

CYIENT

THE SMART CHOICE FOR SMART METER ANALYTICS

Choosing the right solution to drive operational and
business efficiencies



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Meter data analytics is the way to go for utilities. The right solution can help them be more efficient and consumer friendly.

Abstract

Today, utilities face several challenges such as aging assets, pressure to increase operational efficiencies, data residing in 'silo' systems, implementing dynamic pricing, ensuring better demand response, managing distributed resources for energy generation and regulatory compliance. These challenges can be addressed and mitigated by applications such as smart meter data analytics.

Utilities receive a vast amount of data each year from millions of smart meters, a variety of data sensors and other external sources. Smart meter analytics provides unified visualization and insights on the enterprise, grid, and environmental data to enhance operational efficiencies and revenues.

Meter data analytics solutions have been around for a while with applications only in historical data analysis and billing.

With the arrival of smart meters that bring massive amounts of data in their wake, commercial off-the-shelf (COTS) solutions and Big Data platforms are more appropriate solutions to leverage the insights hidden in these data repositories.

This paper examines the business benefits that smart meter analytics brings to utilities, the various analytics solutions available, and recommends the most cost-effective and scalable solution for the current ecosystem.

Introduction

Utilities are investing heavily in distribution management and monitoring infrastructure to collect massive amounts of high-velocity data from millions of smart meters, and a variety of data from sensors and external sources. Smart meters enable collection of data at smaller intervals, remote monitoring, and two-

way communication. Tapping into this data streaming in from tens of thousands of smart meters and integrating it into the business operations of utilities can provide several operational and business efficiencies, including better load forecasting from more frequent interval meter readings, theft detection, and improved response time to outage. These business efficiencies translate into economic and competitive advantages for smart utilities.

Leveraging analytics technology for better business results is going to drive the IT strategy of utilities in the decade ahead. Gartner has identified smart meter analytics as one of the top 10 technology trends in the Energy and Utilities sector for 2013¹. According to a GTM Research's report, the Advanced Metering Infrastructure (AMI) market is expected to total \$9.7 billion by 2020².

In order to successfully tap into smart metering for better business results, it is essential that utilities deploy a robust meter data management solution with an advanced analytics capability that provides actionable insights into a utility's operations. It is also crucial to integrate multiple systems and data stores, collect data more frequently, and put the data and insights into the hands of the right set of people who can leverage its value.

Business Challenges Facing Utilities

Utilities are on a mission to minimize the impact of costs even while they prepare themselves for the regulatory changes and technological evolutions expected in the future. Some of the key challenges they face can be classified broadly as:

- **Aging Assets:** Utilities are facing the double threat of aging assets along with the growing need for extracting more life and performance from the available assets. Predictability in asset performance and maintenance needs will help utilities meet this challenge.

Utilities are overwhelmed by the volume and velocity of data and they need to use it effectively to ease cost, consumer and ecological pressures. But implementing the right solution is the key to keeping up with regulatory and technological changes while meeting their business and operational goals.

- Distributed resources³: In a utility, energy generation could be distributed to multiple units. It could also utilize a variety of energy inputs including traditional and renewable sources. Integrating and managing these poses a significant challenge.
- Regulatory controls: Regulations pertaining to utility supply and pricing are under constant scrutiny and are liable to change. This is imperative in the face of the move towards better consumer protection and eco-friendly regulations.
- Demand response⁴: To ensure demand response, the utility will require the ability to coordinate the demand-response events by monitoring and measuring real-time consumption data such as changes in usage patterns by end-users and expected usage changes.
- Geographic concentration of revenues: Most of the utilities have uneven distribution of revenues across geography because of which they are vulnerable to economic fluctuation in certain regions where revenue is concentrated. Clear visibility into geographic distribution of power consumption and revenues will help utilities in better risk management, identify, and control energy theft etc.

Why Meter Data Analytics

Smart meter analytics result in several business benefits both for the provider and the consumer. While it ushers in operational and business efficiencies for the retailer by monitoring consumptions and optimizing peak demand in near real-time, consumers stand to benefit due to greater transparency and responsive information that will allow them to monitor and conserve energy usage.

Evolution of Meter Data Analytics

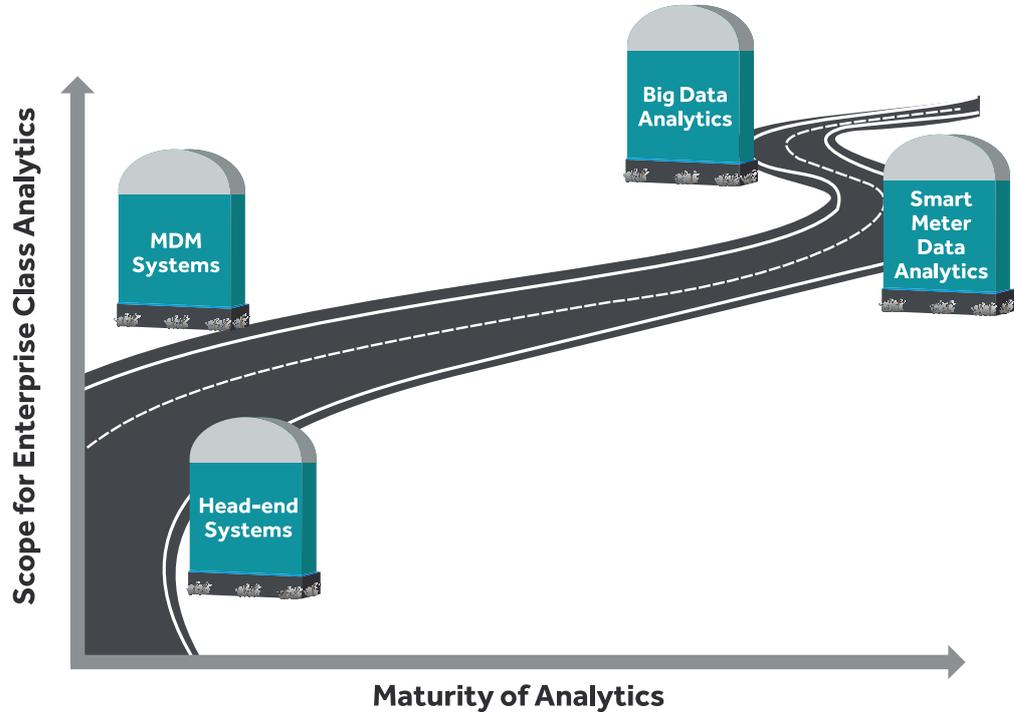
Traditionally meter data has been primarily used for monthly billing and settlement. With the new meter data management systems being deployed around the globe, this opens up the possibility for a wide range of analytics on monthly consumption and billing data. In the recent past, energy companies have started to realize the potential of deriving actionable insights from smart meters and are looking to use these insights to improve business outcomes.

To get higher resolution data and distribute it more quickly, a new breed of technical solutions is required. The focus of these solutions would be to distribute consumption information and applications amongst users and acquire data in near real-time at shorter intervals. These new capabilities will elevate metering from simply a component of the revenue process life cycle to more value-added services such as network management, asset management, commodity management and customer relationship management (CRM).

Based on a study of the current ecosystem, we can categorize the products and solutions contributing to meter data analytics as follows⁵:

- Head-end systems offering stand-alone energy consumption repositories such as Echelon, Itron, Landys & Gyr, Sensus etc.
- Meter Data Management (MDM) systems enabling monthly bill generation along with good reporting capabilities such as eMeter, Itron, Landys & Gyr, Oracle etc.
- Smart meter data analytics solutions from leading product vendors offering Big Data Analytics to analyze smart meter data such as SAP HANA, Oracle DataRaker, SAS Visual Analytics for utilities etc.

While the market is familiar with the existing meter data solutions, they are unsuitable for near real-time data from smart meters. Investing in a cost-effective Big Data solution provides utilities with operational and business insights besides analytics from meter data.



Source: Cyient Research

Fig. 1 | Utility Analytics Roadmap

- Big Data Analytics solutions built on Big Data platforms to develop meter data analytics connecting with enterprise data and any other external data if required.

These platforms are highly scalable and cost effective. They provide multiple out-of-the-box analytical models that can be used to generate rich insights into data. They also facilitate rendering analytics through multiple channels such as web, mobile, tablet etc. for enterprise-wide access anytime anywhere. Examples include leading platforms such as IBM InfoSphere BigInsights, Space-Time Insight as well as niche, cost effective, but equally powerful platforms like StarView.

For each of the above mentioned solution categories, the Fig. 1 above depicts:

- (i) The maturity of analytics
- (ii) The ability of these solutions to extend to enterprise class analytics

Analytics solutions from head-end systems and MDM systems have been in the market for many years, and they are suitable for traditional data analytics needs such as monthly billing reports and historical usage patterns. Meter data analytics solutions using near real-time data from smart meters are easy to implement and generate a quick return on investment (ROI). However, they are generally expensive and command a premium in the market compared to platform-based solutions.

Big Data analytics can be used both for bottom line and topline enhancement. Utilities can leverage it not just for cost control and better customer tariffs but also to maintain the assets better, detect, predict and prevent failures and forecast demand patterns.

The Big Data Revolution in Smart Meter Analytics

As per an estimate, the electric utilities possessed 194 petabytes of data in 2009 and more terabytes of data has been arriving ever since⁶. With vast quantities of data becoming available, it is not surprising that the Big Data revolution has reached the utilities industry. Big Data technology platforms can collect, analyze, and visualize information required to answer questions that were never asked before.

Smart meter data, when combined with distribution network characteristics such as weather and other operational information, can proactively address service delivery issues, improve workforce efficiency, and enable utilities to offer demand response and energy efficiency programs to their customers. Utilities are increasingly adopting these solutions. Several leading utilities have set an example by partnering with technology providers who can effectively convert smart meter data into tangible and actionable insights, in order to deliver better results to diverse stakeholders.

Scope of meter data analytics applications

- **Network management** – Smart meters can be accessed remotely from a utility's central system allowing for more efficient management of the network. Acquiring insights into the utility's network will enable:
 - Early/on-time detection of faults and scope for preventive maintenance
 - Helps in timely corrective action and better utilization resulting in optimization and better management of the network
 - Identification of potential problems and performance levels to help minimize risk and losses
- **Asset optimization** – Since utilities are asset-intensive organizations, managing, and maintaining these assets efficiently has a powerful impact on business results. Smart meter analytics enables utilities to meet customer expectations of regular, uninterrupted power supply and regulatory compliance on equipment maintenance and replacement. It can also enable visualization to answer questions pertaining to:
 - When and where to perform preventative maintenance to assets
 - The right time to replace equipment to prevent serious failures, optimal capacity utilization, and maintenance cost optimization
- **Bottom line enhancement** – Smart meters can be used to:
 - Detect the likelihood or actual occurrence of theft
 - Improve end-to-end tracking and billing
 - Proactively identify opportunities for launching new services
 - Increase transparency on consumption patterns for more accurate load forecasting
- **Customer analytics** – Analyzing customer behavior helps utilities effectively segment their customer base in order to offer customized pricing plans and supports them in their energy conservation efforts during peak periods. Some of the advantages to consumers include:
 - Ability to gather near real-time power usage information and thereby exercise greater control over their energy consumption
 - Participate in environmental conservation by reducing their consumption during peak hours, thereby reducing the need for carbon emitting 'peaker' plants

The right solution should meet the evolving needs of a utility, be scalable and cost effective.

Choosing the Right Solution

Big Data from smart meters and sensor data from networks represent a potential gold mine for utilities looking to gain better insight into operations and customer relationships, and innovate in an increasingly challenging industry.

Choosing the right solution is extremely critical in this constantly evolving market. When it comes to building analytics around smart meter data along with other Big Data sources in a utility, the first solutions articulated in the above solution roadmap from head-end systems and MDM systems are eliminated right away because they are capable of only historic data analytics and cannot process real-time data. That leaves us with the other two options:

Option 1: COTS products for Smart Meter Analytics

A small number of COTS products for smart meter analytics are available from leading vendors, and a few more are set to hit the market in the next couple of years. COTS solutions are generally preferred for their proven technologies, ease of implementation and quick ROI. However, we need to exercise caution while adopting COTS products for rapidly evolving technologies.

Some of the leading COTS products for smart meter analytics and their key features are:

SAP Smart Meter Analytics, Powered by SAP HANA

SAP has introduced smart meter data analytics solutions using their enterprise BI platform, in-memory solution HANA, along with some of their analytics tools. This solution is showcased as delivering instant, in-depth customer insights and advanced customer segmentation based on energy consumption patterns. Utilities can also perform energy efficiency benchmarking and provide customers with self-service access to energy data.

Key Features:

- Powerful customer insights
- Advanced customer segmentation
- Energy efficiency benchmarking
- Access to insights for end customers

Though it looks like a single packaged solution from SAP, the prerequisites for smart meter analytics solutions highlight the need for a varied set of SAP software that adds to the cost of this solution.

SAS Visual Analytics for Utilities

SAS provides a smart meter analytics solution that can scale to deliver actionable knowledge from the multitude of data flowing from smart meters. SAS Smart Meter Trial Optimization is positioned to determine the most valuable customers, how best to interact with those customers, and when is the best time to cross-sell to them during the rollout process.

Key Features:

- SAS demand and load forecasting provides a solid foundation to procure energy and balance load requirements
- SAS outage management can identify the real drivers of performance and reduce downtime and unscheduled outages

Oracle Utilities Meter Data Analytics

Oracle has recently acquired DataRaker, a software company focused on Big Data tools for utilities, to strengthen Oracle's offerings in Big Data solutions for utilities investing in smart meter infrastructure and other devices.

Oracle DataRaker provides an efficient mechanism to extract high volume smart meter data out of meter data management systems in order to analyze the data without affecting the transactional system. It also provides a comprehensive list of high-level, detailed dashboards for usage patterns, head-end system performance, meter installs, theft detection, VEE exception analysis, and tamper event analysis.

Customer support and revenue management support provided include shorter call handling time, reduction in high bill complaints, reduced volume of field appointments, improved cash collections by detecting meter and service irregularities, and improved customer engagement through personalized information and targeted interactions.

Asset and network operations support provided include more accurate capital and operational expenditure planning, improved optimization and maintenance plans to increase reliability and efficiency, better demand forecasts from empirically-driven scenario planning.

COTS products offer promising and attractive benefits to utilities. At the moment, COTS products are mainly dominated by leading independent software vendors (ISVs) and are expected to deliver the value they propose.

Option 2: Enterprise Big Data Platforms

Enterprise Big Data platforms offer comprehensive analytics solutions with enterprise-wide scalability at comparatively lower cost, enabling utilities to leverage the business benefits of smart meter analytics.

Though enterprise Big Data platforms have traditionally been used to process only smart meter data as input, it can take data from other systems like SCADA to enrich event processing and build algorithms for generating insights. Depending on the business context, the individual operational systems can send data to the platform and get actionable insights out of it. For example, a request can be sent from an outage management system (OMS) for checking the status of one or more smart meters, and in return get the information to create an outage ticket from the Big Data platform. Similarly, customer

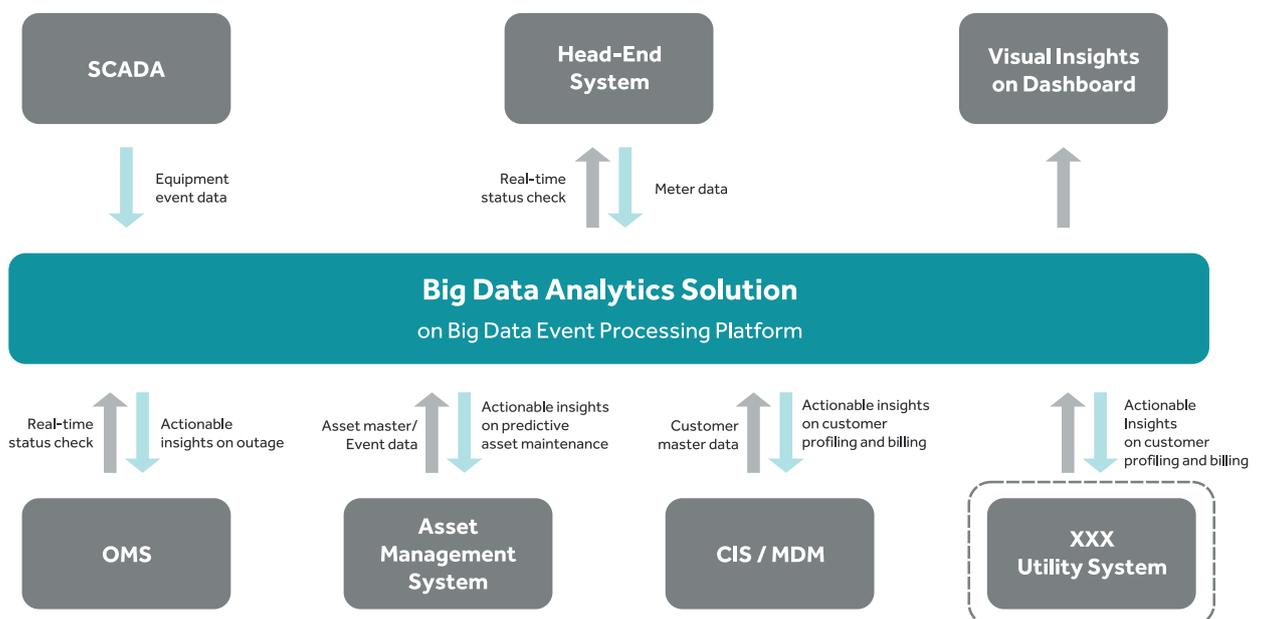


Fig. 2 | Big Data solution architecture

profiling data can be sent to a customer information system (CIS) to generate actionable insights on customer profiling that enables time-of-use pricing. Other utility systems that have data relevant to meter data can use the platform to generate similar insights. Big Data platforms also support the creation of customized dashboards for different stakeholders within the utility and share the output through different channels such as desktop, mobile etc. (Fig. 2)

Key Benefits of Big Data Platforms:

- Highly scalable, enterprise level analytics can be built to connect the rest of the utility systems from the same platform
- Standards-based architecture that supports an interactive development environment with rich set of adapters and graphical management tools
- Support for existing IT and operational systems such as GIS, SCADA, DMS, OMS etc.
- Developing complex event processing applications for other data elements such as sensors in a power grid
- A single enterprise-level platform can support multiple dashboards for various stakeholders
- Highly cost-effective compared to standalone packages that cater only to specific needs

Since these platforms do not have any out-of-the-box solutions for meter data analytics, it will require development of desired solutions based on the available data and IT infrastructure within the utility. Partnering with system integrators with strong skills in Big Data application development will result in customized solutions, avoiding the risk of obsolescence of immature products in the enterprise architecture.

Summary

Smart meter data captures a wealth of information, which can be combined with other key data in the utility business to improve efficiencies, customer experience, and business results. It also helps consumers save money and help with energy conservation, especially during peak periods, and helps utilities prepare for better regulatory compliance.

Meter data analytics solutions from head-end systems and MDM systems have been around in the market for many years and are suitable for traditional data analytical needs such as monthly billing reports and historical usage patterns. Analytics from near real-time meter data are far more impactful and can be built using either COTS products from analytics solution vendors or Big Data analytics platforms.

COTS solutions for smart meter analytics that are currently in the market show promising benefits. They are generally easy to implement. However, the downside is that these solutions are expensive, and there are not many success stories in the market yet to determine their credibility.

A judicious alternative aligned with current business imperatives is to use an in-house solution on a capable Big Data platform. Big Data platforms provide flexibility in solution development, customization to specific utility needs, and facilitate the development of enterprise-wide analytics. Considering the rapid evolution of technology in Big Data analytics, it would be appropriate to start small with a platform that is capable enough to collect data, process it, and generate insights from required functional and operational datasets within the utility. However, utilities need to ensure that they have an able system integration partner who can support their analytics journey from inception to the realization of enterprise-wide Big Data analytics.

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Author

Bhoopathi is the Head of Big Data Analytics practice at Infotech Enterprises. He has over 17 years of experience in business intelligence and technology management, and has spent the last several years evangelizing the integration of operational real-time technologies with IT technologies, primarily for Utilities and Telecom. Bhoopathi has built and run large BI teams and delivered enterprise-level solutions for advanced functional and operational analytics platforms.

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About Cyient

Cyient is a global provider of engineering, manufacturing, data analytics, networks and operations solutions. We collaborate with our clients to achieve more and shape a better tomorrow.

With decades of experience, Cyient is well positioned to solve problems. Our solutions include product development and life cycle support, process and network engineering, and data transformation and analytics. We provide expertise in the aerospace, consumer, energy, medical, oil and gas, mining, heavy equipment, semiconductor, rail transportation, telecom and utilities industries.

Strong capabilities combined with a network of more than 13,100 associates across 38 global locations enable us to deliver measurable and substantial benefits to major organizations worldwide.

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