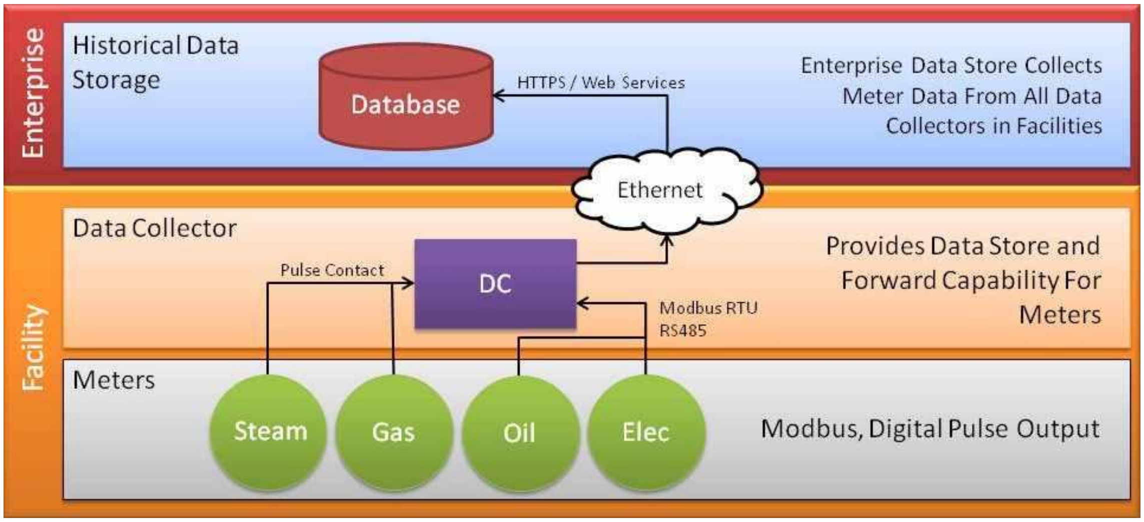
There are several goals of the NYC citywide utility metering system. At a building level, individual facility managers will have access to utility consumption and demand information in near real-time. Having timely access to their facility's utility data improves a building manager's ability to make informed energy management decisions.

This information may also be used to increase the energy efficiency awareness of building occupants. Simply having energy information available and promoting awareness, building occupants often modify their behavior resulting in an energy savings for the facility.

At the City level, data from facilities that has been collected is used to perform analytics to determine where energy optimization opportunities exist and how the current energy processes can be modified to meet goals set by the City. The City can then work directly with the facility managers to coordinate energy plans, improve energy utilization, and realize citywide energy cost reductions.

2. Basic Architecture

The following diagram depicts the common and standardized architecture for the New York City citywide utility metering system. The system components are explained below.



2.1. Meters

Meters are responsible for measuring various utilities at a facility such as electricity, natural gas, fuel oil, steam, and HVAC chilled/hot water. Meters are capable of communicating the measured consumption and other information to an external data collection device. Each meter is capable of communicating data by using either a digital pulse output or through an RS-485 port using the Modbus RTU protocol.

2.2. Data Collector

The data collector is responsible for obtaining information from the utility meters and storing that data locally in a time stamped format. Data collectors can store collected information locally for 30 days or more. The data collector is responsible for communicating with a remote data storage server in order to transmit its collected meter data offsite for long term storage. Information is transferred between data collectors and the historical data storage using Ethernet-based communications.

2.3. Historical Data Storage

The historical data storage is a single, centralized component responsible for gathering meter information from each data collector at the various facilities and storing it for long term retention and analysis. The scope of this document does not describe this component in detail. The standard communication architecture enables the metering information to be delivered to the data storage component.

3. Metering Guidelines

There are several typical reasons metering systems are deployed in facilities. Many deployments are for economic purposes and it is expected that the information provided by the meters will achieve a return on the metering investment. Other deployments are for strategic reasons (for example, to measure the benefits of a renewable energy initiative or to achieve high visibility for public relation purposes).

Below are general guidelines for determining the economic viability of a metering system installation. Other strategic factors may certainly affect the metering evaluation and, ultimately, the City will make the final decision.

3.1. General Economic Guidelines

Although there are many factors that can contribute to the payback of a metering system, the following provide a generalized method to obtain financial metering guidelines. In general, metering and its associated effect (commonly called the “Hawthorne Effect”) will produce a savings by the changes in human behavior based solely on awareness. Many studies have shown this savings to be 1 - 2%.

Taking only the savings from the Hawthorn Effect into account (the minimum expected savings from implementation of metering) we can calculate the minimum annual utility costs required to justify metering installation. The components involved in calculating the minimum annual utility cost are:

- **Installed Cost** – The total cost to purchase and install the meter and data communications equipment.
- **Simple Payback** – The number of years it will take the metering system to produce cost savings equal to the installed cost. The simple payback period required per NYC is 10 years.
- **Recurring Annual Cost** – The total operating and maintenance costs plus communications, data collection and storage, data analysis, and meter and data collector configuration/commissioning. This estimated annual cost is typically $600.
- **% Annual Savings** – The estimated cost savings to be realized from the productive use of the metered data. In these calculations this only takes the Hawthorn Effect into account.

The formula for determining annual cost that justifies metering is as follows:

$$Minimum\ Annual\ Utility\ Cost = \frac{\left(\frac{Installed\ Cost}{Simple\ Payback\ Years}\right) + Recurring\ Annual\ Cost}{\%\ Annual\ Savings}$$

The following is a calculation example to determine economic justification:

Assuming an install cost of $6,700, a 10 year simple payback, a $600 recurring annual cost, and a 2% expected energy savings we would conclude that in order to achieve a simple payback within the period of 10 years the utility cost must meet or exceed as follows:

$$Minimum\ Annual\ Utility\ Cost = \frac{\left(\frac{\$6{,}700}{10}\right) + \$600}{.02} = \$63{,}500$$

Actual economic justification should be evaluated on a site by site basis as installation costs and annual savings that may vary.

3.2. Economic Guidelines with Other Capital Projects

The same formula is used to calculate economic justification when performing meter installations as part of another capital project. However, the installation costs are usually significantly lower since labor is already mobilized as part of the project. These projects present a key opportunity to include metering as a more economically viable effort and the Installed Cost for the calculation should be adjusted appropriately.

4. Metering Project Responsibility Breakdown

The following matrix breaks down the major tasks required to plan and implement a utility metering project. The tasks are broken down into 5 major categories and each of those is broken down into a number of sub-tasks pertaining to the major category. Each of the sub-tasks listed has been assigned one or more entities that are typically responsible for performing the task. These responsibility assignments are based on practices from the current pilot implementation and may differ per project.

Task	Sub-task	Typical Responsible Party
Site Planning and Surveys	Gather preliminary building documents and information (Floor plans, utility consumption data, and number of meters…)	System Integrator
	Survey sites to gather pictures and preliminary information about meter locations and identify potential installation issues	System Integrator
	Develop network connectivity architecture and planning	System Integrator
	Perform NYCWiN Signal strength testing and record results to verify availability of wireless network.	System Integrator
	Markup building floor plans to indicate meters, data collector panel location, and network access.	System Integrator
	Assign and manage Asset IDs for meters and data collectors.	System Integrator
	Develop and document scope of installation and requirements per site for meters, data collectors, and network connectivity	System Integrator
Meter Installation	Procure materials (meters, conduit, wire, etc…)	Installation Contractor
	Interface with utility company to purchase pulse outputs for existing meters	Installation Contractor
	Mount and connect all physical meter equipment: Meters, conduit, power and communications wiring	Installation Contractor
	Install new CTs if required for use in installation of new electric meters	Installation Contractor

	Label conduit for CTs, communications wiring, and power to identify it as part of the utility metering project.	Installation Contractor
	Label all meters with an asset ID number (the number to use will be provided)	Installation Contractor
	Configure software settings on all meters to output data as specified. This includes but is not limited to the configuration of electrical smart meters, flow computers for oil, steam, and hot water/chilled water meters.	Installation Contractor
	Verify new meters are accurately reading metered utility	Installation Contractor
	Verify proper installation of physical equipment (meters, conduit, labeling)	General Contractor
Data Collector Installation	Procure materials (data collector, conduit, wire, mounting panel, etc…)	Installation Contractor
	Mount data collector and required power supply equipment in control panel. Mount panel on site.	Installation Contractor
	Label data collectors with an asset ID numbers (the number to use will be provided)	Installation Contractor
	Install Conduit and all related wiring for power, and communication between meters and data collector	Installation Contractor
	Perform initial startup of data collector to ensure it powers on and is working properly	Installation Contractor
	Configure data collector point communication with meters (pulse and Modbus)	Installation Contractor
	Configure data collector Ethernet communication (configure IP address, other network settings)	System Integrator
	Configure data collector to log data as specified and expose history information over oBIX	System Integrator
	Verify proper installation of physical equipment (data collector, panel, conduit, labeling)	General Contractor

Network (NYCWiN) Installation	Procure materials (Antenna, Modem, Coax, Connectors, etc…)	DoITT
	Install NYCWiN network equipment including antenna, modem, router, and cabling to connect antenna with modem.	Installation Contractor
	Configure modem and router to connect to NYCWiN Network	System Integrator
	Verification and Sign-off NYCWiN network connectivity and signal integrity	System Integrator / DoITT
Oversight, Sign-off, and Documentation	Oversee site equipment installations	General Contractor
	Develop site reports for sign-off approval	General Contractor / System Integrator
	Final sign-off on completion of installation on sites	General Contractor / System Integrator
	Develop as-built documents for installations	Installation Contractor

5. General Specifications

The general specification sections below detail the metering requirements for electrical, natural gas, steam, fuel oil, and hot/chilled systems. The requirements are intended to ensure that utilities are accurately measured and the selected metering hardware can be integrated with the City's enterprise metering system.

Although sample metering hardware datasheets may be provided with this document, the specifications do not stipulate that specific hardware types or vendors be used. The specifications are intended to promote competition while ensuring required functionality and interoperability.

Each section will expand on meter requirements regarding:

- Type of information meter MUST be capable of reporting for collection.
- Required accuracies of metering data.
- Requirements to communicate data from the meter to a data collection device.
- Specific hardware requirements (where applicable).

5.1. Construction

All construction and installation of metering hardware MUST adhere to City, state, and City agency (where applicable) laws and guidelines.

5.2. Accuracy

The meter accuracy requirements provided in this document are to be measured against device manufacturer specifications and do not take into account other outside environmental factors that can affect the accuracy readings. Many factors can influence the accuracy of steam, water, and gas flow meters such as the installation location of the meter on piping or the type of substance being measured. Each location at which flow/energy meters are installed should be surveyed to identify technical challenges which may influence which type of meter installation will guarantee the best accuracy.

5.3. Asset Management

All metering devices (meters and data collectors) MUST be labeled with a unique identifier that enables the City to manage each asset within the metering system. Asset identifiers must be obtained from the City prior to installation and specific device details (vendor, model, serial number, username, and password) recorded for asset management purposes.

6. Electric

The following details the requirements for electrical utility metering.

6.1. Physical and Common Requirements

- Power meter shall be panel-mounted design. Necessary test devices shall be incorporated within each meter and shall provide means for testing either from an external source of electric power or from associated instrument transformers or bus voltage.
- Meter shall be a Class 20, transformer rated design.
- Meter shall be rated for use at temperature from -40 degrees Centigrade to +70 degrees Centigrade.
- Meter shall be installed in a surface mounted enclosure.
- Surge withstand shall conform to IEEE C37.90.1.

6.2. Voltage Requirements

- Meter shall be capable of connection to the service voltage phases and magnitude being monitored. If the meter is not rated for the service voltage, provide suitable potential transformers to send an acceptable voltage to the meter.
- Meter shall accept independent voltage inputs from each phase. Meter shall be auto-ranging over the full range of input voltages.
- Voltage input shall be optically isolated to 2500 volts DC from signal and communications outputs.
- The Contractor shall be responsible for determining the actual voltage ratio of each potential transformer. Transformer shall conform to IEEE C57.13 and the following requirements.
- Transformer shall conform to IEEE C57.13 and the following requirements.
- Type: Dry type, of two-winding construction.
- Weather: Outdoor or indoor rated for the application.

6.3. Current Requirements

- Meter shall accept independent current inputs from each phase. The Contractor shall be responsible for determining the actual current transformer (CT) ratio of each potential transformer.
- Single ratio current transformer (CT) shall have an Accuracy Class of 0.3 at 5.0 amps.
- Current transformer shall have:
- Insulation Class: All 600 volt and below current transformers shall be rated 10 KV BIL. Current transformers for 2400 and 4160 volt service shall be rated 25 KV BIL.
- Frequency: Nominal 60Hz.
- Burden: Burden class shall be selected for the load.
- Phase Angle Range: 0 to 60 degrees.
- Meter shall accept current input from standard instrument transformers.
- Current inputs shall have a continuous rating in accordance with IEEE C57.13.

- Multi-ratio current transformer where indicated shall have a top range equal to or greater than the actual load. The Contractor shall be responsible for determining the actual ratio of each transformer.

6.4. Electrical Measurements

Power meter shall measure and report the following quantities:

- Cumulative Real power consumption in Kilowatt-hours.
- Real power demand, average of 3-phase total over a selectable demand interval (integrated demand) between 5 and 60 minutes (typically 15 minutes).
- Apparent power demand, average of 3-phase total measured over the same demand interval as the Real power demand.
- Reactive power demand, average of 3-phase total measured over the same demand interval as the Real power demand.
- Power factor, average of 3-phase total measured over the same demand interval as the Real power demand.
- Meter readings shall be true RMS.

Instantaneous Measurements

- Active (Real) Power (kW) - per phase and total
- Apparent Power (kVA) - per phase and total
- Reactive Power (kVAR) - per phase and total
- Active (Real) Energy (kWh)
- Apparent Energy (kVAh)
- Reactive Energy (kVARh)
- Power Factor - per phase and total
- Voltage (L-L, L-N) – per phase and total
- Current – per phase

6.5. Meter Accuracy

Power meter shall meet NEMA C12.20 for Class 0.5 and IEC 62053-22 accuracy requirements. Power meter accuracy shall be revenue grade, +/- 0.5%. Accuracies shall be measured as percent of reading at standard meter test points.

6.6. Meter Power

The meter shall be powered from the potential being monitored or from a dedicated 120 vac power circuit. This power shall be supplied from the nearest 120 vac power source to the meter location. The breaker feeding the power shall be identified at its power panel as “Meter Power”.

6.7. Information Visualization

The meter will have a face display plate (LCD, LED, etc.), with user keypad, and shall display every electrical parameter indicated to be recorded. The meter shall be capable of displaying all actual readings and listed measured parameters.

6.8. Field Programmability

Meters shall provide the ability to program the following from the front panel keypad:

- Voltage and current input scales
- RS-485 communication port parameters

6.9. Security

Access to both local meter configuration editing (through use of the front display panel) and remote meter configuration editing shall be securable by requiring authentication to a set of username/password credentials via the keypad.

6.10. Communications

The following sections describe the required communication capability of the meter.

6.10.1. RS-485 Serial Port

The meter shall provide, either standard or with an expansion module or card, a RS-485 communication port. This port shall be user configurable to set port speed, protocol, address, and other parameters.

6.10.2. Modbus Protocol

The meter shall be capable of communicating required measurement information through the RS-485 port using the Modbus RTU protocol and have a published list of measurement value to Modbus address mappings.

7. Natural Gas

There are no specific requirements on the type of device used to meter natural gas given it is accurate to within 2.0%. Where available, gas consumption information should be gathered from the existing utility owned gas meter by capturing a pulse output. In instances where existing utility owned gas meters are used, the accuracy is assumed to be acceptable.

If a new natural gas meter is required the meter MUST be capable of measuring gas flow with a rated accuracy to within 2.0%. The new gas meter MUST support one of the two following methods to communicate flow information:

- The meter may provide a pulse output which will transmit a pulse at 50ms or slower and represents gas flow in cubic feet. If a multiplier is used, the multiplier value MUST be provided as part of the Asset Management information.
- The meter may provide consumption information over the Modbus RTU protocol. This Modbus connection MUST utilize an RS-485 serial port. Flow information MUST include cumulative gas flow readings in cubic feet per minute.

8. Fuel Oil

There are no specific requirements on the type of device used to meter fuel oil. Due to the variables in involved in fuel oil systems (such as oil type, viscosity, and installation difficulty), each system should be evaluated on a case by case basis to determine the best meter type for the specific fuel oil system. Regardless of the type of meter, the following are general requirements that must be met:

- The meter MUST provide fuel oil flow readings in gallons.
- The meter MUST have a rated flow accuracy of 1.0% or greater.
- The meter MUST have a turndown rating of 10:1 or greater.
- Flow information MUST be measured at a common location if multiple boilers are fed by the fuel oil system. In systems where unused oil is returned to the supply tanks both the supply flow and return flow must be measured in order to determine the net oil consumption. The new fuel oil meter MUST support one of the two following methods to communicate flow information:
  - The meter may provide a digital pulse output which will transmit a pulse at 50ms or slower and represents flow in gallons. If a multiplier is used, the multiplier value MUST be provided as part of the Asset Management information.
  - The meter may provide flow information over the Modbus RTU protocol. This Modbus connection MUST utilize an RS-485 serial port. Flow information MUST include cumulative fuel oil flow readings in gallons.

9. Steam

There are currently two types of steam utility collection methods. The first is to gather pulse information from an existing utility owned steam meter and the second is to install a new steam meter to monitor the steam flow and energy of a building provided steam from a city owned facility.

In instances where existing utility owned steam meters are leveraged by gathering pulse data, the accuracy may be assumed to meet the requirements.

For all new city specified steam meter installations there are no specific requirements on the type of device used to meter steam but there are requirements on the results of the data gathered. The following are general requirements that must be met by any meter selected for installation.

- The meter MUST provide steam mass flow in pounds of steam.
- The meter MUST provide cumulative energy flow in millions of BTU (MMBTU).
- The meter MUST be rated with the following accuracies:
    - Volumetric flow rate - 1.0% or better.
    - Mass flow rate and temperature – 2.0% or better.
- The meter MUST have a turndown rating of 10:1 or greater.
- The new steam meter MUST provide flow and energy information from the flow computer over the Modbus RTU protocol. This Modbus connection MUST utilize an RS-485 serial port.

10. Hot / Chilled Water

There are no specific requirements on the type of device used to meter a hot/chilled water system. The following are general requirements that must be met by any meter selected for installation.

- The meter MUST calculate energy consumption in British Thermal Units (BTU) and provide a cumulative energy total in thousand BTU (kBTU).
- The meter MUST have rated flow, temperature, and energy accuracy of 1.0% or better.
- The meter MUST have a turndown rating of 10:1 or greater.
- The meter MUST provide BTU consumption information over the Modbus RTU protocol. This Modbus connection MUST utilize an RS-485 serial port.

11. Data Collector

The following section describes the technical data collection device specifications. These specifications define a set of minimum acceptable requirements that must be met by any selected data collection device. Any device that meets the specification may be used as a valid data collection device.

11.1. Hardware Specification

- The Data Collector MUST be an embedded device, not a traditional desktop PC or server running data collection software.
- The Data Collector MUST have the following integrated communications:
  - One (1) RJ-45 10/100 Ethernet port.
  - One (1) RS-485 serial port.
- The Data Collector MUST provide the following I/O components, these components MUST either be integrated directly on the Data Collector or be part of a I/O expansion module directly attached to the Data Collector.
  - Two (2) pulse counting digital inputs.
  - Two (2) digital outputs.
- RS-485 port MUST support the Modbus RTU protocol.
- The Data Collector MUST be capable of acting as a Modbus RTU Master.
- Digital inputs on the Data Collector MUST be capable of reading pulse width of 50ms and greater.
- Data Collector power sources such as outlet or intermediary power supply unit (for 24 VDC, etc…) MUST reside in the same enclosure as the Data Collector itself in cases where the Data Collector is not wired directly to a power panel.
- The Data Collector MUST support logging historical information locally in non-volatile memory. The following outlines additional data logging requirements.
  - MUST be capable of storing log information at an adjustable rate.
  - The minimum rate of collection MUST support 15 minute intervals
  - MUST be capable of storing 120 floating point values collected at the minimum rate of collection (every 15 minutes) locally for a minimum of 30 days.
- MUST provide one (1) year warranty parts and labor to maintain hardware

11.2. Software Specification

- The Data Collector MUST provide the ability for 3rd parties to write, load, and execute custom program modules directly on the device. The custom programmable modules for the Data Collector MUST be capable of performing the following tasks:
  - Read and write access to Data Collector file system including log files.
  - Directly read digital inputs and write to digital outputs, read and write to Modbus addresses.
  - Create network TCP connections to remote computers over the Ethernet interface.
  - Initializing and sending data over HTTPS via either POST or SOAP to any remote web server.
- The Data Collector MUST be remotely configurable over a TCP/IP connection. This configuration includes operating parameters, software/modules updates, and firmware updates. The TCP/IP connection may be initialized through either a thick or thin client.
- The Data Collector MUST serve web pages and is securable by an SSL certificate.
- The Data Collector MUST transmit data using Secure HTTP (HTTPS).
- The Data Collector MUST host an Open Building Data Exchange (oBIX) server to expose historical data.
- The Data Collector MUST require username/password authentication for device configuration access. Username and password MUST be encrypted as part of the security negotiation process.
- The Data Collector MUST be capable of time synchronization using NTP (Network Time Protocol).
- The Data Collector MUST provide event and diagnostic logging of data log and data transfer operations to include but not be limited to:
  - Data and time of event
  - Type of event
  - Error information
  - Server response (where applicable)
- Diagnostic log MUST be remotely viewable.
- MUST provide one (1) year warranty support for developed or COTS implemented software solution.
- Data Collector MUST have configuration software that enables a user to configure input / output mappings between:
  - Digital Input and Modbus points to the history log file.
  - Logged historical data to oBIX history objects and server URIs.
  - Data collector internal configuration variables to oBIX URIs.
  - Data collector digital outputs to oBIX URIs.

11.3. Data and Calculations

In some cases the information natively provided by the utility meter will require some additional calculations to capture desired values such as adding together the values of multiple Modbus registers to create a 32-bit or-64 bit number. In these instances calculations must be performed at the data collector if supported. For example, if the cumulative real power (kWh) is represented by two 16-bit Modbus registers and the data collector has the capability of combining two registers into a single 32-bit number it must be configured at the data collector to expose the consumption value as a single output.

11.4. Data Collector Implementation Goals and Requirements

The main goal of the data collector is to provide a reliable interface between the utility meters and the enterprise systems that store and analyze the utility meter information. There are three main components the data collector must provide in order to accomplish this.

1. **Interfacing with meters** – The data collector must be able to communicate using the open and published Modbus RTU protocol in order to read the real time information from the utility meter. It also must be capable of counting pulse outputs from less sophisticated utility meters.
2. **Providing short term historical logging** – In order to guarantee reliability of the data collection process, the data collector must provide the ability to temporarily store data it polls from the meters (as specified: 15 minute intervals for 30 days of continuous storage). In scenarios where communication between the data collector and higher level systems is interrupted for a period of time (ranging from minutes to days), there would be no loss of data.
3. **Expose historically logged data and descriptive data to higher level systems** – The data collector is responsible for exposing the specified utility information to higher level systems so that those systems may perform analysis on the information. The date collector exposes this information using a web server over secure connections (HTTPS) and formats the data into XML documents adhering to the Open Building Data Exchange specification (oBIX).

11.5. Data Collector to Enterprise Server Communications

It is a goal of the system to provide a standard expected format for required data points to be exposed to high level systems from data collectors. Communications between the Data Collector and the NYC Enterprise Metering server MUST utilize the Open Building Data Exchange (oBIX) protocol (specification 1.1: http://www.oasis-open.org/committees/download.php/38212/oBIX-1-1-spec-wd06.pdf) over HTTPS. In this system the Enterprise server will use an oBIX client to connect to the oBIX server hosted from each data collection device. The Enterprise server will be responsible for extracting the historically logged information from each device using this client/server communication over oBIX.

11.6. Java Application Control Engine (JACE) Data Collector

The JACE data collector is a device identified to meet the requirements and goals of the specification and is currently in use at metering project sites. The following sections highlight specific configuration requirements and details needed to properly implement the specification using this device.

11.6.1. JACE Programming Requirements

The following section details the expected programming requirements to configure a Tridium JACE to meet the data collection requirements.

The JACE MUST have the following non-standard Drivers installed and configured. The following Drivers provide communication between the JACE and respective devices:

- oBIX Driver
  - Once installed this driver required little configuration beyond enabling it. It provides the ability to expose the historical meter information to be gathered by an enterprise server.
- Modbus Driver (license required)
  - Modbus driver configuration includes programming configuring the Modbus maps for devices on the Modbus network that the JACE will be polling data from. In the scope of this project all meters that are not providing a pulse contact will utilize Modbus for communication.
- Ndio Driver
  - The Ndio driver is used to read data from the IO-16 Expansion module (where pulse outputs from utility meters are wired to)

The JACE MUST have the following services installed and/or configured:

- HistoryService
  - Enables logging historical information for data points.
- Webservice
  - Standard Webservice service must be installed; HTTPS must be enabled to run on port 443.
- Cryptoservice (license required)
  - In order to enable support for HTTPS the Crypto module must be licensed and installed on the JACE and the Cryptoservice installed on the station.

Calculated Modbus Point Data

- In some instances, programming will be required to combine multiple 16-bit Modbus registers in order to calculate 32-bit or 64-bit numbers. This configuration requirement is separate from the Modbus driver configuration.

Metadata

- The JACE must also be configured to hold a set of metadata identifying information about the data collection site such as device ID, meter numbers, address, etc.

Logging

- The JACE requires the configuration of internal points to log required meter data points at 15 minute intervals (as returned from the raw Modbus registers or from the computed values from combining multiple Modbus registers).

User Accounts

- The JACE must be configured to create and set permissions for the accounts that will access the device to poll meter data and configure the device. Account information will be provided to the installation contractor as part of the assigned asset management data.

11.6.2. oBIX URL Formats Requirements

In oBIX, each individual set of data has its own URL web reference. Using a standard web browser, the historical information for a collected data point may be retrieved by targeting each of the respective URLs pointing to the data point history. The following outlines the required URL format for exposed data from the JACE data collector.

Data Category	URL Schema
JACE oBIX Meter Real Time Data Point URLs	https://<IP Address>/obix/config/drivers/<network name>/A<meter asset ID>/points/<point name>
JACE oBIX Meter Meta-data URLs	https://<IP Address>/obix/config/drivers/<network name>/A<meter asset ID>/points/<point name>
JACE oBIX Data Collector Meta-data URLs	https://<IP Address>/obix/config/collector_info/<point name>
JACE oBIX Histories	https://<IP Address>/obix/histories/<JACE asset ID>/A<meter asset ID>_<point name>

The following tables list the minimum required data points that must be exposed for each device that has associated data. Each point table relates to a specific oBIX URL format above. This includes the data collector device itself as well as each of the utility and meter types that are connected to it.

11.6.3. JACE oBIX Meter Real Time Data Point Names

The oBIX URL names for the real time data point values may vary from vendor to vendor. See appendix document *Meter and JACE Device Config Template* for example point names for approved meters.

11.6.4. JACE oBIX Meter Meta-data Point Names

Point Name	Description
meter_type	Type of meter (Electric, Steam, Gas…)
utility_provider	Company name of utility provider
utility_meter_num	Number of utility meter
utility_account_num	Account number of utility meter
building_name	Name of building meter is providing service to
asset_id	Asset ID of meter

11.6.5. JACE oBIX Data Collector Meta-data Point Names

Point Name	Description
agency	NYC Agency of building ownership
site_name	Name of the site building resides at
site_code	Shorthand code used to identify the site
building	Name of the building data collector is installed in
asset_id	Asset ID of data collector

11.6.6. JACE oBIX History Point Names

Point Name	Description
Electric Pulse Meter	
Consumption_Counter	Cumulative pulse total
KWH_Total	Cumulative electricity consumption in kilowatt hours (KWH) (derived by multiplying the cumulative pulse total by the pulse multiplier)
Consumption_Counter	Cumulative pulse total
Gas_Total	Cumulative Gas consumption in hundreds of cubic feet (CCF) (derived by multiplying the cumulative pulse total by the pulse multiplier)
Steam Pulse Meter	
Consumption_Counter	Cumulative pulse total
Steam_Total	Cumulative Steam consumption in hundreds of pounds of steam (CLB) (derived by multiplying the cumulative pulse total by the pulse multiplier)
KWH_Total	cumulative 3-phase total of kWh (delivered)
KW_Demand	Real Power, Integrated demand over 15 minute interval
kVA_Demand	Apparent Power, Integrated demand over 15 minute interval
kVAR_Demand	Reactive Power, Integrated demand over 15 minute interval
PF	Power factor, average of 3 phase total
Steam Meter	
Steam_Total	Cumulative Steam production in hundreds of pounds of steam (CLB) (derived by multiplying the cumulative pulse total by the pulse multiplier)
Energy_Total	Cumulative Energy consumption in Millions BTU (MMBTU)
Hot Water / Chilled Water Meter	
Energy_Total	Cumulative Energy consumption in Millions BTU (MMBTU)
Fuel Oil Meter	
Flow_Total	Cumulative net total of oil supplied to boilers (In Gallons) (supply oil - return oil)

12. Approved Products / Product Selection Guidelines

The following sections describe product examples and selection guidelines for the different metering categories and data collectors. Products specified in these sections have been evaluated and approved to meet the required hardware/software specifications above.

While there are a number of approved products described in this document the list is by no means exclusive. Any product equivalent to one described below that meets the specified requirements for the utility category may be used to meter that utility category.

Please see accompanying appendix documents for data sheets on the listed approved equipment.

12.1. Data Collectors

The following provides example data collectors that meet specification.

12.1.1. Java Application Control Engines (JACE)

The current phase of the NYC metering pilot has been deployed using Java Application Control Engine (JACE) devices leveraging the Tridium Niagara AX platform. The JACE product line offers a number of models that meet the data collection requirements. The JACE-200 was used at all initial metering pilot sites. For sites where pulse information is collected directly from utility owned meters a JACE IO-16 Expansion module is required. All JACE controllers used in the NYC metering program are required to meet the Tridium specification for Open NiCS.

12.1.2. Other Data Collectors

Other devices that meet the specified data collector hardware and software requirements may be used given that they have been submitted for approval and verified to meet the specifications.

12.2. Electric Meters

The following provides example electric meters that meet specification.

- Square D Powerlogic ION6200 (Using EP2)
- Eaton IQ 250
- GE EPM 6000

12.3. Hot Water / Chilled Water Meters

The following provides example water meters that meet specification.

- Spirax Sarco UTM10

12.4. Fuel Oil Meters

The following provides example fuel oil meters that meet specification.

- Spirax Sarco UTM10

12.5. Steam Meters

Where applicable to meter the steam production from boilers or sub-meter a portion of steam being fed to various facilities the following products have been approved for use:

- Spirax Sarco Masstracker M-TMP-600

13. Appendix A: Document Revision

The following table describes the document revisions.

Version	Date	Author	Description
1.0	2011-05-10	SAIC	Initial version.
1.1	2011-07-15	SAIC	Updated Specification, added product details
1.2	2011-07-19	SAIC	Added responsibility matrix, Reorganized sections, general document cleanup