ICC Docket No. 16-0259

**Commonwealth Edison Company's Response to
The People of the State of Illinois ("AG") Data Requests
AG 7.01 - 7.14
Date Received: May 20, 2016
Date Served: June 7, 2016**

REQUEST NO. AG 7.10:

(Data Analytics) With reference to the direct testimony of Jennifer Montague at page 26, lines 549-550.

a. Please indicate if the Company has evaluated the incorporation of data analytics to implement system enhancements and processes to continue the improvement of system operations. If so, please describe and provide supporting documentation regarding the Company's efforts to expand the use of data analytic tools and processes. If not, please explain why not.

b. Please indicate if the Company conducts data analytics internally or through the use of vendor(s) to implement system enhancements and processes to continue the improvement of system operations. If using vendor(s), please identify vendor(s).

c. Please indicate if the Company commissioned and/or produced an assessment(s) for data analytic requirements to implement system enhancements and processes to continue the improvement of system operations. If so, please provide a copy of all such assessments and/or evaluations of the Company's data analytics needs. If not, please explain why not.

d. Please indicate if the Company issued RFP(s) for data analytics providers to implement system enhancements and processes to continue the improvement of system operations. If so, please provide a copy of RFP(s). If not, please explain why not.

RESPONSE:

a. ComEd objects to this request on the grounds that the undefined term "data analytics" is vague and ambiguous. Subject to and without waiving these specific objections, and ComEd's General Objections, ComEd responds as follows:

As an initial matter, ComEd defines data analytics as the tools and techniques used to understand and forecast business outcomes by analyzing the relationships among data.

Business intelligence and data analytics opportunities and initiatives have been, and remain today, in use and under study across multiple departments at ComEd whether involving a single spreadsheet to study data relationships to a robust information technology system with complicated algorithms. The attachment to ComEd's Data Request Response to AG 6.26 labeled as AG 6.26_Attach 1 contains a summary of ComEd's broader Business Intelligence and Data Analytics ("BI/DA") strategy. As ComEd reviews data analytic solutions it does not specifically look for a cloud based or on-premise solution, but rather considers a range of factors to choose the best solution to fill the business need. When choosing a vendor provided solution, ComEd generally follows its standardized procurement process which includes a review of competitive bids from vendors.

With regard to the specific 2015 AMI Implementation investments placed in service in 2015 and referenced in Montague Dir., ComEd Ex. 4.0 at 26:543-555, ComEd employs two primary data analytics information technology solutions within its ComEd Advance Meter Infrastructure (AMI) Operations and Revenue Protection departments to monitor smart meter communications, health and to manage "events" coming from smart meters indicating an abnormal condition. ComEd also utilizes data analytic tools in relation to the Peak Time Savings ("PTS") Program as discussed in ComEd's Data Request Response to AG 7.08. ComEd utilizes data relationships as well in other processes, for example using smart meter analytics to verify meter to transformer relationship and make corrections as needed. These changes improve transformer load management data and outage management.

AMI Operations data analytics include, but are not limited to:

- Tracking of meter status - Data analytics incorporating data from multiple sources are used to identify meters that are not certified and help determine any required work for the meter to be certified. Smart meters stay on a meter reader route until the meter is reliably communicating with the network, synced across all required IT systems and certified.

- Meter temperature monitoring - An algorithm is used integrating meter temperature data, load and ambient temperature to monitor smart meter temperatures and identify any abnormal conditions. This is reviewed by AMI Operations and field orders are created as needed for field investigations., and

- Meter communications - Data analytics are used to identify meters not communicating reliably or sending usage data as expected. These meters are reviewed by AMI Operations and any required action is taken. Common resolutions include meter exchanges and over the air fixes.

- ComEd also uses smart meter analytics to verify meter to transformer relationship and makes corrections as needed. These changes improve transformer load management data and outage management.

Revenue Protection monitoring is conducted via the use of several algorithms within Operations Optimizer (formerly Detectent) from Silver Spring Network. As "events" indicating an abnormal condition come from the meters, they are filtered through analytic algorithms to identify potential leads or causes for the abnormal condition. Analysts review those leads and determine whether or not a field visit/field order is warranted. Operations Optimizer also works as a database in that follow up actions are tracked so a lead converted to field order can be managed to resolution. The analytics tool is used for reporting on the various statuses of meters such as smart meters that are inactive and generating usage, potentially tampered with and communications with the meter have been lost and potentially tampered with although communications with the meter continue with no usage registering.

b. ComEd uses Operations Optimizer (formerly Detectent) from Silver Spring Network for AMI and Revenue Protection data analytics.

c. The RFP released in 2013 to data analytic providers, which includes analytic objectives and requirements, is provided in the attachment labeled as AG 7.10_Attach 1.

d. See ComEd's response to subpart (c), above.

Advanced Meter Infrastructure Business Intelligence / Data Analytics

Functional Requirements

Contents

Section 1. Introduction

1.1. Overview of AMI Business Intelligence / Data Analytics:

Each of the Exelon Utilities are currently, or will soon be, pursuing full deployment of a smart grid system for a combined total of approximately 9 million endpoints. Baltimore Gas & Electric Company (BGE) is in the midst of a Smart Grid deployment that will ultimately consist of 1.3 million electric meters and 650,000 gas endpoint modules. PECO Energy Company (PECO) has currently deployed 500,000 endpoints, which will expand to 1.6 million electric meters and 500,000 gas modules deployed at the completion of deployment. Commonwealth Edison (ComEd) has deployed 130,000 meters and will have approximately 190,000 by the end of 2013, 350,000 by the end of 2014 and a total of 4.2 million at the completion of deployment. Both BGE and ComEd are utilizing the Silver Spring Networks smart grid solution, while PECO is utilizing the Sensus solution. As millions of smart electric meters and gas modules are deployed, the granularity of data from individual endpoints grows exponentially which will lay foundation to transform how a number of organizations perform their day to day activities. This, however, cannot be accomplished with the data in its current form, it requires an analytic solution that can combine disparate forms of data and transform it into actionable information.

Pilots of analytics engines and deployment of niche analytics solutions have demonstrated the value of smart grid analytics to a variety of business units throughout the company. While value has been demonstrated, in order to achieve the full potential and be able to operationalize these analytics, a long term solution needs to be implemented. The ultimate goal for the Business Intelligence / Data Analytics initiative is to do just that, implement a solution that is able to integrate disparate forms of data, both internal and external to the company, and provide an analytic engine to turn the data into actionable information to streamline business processes.

Through the analytics pilot and deployment of niche solutions, numerous use cases have been developed and can be categorized into five main business functional areas; AMI Operations, Revenue Protection, Customer, System Planning, and Reliability. While all of those functional groups have seen inherit benefit of data analytics, not all may be in a position to begin leveraging those analytics. The immediate need is to implement a platform that can be utilized by those groups that are poised to use the actionable information and then extend to other functional areas as well as other Exelon Utilities as part of the Meter Data Services Business Intelligence / Data Analytics convergence project. As such, if a phased approach (focused on only specific business areas) is more practical the company is open to such an option.

1.2. Objective / Goals:

The objective of this RFP is to evaluate the market and retain a vendor with a full data analytics solution with a primary emphasis on metering data in order to meet the proposed EU MDS BI/DA roadmap attached in the section. This solution will have the ability to address the detailed function requirements to meet the immediate and near term business need. In addition, the company would like to understand the vendor's overall data analytics vision. While there are primary emphasis is centered on metering data, the company is interested in an enterprise wide solution that would be able to scale to other analytic opportunities.

1.3. High Level Requirements

At a high level, in order to leverage the full benefit of the investments in smart grid technology an analytics solution will need to be able to transform raw data into actionable information that can be used to streamline and create more efficient business practices without human intervention. In short, solution will need to be able to integrate, analyze and provide actionable information.

First the solution must be able to integrate disparate forms of data. These data sources will be both internal and external to the company. Internal data sources may include smart grid meter usage and events, customer information system, work management system, asset management system, outage management system, geographic information systems. External data sources may include regional weather, tax, census, social media, etc…

The tool must then be able to analyze and aggregate the data into actionable information based on the detailed functional requirements outlined later in the document. The functional requirements have been categorized in five general areas, AMI Operations, Revenue Protection, Customer, System Planning, and Reliability. AMI Operations would be specific to the metering system and might include such use cases as; identifying and rectifying meter exceptions, meter troubleshooting, meter asset data consistency, and meter data quality. Revenue protection would be focused on reducing the amount of unaccounted for energy by identifying such items as theft, consumption on inactive meters, broken/malfunctioning meters, and unmetered load. The Customer Experience functional area would be primarily interested in improving the customer experience by providing more detailed data on individual customer usage, facilitate more targeted marketing of programs and provide deeper insight into demand response and energy efficiency programs effectiveness. The System Planning function area would be focused on a more holistic view of the distribution system by aggregating interval consumption and voltage. Lastly, the Reliability functional area will be focused on tracking and improving outage metrics and providing outage/restoration intelligence.

Once the integrated data is transformed into actionable information, it will need to be fed back to users in various avenues to fully leverage it. Some of those avenues may include a customizable user interface, dynamic map, or integrated directly into those enterprise wide systems to generate work orders, provide automated data corrections, eliminate erroneous work queues, etc…

Section 2. Functional Requirements and Questionnaire

For each of the function requirements outlined below, the bidder is to (i) specify the degree to which they meet the requirement given the defined phases below, (ii) provide a detailed explanation of how they meet or plan to meet the requirement and (iii) identify other engagements where this requirement is in use or operational. For any additional questions outlined in this section, provide a detailed response to each.

- 'Meets Requirement' - part of the core solution being proposed
- 'Future Release' – not part of the core solution being proposed but will be met in a future release. Please indicate the release number/version and scheduled date.
- 'Meets Requirement with Modification' – requirement can be met with slight code / system modification without needing an extensive amount of time and effort.
- 'Does Not Meet Requirement' – cannot be currently fulfilled by the product

2.1. Functional Data Integration

At a high level the solution must be capable of integrating many disparate forms of internal and external data. Internal data sources would originate from within the respective utilities and would include customer information, asset management, work management, outage management, and geospatial information systems. External data sources would not be supplied by the respective utilities and require the solution provider to provide these. Examples of external data sources include local tax and census data, social media, weather etc… The detailed data integration requirements are located within the technical requirements section G of this RFP. Exelon is interested in how easily the proposed solution architecture is able to integrate additional data sources not specifically listed within those requirements and the additional cost/timeline for doing so.

2.2. Functional Analytics

2.2.1. AMI Operations Analytic Requirements

2.2.1	AMI Operations Analytic Requirements
2.2.1.1	Meter Deployment Analytics and Reporting; reconcile all installed meters and their provisioning status
Answer	i. ii. iii.
2.2.1.2	Meter Deployment Analytics and Reporting; reconcile all installed meters between utility systems and installation vendor work management system
Answer	i. ii. iii.
2.2.1.3	Meter Deployment Analytics and Reporting; reconcile all installed meters and all meters that have successfully billed
Answer	i.

	ii. iii.
2.2.1.4	Meter Deployment Analytics and Reporting; Network Health Custom Report for network devices that includes trending of: Device Reachability, Ping Response, WAN Packets In/Out, Packet Errors, Network Bandwidth Capacity and Consumption, Failed/Successful Secure Associations, Invalid Certificates, Certificate Errors, Battery Status, reboot counts, remote disconnect certificates used
Answer	i. ii. iii.
2.2.1.5	Meter Deployment Analytics & Reporting: Analyze Electric and gas meter data (Events, Read Rates, and Meter Performance) to report and predict device failures. Auto forward notifications of poor performance or auto-generate work orders for appropriate business areas
Answer	i. ii. iii.
2.2.1.6	Meter Deployment Analytics & Reporting; identify incorrect asset location between GPS coordinates captured at installation, existing asset location data, and geo-coded premise address
Answer	i. ii. iii.
2.2.1.7	Meter Deployment Analytics & Reporting; Trending of malfunctioning meters, capturing the number of meter failures and the reason for failures.
Answer	i. ii. iii.
2.2.1.8	Meter Asset Reporting; identify co-generation customers that are not identified as so in the customer information systems or as potential theft cases
Answer	i. ii. iii.
2.2.1.9	Detect and report physical meter security breaches/incidents
Answer	i. ii. iii.
2.2.1.10	Capture Pre AMR /Post AMI install data to flag instances in which usage patterns deviate significantly
Answer	i.

	ii. iii.
2.2.1.11	Identify meters without GPS coordinates and provide those coordinates
Answer	i. ii. iii.
2.2.1.12	Meter Asset Reporting; validate new meter health following installation
Answer	i. ii. iii.
2.2.1.13	Identify all the identified co-generation premises with no usage in the received channel
Answer	i. ii. iii.
2.2.1.14	Detect and report physical and logical security breaches/incidents on meter and network equipment. Examples include, removal/reversal, power supply tampering, hacking, performance/abnormality trending
Answer	i. ii. iii.
2.2.1.15	Current Transformer (CT) installation verification using phasor diagrams immediately after installation. Verifying they are wired correctly
Answer	i. ii. iii.
2.2.1.16	Identify "bottleneck" meters within the mesh network connectivity
Answer	i. ii. iii.
2.2.1.17	Meter with temperature above ‘x’ number of degrees
Answer	i. ii. iii.
2.2.1.18	Meter with temperature above ‘x’ number of degrees for more than ‘y’ number of readings
Answer	i. ii. iii.
2.2.1.19	Screen for invalid temperature alarms (associate additional meter events)

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Answer	i. ii. iii.
2.2.1.20	Report/List meter temperature and ambient temperature (i.e. a metric for meters 'x' number of degrees above daily average)
Answer	i. ii. iii.
2.2.1.21	Analyze meter temperature, ambient temperature, service point characteristics, historic meter temperature, meter load, to identify service points that are likely to escalate to a hazardous condition
Answer	i. ii. iii.
2.2.1.22	Generate a list of non-communicating meters, identifying the reason for not communicating (system connectivity, removed, network outage, existing work order, etc…)
Answer	i. ii. iii.
2.2.1.23	Identify malfunctioning meters based on number of reboot events
Answer	i. ii. iii.
2.2.1.24	Detect meters communicating on the smart grid system without a known location (i.e. orphan meters)
Answer	i. ii. iii.
2.2.1.25	Identify meters were the beginning read in the smart grid system and the reading in legacy meter reading system is greater than a threshold
Answer	i. ii. iii.
2.2.1.26	Identify meters that are getting register data but not interval data and vise versa
Answer	i. ii. iii.
2.2.1.27	Retain at least 4 years of legacy meter read data and 4 years of AMI data for each endpoint
Answer	i.

	ii. iii.
2.2.1.28	Identify and store instances of an incorrect meter constant
Answer	i. ii. iii.
2.2.1.29	Capture the number of Damaged Meters
Answer	i. ii. iii.
2.2.1.30	Capture the Number of Meter Read Error Flags
Answer	i. ii. iii.
2.2.1.31	Perform a Static Test (this analyzes consistently low usage)
Answer	i. ii. iii.
2.2.1.32	Provide existing AMR data from legacy meter reading system including usage, flags and alarms in a format capable of further analysis and consistent with AMI data elements; this includes a daily read and its associated alarms for at least the last 12 months
Answer	i. ii. iii.
2.2.1.33	Validate the type (size, form, etc..) electric meter or gas module installed matches the expected based on service point characteristics
Answer	i. ii. iii.
2.2.1.34	Report meter read rate (percentage of intervals received vs. expected; number of meters read daily, etc…)
Answer	i. ii. iii.
2.2.1.35	Provide an iterative solution to analytics to continuously enhance the analytic and reduce false positives. Example; for automatically generated meter work orders, incorporate meter test results to confirm that there was a meter issue.
Answer	i. ii. iii.
2.2.1.36	Capture meter failure data including reason code, age of meter and meter type

Answer	i. ii. iii.
2.2.1.37	Capture metrics and effectiveness of the use of the Remote Disconnect Switch; including the number of (dis)connect requests, % successful, track failures and failure reasons
Answer	i. ii. iii.
2.2.1.38	Track and provide reports on all required Department of Energy metrics on a weekly, monthly, quarterly, and yearly basis
Answer	i. ii. iii.
2.2.1.39	Provide AMI deployment productivity dashboards at the technician, deployment region, and full deployment level
Answer	i. ii. iii.
2.2.1.40	Track and show geographically customers that have refused installation
Answer	i. ii. iii.
2.2.1.41	Provide geo-spatial tool to optimize deployment or maintenance technician daily route
Answer	i. ii. iii.
2.2.1.42	Display an interactive map to track and display meters and network equipment in various "states" or modes
Answer	i. ii. iii.
2.2.1.43	Provide home area network (HAN) device connectivity status to meter
Answer	i. ii. iii.
2.2.1.44	Identify and track customers with a power factor of 85% or less
Answer	i. ii. iii.
2.2.1.45	Ability to align installation plans with inventory availability by form size, potentially with available installer skill sets
Answer	i. ii. iii.
2.2.1.46	Meter Lifecycle Management assures any new meter set is setup properly (setup & binding pings, lat/long, firmware, etc.. and is communicating well (RIS, RAW) as part of meter exception process. Ability to auto submit for encryption upon completion

Answer	i. ii. iii.
2.2.1.47	Interval Read Delivery Management that assures all tariff's that require intervals for billing (TOU, demand, MV90) are getting their needed interval data for the Billing process
Answer	i. ii. iii.
2.2.1.48	RCD Performance Details like having SNR and other attributes readily available
Answer	i. ii. iii.
2.2.1.49	Meter Exception tracking & work management capability that allows automatic import of exceptions, ability to analyze and route to appropriate exception group
Answer	i. ii. iii.
2.2.1.50	Network Availability metric that shows overall performance by TBG, both AMI & DA networks, and network events
Answer	i. ii. iii.
2.2.1.51	Automation or semi-automation of AMI Deployment metrics of Installations, Refusals, Orphans, etc..
Answer	i. ii. iii.
2.2.1.52	Analytics must be able to be added, removed, and modified rapidly and at a low cost
Answer	i. ii. iii.
2.2.2.35	Users must be able to select potential meter exceptions which will automatically initiate a field order to be placed in the 90 day bucket
Answer	i. ii. iii.
2.2.2.36	Users must be able to define scenarios for when a meter order will be generated.
Answer	i. ii. iii.

2.2.2. Revenue Assurance Analytic Requirements

2.2.2	Revenue Assurance Analytic Requirements
2.2.2.1	Identify service points where electric meter has been removed but there is gas consumption

	on gas meter
Answer	i. ii. iii.
2.2.2.2	For twin service customer with one of the services cut off, analyze voltage patterns of the other twin service which is ON
Answer	i. ii. iii.
2.2.2.3	Capture cases where there is consumption on meter and service is disconnected (at pole, service line etc.) as per system
Answer	i. ii. iii.
2.2.2.4	Identify meters with gas or electric consumption that have no customer account
Answer	i. ii. iii.
2.2.2.5	Identify diversion where the meter indicates a repeating tamper pattern where the meter is temporarily removed and replaced with another meter
Answer	i. ii. iii.
2.2.2.6	Identify meters where customer has removed the meter and inserted a jumper across terminals resulting in partial bypass/diversion.
Answer	i. ii. iii.
2.2.2.7	Identify a tampering pattern where the meter has repeating periods of zero-consumption usage, indicating meter is fully bypassed for intermittent periods of time (insertion of bypass switch or other).
Answer	i. ii. iii.
2.2.2.8	Recap of energy usage for last 30,60,90,120,180 days etc. to identify consumption on meters from the point the customer began using at the premise until the point a service request is made
Answer	i. ii.

	iii.
2.2.2.9	Provide usage and corresponding billing information for like premises to estimate and bill for usage on stopped meters
Answer	i. ii. iii.
2.2.2.10	Report the specific addresses where the meter number on-site does not match the meter number on record for the premise (i.e. switched/swapped meters)
Answer	i. ii. iii.
2.2.2.11	Report showing where a specific meter number has been located for a specific period of time to assist with switched meter investigations.
Answer	i. ii. iii.
2.2.2.12	Report the amount of consumption on each inactive meter over a user defined period of time
Answer	i. ii. iii.
2.2.2.13	Identify meter potential fuse failure, usually seen as a 1/3 reduction in measured load
Answer	i. ii. iii.
2.2.2.14	Detect overloaded current transformers, typically greater than 15amps measured at the meter
Answer	i. ii. iii.
2.2.2.15	Detect overrated/under loaded CT, typically 5amps or less measured at the meter.
Answer	i. ii. iii.
2.2.2.16	Identify stopped electric meters
Answer	i. ii. iii.
2.2.2.17	Detect periods of net customer generation during periods of darkness

Answer	i. ii. iii.
2.2.2.18	Detect changing load patterns on co-generation customers (more generation than consumption) after a meter outage event
Answer	i. ii. iii.
2.2.2.19	Determine meters with an energy bypass shortly after installation
Answer	i. ii. iii.
2.2.2.20	Identify normal pattern of gas consumption associated with very low level of electric consumption
Answer	i. ii. iii.
2.2.2.21	Identify and capture leading indicators surrounding AMI Business Operations
Answer	i. ii. iii.
2.2.2.22	Perform a Gap Test (this compares no usage then normal usage in short periods)
Answer	i. ii. iii.
2.2.2.23	Perform a Static Test (this analyzes consistently low usage)
Answer	i. ii. iii.
2.2.2.24	Provide an iterative solution to analytics to continuously enhance the analytic and reduce false positives. Example; for automatically generated revenue assurance work orders, incorporate field investigation results to determine if the analytic was successful and adjust the analytic as necessary.
Answer	i. ii. iii.
2.2.2.25	Identify meters with no usage, that are not defective (i.e. seasonal locations) to screen out false positive consumption on inactive cases
Answer	i. ii.

	iii.
2.2.2.26	Given meter characteristics, identify meters with incorrect multipliers
Answer	i. ii. iii.
2.2.2.27	Distinguish between valid and invalid tamper flags based on service order and customer account activity information
Answer	i. ii. iii.
2.2.2.28	Use meter temperature, weather data, and other meter characteristics to determine if the meter is indoor or outdoor and correct system data accordingly.
Answer	i. ii. iii.
2.2.2.29	Analytics must be able to be added, removed, and modified rapidly and at a low cost
Answer	i. ii. iii.
2.2.2.30	Provide a month to month report on the number of active and inactive premises, the reason why it is inactive and duration that it has been inactive.
Answer	i. ii. iii.
2.2.2.31	Display instances of prior theft on a map
Answer	i. ii. iii.
2.2.2.32	Display potential theft cases on a map
Answer	i. ii. iii.
2.2.2.33	Detect tampering by identifying tampering flags and load side potential together
Answer	i. ii. iii.
2.2.2.34	Developed a prioritized list of potential theft cases based on likelihood of theft
Answer	i. ii. iii.
2.2.2.35	Users must be able to select potential theft cases which will automatically initiate a field order to be placed in the 90 day bucket
Answer	i. ii. iii.

2.2.2.36	Users must be able to define scenarios for when a revenue protection order will be generated.
Answer	i. ii. iii.
2.2.2.37	Identify and list hard-to-access situations in potential theft
Answer	i. ii. iii.
2.2.2.38	Provide listings of linked properties (same owner, etc) for suspected theft
Answer	i. ii. iii.
2.2.2.39	The system must display potential instances of theft based on user-configurable criteria
Answer	i. ii. iii.
2.2.2.40	The system must allow users to set priorities for theft indicator criteria
Answer	i. ii. iii.
2.2.2.41	The system must allow a selection of potential theft instances for which to issue orders into the 90-day bucket
Answer	i. ii. iii.
2.2.2.42	The system must automatically issue orders based on criteria entered
Answer	i. ii. iii.
2.2.2.43	The system will display an indicator for accounts that have been marked as 'hard to access'
Answer	i. ii. iii.
2.2.2.44	The system will allow the use of historical theft as a criterion for displaying instances of potential theft
Answer	i. ii. iii.
2.2.2.45	The system will provide a means of issuing investigation orders on seasonal or vacant properties with usage that does not fit those categorizations

Answer	i. ii. iii.
2.2.2.46	Reconcile the number of meters that are successfully read verses which meters are expected to be read to identify potential consumption on inactive or orphan meters
Answer	i. ii. iii.
2.2.2.47	Time and geography correlation of non-communicating disconnected meters with nearby temporary "loss of power" meters
Answer	i. ii. iii.
2.2.2.48	Ability to look at past service order activity or view current open order status and type, including order issuance and closing comments
Answer	i. ii. iii.
2.2.2.49	Geo-spatial view of high loss (unmetered load) feeders
Answer	i. ii. iii.
2.2.2.50	To the extent possible, ability to screen, track and report all events/data in one comprehensive tool
Answer	i. ii. iii.
2.2.2.51	Ability to create lists or query on past activity on a meter and check in on a list or subset of a list of meters in the near future. (Critical for repeat offenders and for problematic metering issues)
Answer	i. ii. iii.
2.2.2.52	Ability to have separate repeat offender or problematic metering reports/lists/leads.
Answer	i. ii. iii.
2.2.2.53	Track and report success rate of theft leads
Answer	i. ii. iii.
2.2.2.54	Ability to view account and customer contacts, as well as payment information
Answer	i. ii. iii.
2.2.2.55	Track and report amount billed to customer due to theft (back-billed, tamper charges, etc…)

Answer	i. ii. iii.
2.2.2.56	Ability to view usage compared to neighbors and like homes (square footage, vintage, construction, etc…)
Answer	i. ii. iii.
2.2.2.57	The system must provide a user interface where instances of potential theft may be shown
Answer	i. ii. iii.

2.2.3. Customer Experience Analytic Requirements

2.2.3	Customer Experience Analytic Requirements
2.2.3.1	Meter Asset Reporting; identified disconnected/inactive meters that remain in service for a certain period of time
Answer	i. ii. iii.
2.2.3.2	Identify active gas meters showing no consumption for certain period of time
Answer	i. ii. iii.
2.2.3.3	Determine if customers have central air conditioning to enhance demand response marketing programs
Answer	i. ii. iii.
2.2.3.4	Determination of potential non-operational demand response central air conditioner devices
Answer	i. ii. iii.
2.2.3.5	Determination of high energy customers for summer and winter periods to enhance demand response marketing programs
Answer	i. ii. iii.

2.2.3.6	Determination of electric water heater for residential customers o enhance demand response and energy efficiency marketing programs
Answer	i. ii. iii.
2.2.3.7	Capture hourly consumption data and monitor control group consumption vs. actual customer consumption for energy efficiency programs
Answer	i. ii. iii.
2.2.3.8	Improve the accuracy of the electric revenue accrual by leveraging the entire population of AMI meter data for unbilled sales calculation as opposed to using a smaller sample of meters
Answer	i. ii. iii.
2.2.3.9	Determine customers that are peak shaving that are not captured in customer information systems (peak shaving via a third party)
Answer	i. ii. iii.
2.2.3.10	Rank individual customers by class by ability to produce firm service level (FSL) impact. Using interval data, event data, customer peak load contribution (PLC), build a process to establish and maintain residential customer ranking from most to least valuable under FSL compliance. This process should be blind to switch data, i.e. measured loads should be used as the only measure of customer ability to reduce load below PLC (last and current summer)
Answer	i. ii. iii.
2.2.3.11	Develop weather normalized capacity peak load contribution (PLC), and network service PLC calculation based on interval data during PLC hours.
Answer	i. ii. iii.
2.2.3.12	Predict system load and load curtailment during DR events using real-time metering data.
Answer	i. ii. iii.
2.2.3.13	Identify overloaded services and customer load increases

Answer	i. ii. iii.
2.2.3.14	Provide a typical voltage profile, demand load, etc, for each customer class
Answer	i. ii. iii.
2.2.3.15	Perform customer aggregation by adding up the usage of all customers on a feeder and comparing this with SCADA information to identify any feeder (or feeder segment) loss that is greater or less than what is expected.
Answer	i. ii. iii.
2.2.3.16	Provide calendar month true up for energy consumption and supplier load balancing
Answer	i. ii. iii.
2.2.3.17	Analyze legacy meters that may have been fast or slow based on AMI meter consumption
Answer	i. ii. iii.
2.2.3.18	Identify all co-generation customers who are generating more than what they are consuming on a monthly & cumulative basis and based on supplier
Answer	i. ii. iii.
2.2.3.19	Merge and update the electric system connectivity model with load settlement, data analytic, mapping, and data warehouse system so that individual premises or groups of premises can be linked to its TLC, feeder, distribution substation, master station, and other upstream equipment as warranted. This would allow better system planning and optimization for electric vehicles, renewable energy and other distributed resources. This could be linked to customer analytics information
Answer	i. ii. iii.
2.2.3.20	Calculate an average load profile for a neighborhood to assist with proactive customer communications
Answer	i. ii. iii.
2.2.3.21	Compare month to month consumption and identify potential high bill cases

Answer	i. ii. iii.
2.2.3.22	Correlate usage to weather
Answer	i. ii. iii.
2.2.3.23	Develop Baltimore Zone load forecast
Answer	i. ii. iii.
2.2.3.24	Identify customers with tank less water heaters
Answer	i. ii. iii.
2.2.3.25	Create Sample Load Profiles for Each Rate Class
Answer	i. ii. iii.
2.2.3.26	Detect if meters have been exchanged based on a user definable list
Answer	i. ii. iii.
2.2.3.27	Aggregate hourly loads by supplier and segment for use in settlements with PJM
Answer	i. ii. iii.
2.2.3.28	10 am to 10 am aggregated consumption data per supplier per customer class - gas only
Answer	i. ii. iii.
2.2.3.29	Gas load forecasting based on actual interval data of whole meter population rather than sample meters
Answer	i. ii. iii.
2.2.3.30	Identify customer accounts with billing adjustments following a high bill field investigation, reporting on high bill visits by type and outcome
Answer	i.

	ii. iii.
2.2.3.31	Provide analytics to calculate usage for electric and gas on a per square foot basis.
Answer	i. ii. iii.
2.2.3.32	Provide analytics to compare energy consumption on a seasonal and annual basis for both gas and electric.
Answer	i. ii. iii.
2.2.3.33	Provide analytics to track and record avoided high bill disputes including field visits.
Answer	i. ii. iii.
2.2.3.34	Perform impact analysis and engagement analysis for Smart Energy Rewards (SER) program: takes the AMI load data for SER enrolled customers combined with demand response device data, program operation information, weather data, census data and other customer specific information to estimate average load reduction across the SER enrolled customers as well as determine factors correlated with engagement. This will be performed several times this summer including (1) after the first SER event, (2) mid-summer, and (3) after the conclusion of the summer at a minimum
Answer	i. ii. iii.
2.2.3.35	After each Smart Energy Rewards event, monitor the rebate baseline: check the rebate calculation for SER using AMI load data (requires merging with SER operational information from CC&B and/or Yukon)
Answer	i. ii. iii.
2.2.3.36	After each Smart Energy Rewards event, monitor wholesale energy market baselines and rebate baselines, in comparison with the econometrically determined impacts
Answer	i. ii. iii.
2.2.3.37	Comparing weather response functions within Retail Office settlement system with AMI data during SER events and for match days and baseline data
Answer	i. ii. iii.
2.2.3.38	DOE required report that includes, hourly average loads for eight residential segments (4 individual tariff classes both enrolled and not enrolled in the Smart Energy Rewards program). For each hour of the SER event include; the average hourly load, number of

	customers, standard deviation and a variety of associated descriptive data
Answer	i. ii. iii.

2.2.4. System Planning Analytic Requirements

2.2.4	System Planning Analytic Requirements
2.2.4.1	Construct a yearly load profile of each system transformer, retaining at least 2 years of data
Answer	i. ii. iii.
2.2.4.2	Assign peak values to each transformer including; peak kW, peak kVA, date/time stamp, individual summer and winter values, retain 10 years of assigned values
Answer	i. ii. iii.
2.2.4.3	Construct a yearly voltage profile by customer
Answer	i. ii. iii.
2.2.4.4	Construct a individual feeder or feeder segment load profile
Answer	i. ii. iii.
2.2.4.5	Calculate a peak feeder or feeder segment
Answer	i. ii. iii.
2.2.4.6	Meter Asset Reporting; determine over or under capacity gas meters
Answer	i. ii. iii.
2.2.4.7	User should have ability to calculate hourly/daily peak or actual usage profile for one/multiple no. of customers. It should also do (static) summation results for multiple customer analysis. User should also have ability to calculate coincident & non-coincident peak for multiple customers. Latest data should be made available for analysis
Answer	i. ii.

	iii.
2.2.4.8	Detect abnormal gas usage spikes
Answer	i. ii. iii.
2.2.4.9	Using data aggregations detect where the distribution system has reached x% of its capacity, and relate these to the system connectivity model and segmentation data to assess alternatives for electric system enhancements
Answer	i. ii. iii.
2.2.4.10	Develop geographic application(s) to detect where the electric distribution system has reached x% of its capacity, as well as linking to the gas distribution in the same area. Integrating these two systems geographically will allow for combination gas and electric planning that could improve overall system performance. For example, winter electric overloads could be mitigated by extending new gas mains or services, or by considering season only transfers, or through demand reduction target to that area, or through geothermal heat pumps.
Answer	i. ii. iii.
2.2.4.11	Proactive identification of Plug in Hybrid Electric Vehicles (PHEV) and other abnormal load patterns, for individual customer by analyzing usage pattern
Answer	i. ii. iii.
2.2.4.12	Provide power factor for all feeders and feeder segments
Answer	i. ii. iii.
2.2.4.13	Monitor capacitor banks by using smart meters to capture neutral-current measurements. By measuring VARs, capacitor bank inspections could essentially be performed daily to enhance preventive maintenance programs
Answer	i. ii. iii.
2.2.4.14	Identify customers with electric heat to improve system modeling accuracy
Answer	i. ii. iii.

2.2.4.15	Identify gas register reverses and spikes
Answer	i. ii. iii.
2.2.4.16	Identify gas meters with Low Variability Summer Load to identify potential gas leaks
Answer	i. ii. iii.
2.2.4.17	Capture hourly KVA data from meter and leverage that to calculate KVA value for transformer
Answer	i. ii. iii.
2.2.4.18	Aggregate interval load at the device level to facilitate better balancing of feeders and phases
Answer	i. ii. iii.
2.2.4.19	Output usage aggregations to be used as an input to other system load forecasting tools
Answer	i. ii. iii.
2.2.4.20	Augment SCADA and PI system data with instanteous voltage and power measurements from endpoint meters
Answer	i. ii. iii.

2.2.5. Reliability Analytic Requirements

2.2.5	Reliability Analytic Requirements
2.2.5.1	Track historical and real time CAIDI, SAIFI and SAIDI
Answer	i. ii. iii.
2.2.5.2	Analyze feeders, feeder segments, down to individual service level for frequent momentary and sustained outages to assist with reliability improvements
Answer	i. ii. iii.

2.2.5.3	Track geographic areas of multiple momentary interruptions (n momentary in past m months)
Answer	i. ii. iii.
2.2.5.4	Track geographic areas of multiple interruptions (n interruptions in past m months; CEMI metrics)
Answer	i. ii. iii.
2.2.5.5	Meters with recent or repeat sustained outages
Answer	i. ii. iii.
2.2.5.6	Meters with recent, repeat momentary interruptions
Answer	i. ii. iii.
2.2.5.7	Segment outage data by cause codes
Answer	i. ii. iii.
2.2.5.8	Identify meters or locations with long duration outages, frequent long duration outages (8 hours or greater)
Answer	i. ii. iii.
2.2.5.9	Include voltage data from other devices (e.g., Control Voltage Reduction applications)
Answer	i. ii. iii.
2.2.5.10	Provide a voltage profile at the meter
Answer	i. ii. iii.
2.2.5.11	Power Outage / Restoration intelligence; improve CAIDI accuracy using AMI meter restoration timestamp
Answer	i.

	ii. iii.
2.2.5.12	Identify single phase meters with voltage above user definable thresholds
Answer	i. ii. iii.
2.2.5.13	Identify single phase meters with voltage below user definable thresholds
Answer	i. ii. iii.
2.2.5.14	Voltage Quality; identify voltage quality issues at the meter, transformer, feeder segment and feeder segment level
Answer	i. ii. iii.
2.2.5.15	Identify transformer to premise or meter mapping inaccuracies and re-map to the correct transformer
Answer	i. ii. iii.
2.2.5.16	Identify three phase meters mapped to single phase transformers
Answer	i. ii. iii.
2.2.5.17	Voltage Quality; identify voltage sags or swells outside of defined parameters at the meter, transformer and feeder levels
Answer	i. ii. iii.
2.2.5.18	Identify transformers with x% loading of their utility specified capacity. Incorporate asset item number and utility standards to calculate the specified capacity of the transformer (as opposed to using nameplate capacity).
Answer	i. ii. iii.
2.2.5.19	Generate a list of meters that have captured voltage outside of user definable thresholds for selected feeders
Answer	i. ii.

	iii.
2.2.5.20	Perform a test for frequent power outages (this compares low usage then high usage for short periods)
Answer	i. ii. iii.
2.2.5.21	Determine likely cause for multiple operations of distribution system device
Answer	i. ii. iii.
2.2.5.22	Track and report customer restoration progress; x% of customers restored within y hours
Answer	i. ii. iii.
2.2.5.23	Identify locations on distribution system with high number of customer outages where partial or stepped restoration is not possible. Then indicate where additional switches and undergrounding can be used to improve CADI
Answer	i. ii. iii.

2.3. Functional Data Results Presentation

2.3.1	Display AMR and AMI usage and information in a single view or graph that highlights the point in time of meter exchange
Answer	i. ii. iii.
2.3.2	Meter Asset Reporting; provide a dynamic map of smart grid network and endpoint assets that includes device name, device state, route (for mesh network), received signal strength, last communication time, and primary and secondary network device.
Answer	i. ii. iii.
2.3.3	Meter Asset Reporting; provide an interactive and dynamic map that will be able to drill down to individual meters, groups of meters, and other advanced searching and filtering based on meter events.
Answer	i. ii. iii.
2.3.4	Deliver visibility into all the data coming from the AMI and AMR networks (usage & flags) in a format that allows for further & deeper analysis. Initial non-prescriptive metrics and

	deeper analytic analysis will be provided by external analytic services.
Answer	i. ii. iii.
2.3.5	Provide a user interface that facilitates deeper end-user analysis
Answer	i. ii. iii.
2.3.6	Display AMR and AMI usage and information in a single view or graph that highlights the point in time of meter exchange
Answer	i. ii. iii.
2.3.7	Display AMI usage and flags correlated on the same time-series view or graph
Answer	i. ii. iii.

2.4. Ad-hoc Report and Analytic Development

Due to ever changing business, operating, and regulatory conditions, the data analytics solution will need to enable to users to quickly develop ad-hoc reports and analytics. This functionality is predicated on various unpredictable query configurations that respond to an unforeseeable variety of analysis requests. Since the data in question may be interval data from several million endpoints, coupled with customer specific billing system data, census information, outage information, social media, and other desperate forms of data, a solution is needed which allows access to such data in potentially complex queries for several months and with processing time that allows for a few hours at most. The resulting solution need to have the ability to submit a complicated query on large amounts of data, get it back in a few hours to see if query modifications need to be made, and get the output to interface with existing utility tools and be exportable to Excel. In addition, the solution will need to allow the user to integrate additional forms of non-AMI data when developing these ad-hoc analytics.

2.4.1	Provide access to source data for users to develop ad-hoc reports
Answer	i. ii. iii.
2.4.2	Provide access to source data for users to develop ad-hoc analytics
Answer	i. ii. iii.

2.4.3	Provide training and documentation on ad-hoc report and analytic development
Answer	i. ii. iii.
2.4.4	Describe the programming language required to develop ad-hoc reports and analytics within the solution
Answer	i. ii. iii.
2.4.5	Incorporate additional non-AMI data sources when developing ad-hoc reports or analytics
Answer	i. ii. iii.

Section 3. Relevant Knowledge & Experience

3.1. Background Knowledge

Please provide a detailed description of your firm's knowledge and experience relevant to this engagement, based on the project background, objectives and requirements described earlier.

3.2. Relevant Projects and Clients

Provide a list of your web presentment of interval usage projects for utilities in North America. If the project is not complete please indicate status.

Client	Product Version	Location	Commodity	Number of Meters	Usage Granularity (Hourly, Daily, etc.)	Viewable History (# Months)	Market Type
XYZ Energy	2010	US	Elec/Gas	1.7M	Hourly & Sub-Hourly	25 Months	Regulated/ Deregulated
XYZ Power	2009	US	Gas	600K	Daily, Weekly, etc.	12 Months	Regulated

3.3. Client Impact and Project Summaries

From the aforementioned list please provide project summaries within the following template (see sample below).

XYZ Electric

Background

XYZ is one of the largest combinations natural gas and electric utilities in the United States with X M electric customers and X M gas customers throughout a 30,000 square mile service area within the Midwest.

With the deployment of AMI meters, the utility developed a critical peak pricing program called Smart Rate. The Smart Rate Program is allows consumers voluntarily reduce consumption during RTO stage events. The program will measure the consumer's reduction in usage and offer penalties or rewards based on the customer's behavior. Additionally, this utility wanted to provide customers with presentment of interval usage.

Project Scope

- Implemented our XYZ solution and supported the utility with deploying additional enhancements and driving up overall level of engagement. Key scope included:
- Presentment for all customers with AMI meters (1.6M)
- Integrated into clients existing customer portal
- Developed customer facing reports to drive higher level of engagement
- Deployed Call Center portal version of the tool to X # of client agents including client outsourced Dynamic Pricing Call Center

Integration Environment

- Oracle Meter Data Management System
- SAP ISU Billing System
- Etc.

Results/Benefits

- Client was able to achieve X % utilization
- Improved customer satisfaction by X points
- Reduced high-bill inquiries by providing more insight into the hands of the customer

3.4. Relevant Projects and Clients

Please provide a list of at least five qualified references. Provide the following for each reference:

- Company
- Business and Technical Manager Contact Names and Titles

- Address
- Phone and eMail contact information
- Project Scope and Objectives

Bidders are not allowed to participate in any of this discussion with the references. Please ensure you provide your references in this response and notify your references accordingly.